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# Identification of benthic invertebrate and diatom indicator taxa that distinguish different stream types as well as degraded from reference conditions in Luxembourg

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**Abstract**
The main objective of the Water Framework Directive (WFD) is to achieve good ecological status for surface waters in Europe by 2015. The ecological status has to be defined based on near-natural reference conditions. Benthic invertebrates and diatoms are among the key biological elements recommended by the Directive to assess ecological quality of water bodies. The purpose of this study is to identify species associations of these biological elements that are characteristic of the different stream types occurring in Luxembourg and that distinguish degraded from reference conditions. In general, the results reveal that diatoms and invertebrates can be considered as complementary indicators with more diatom species being characteristic of small size stream types and more benthic invertebrate species being associated with larger stream types. Among invertebrates, Trichoptera, Hydrachnidia, Ephemeroptera and Diptera show high affinities for most stream types. Plecoptera, Oligochaeta appear as useful indicators for some particular types. If only reference sites are selected (all river types considered), the number of indicator species drops from 55 to 24 for diatoms and from 81 to 48 for benthic invertebrates. Moreover, for the larger stream type, no reference site was found at all. This trend is likely to be a consequence of the multiple anthropogenic pressures that have affected large parts of European lowland rivers for decades. Our results suggest that Trichoptera, Hydrachnidia, Diptera, Ephemeroptera and Oligochaeta could be considered as best candidate groups for a tiered-taxonomic resolution approach where only taxa which have narrow and specific ecological requirements would be identified to finer levels. In Central Europe, however, since taxonomic soundness and easy recognition are required, only Trichoptera and Ephemeroptera are the groups to be recommended at the present time.


**Keywords**
Benthic invertebrates; benthic diatoms; indicator species; quality assessment; reference conditions; river health; typology, Water Framework Directive (WFD)

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## Introduction

The Water Framework Directive (WFD) (European Council, 2000) outlines a legal structure for the assessment of all types of water bodies in Europe with the aim of ensuring the overall consistency of European water policy on the basis of a common objective of "good status" (Wasson, 2001). A main focus of the WFD is the use of quality elements (macrobenthic fauna, fish fauna and aquatic flora) in stream assessment, which is a concept new to many European countries (Hering et al., 2004). Using these quality elements, the "ecological status" is defined by comparing the actual biological community composition of a river ecosystem with the characteristic "Reference Conditions" (RC) for each river type. Therefore, cost-effective assessment programmes should focus on the selection of the most appropriate indicators (high discriminatory power and low error) to monitor the stressors affecting these reference conditions (Johnson et al., 2006 a). Most researchers recognize that the finest level of identification is needed to detect the exact biological response to environmental disturbances. A way to answer to these antagonist statements (cost, unavailability versus necessity of higher sensitivity) might be to focus attention on selected taxonomical groups. Some authors (e.g. Bailey et al., 2001; King and Richardson, 2002) also suggest a tiered-taxonomic approach, in which taxa known to be sensitive primarily at a genus or species level are identified as such, but remaining taxa are identified only to family level. This strategy, by focusing the effort of taxonomic resolution on taxa that have narrow and specific environmental tolerances would enable to reduce the high variability often associated with species level data. Indeed, several studies have concluded that genus- or species-level identifications provide little additional information concerning the pollution status when compared to family-level identifications (e.g., Wright, 1995; Zamora-Muñoz and Alba-Tercedor, 1996; Bowman and Bailey, 1997; Marchant et al., 1997) in particular because species-level data showed a greater response to environmental variation, which could contribute to noise and mask the effects of human activity (Warwick, 1993). We hypothesize that among the whole community of benthic invertebrates inhabiting freshwater streams, a small subset of taxa has narrow and specific environmental tolerances (Dohet et al., 2002). The identification below the family level (preferably species level) of these indicator taxa of first importance would be more efficient (in terms of accuracy) and less costly than identifying all members of the community sampled at a site to the lowest practical level (Bailey et al., 2001).

However, the merit of the tiered-taxonomic approach has rarely been evaluated, probably because of the rarity of high taxonomic resolution datasets (especially species-level datasets) in bioassessment protocols using benthic invertebrates as indicators. The present biocenotic study, which covers the main stream types and ecological conditions that can be found in Luxembourg, and which involves a dozen of taxonomists for the identification of all benthic invertebrate groups at a species level, is likely to give some responses to questions arising from the tiered-taxonomic approach.

The main objectives of the present study are (1) to evaluate the usefulness and the potential complementarities between benthic diatoms and invertebrates for the characterization of different stream types and environmental conditions, (2) to identify among benthic invertebrates the groups which better distinguish different stream types

and degraded ecosystems from the reference conditions, and (3) to draw up short lists of critical invertebrate indicator taxa, for which the identification of specimens to the species level would be required to increase precision and relevance in river health assessments.

About one thousand species of macroinvertebrates have been enumerated and identified during this survey. Knowing the different threats on ecosystem health and particularly on aquatic ecosystems, it is unlikely that a comparable diversity will be found if a similar survey will be conducted in a couple of years. Thus, a resulting objective of this paper is also to establish detailed reference lists of indicator species that could be used to derive useful criteria for assessing further conservation values of particular sites.

## Material and methods

### *Site selection and field sampling*

The dataset comprises physio-geographical, physical, chemical and land use variables measured at 231 sampling sites distributed all over the country (fig. 1). These sites were selected in order to provide a relevant and representative hydrological and geographical coverage. Although different degrees of human impact were considered, a particular effort was made to find streams with minimal disturbance. The complete list of variables measured at sampling sites can be found in Ferréol et al. (2005). Over the whole sampling site dataset, 38 sites were considered as "reference" and 193 as "diversely affected" sites after a strict validation procedure (see below).

Benthic invertebrates and diatoms were sampled at each station twice a year (spring and summer-autumn seasons). Benthic invertebrates were gathered from the different microhabitats (riffles, depositional zones, different types of vegetation). The sampling procedure was described in Dohet et al. (2002) and Rimet et al. (2004). A rectangular hand net (frame: 25×30 cm, mesh: 500 μm) was used to collect aquatic animals. The diatom biofilm was sampled using a clean blade and fixed in 40 ml 4% formaldehyde. The diatom valves were cleaned with 40% hydrogen peroxide to eliminate organic material and with hydrochloric acid to dissolve carbonate. Clean frustules were mounted in a synthetic resin (Naphrax) and up to 400 valves were identified and counted in each sample (AFNOR, 2000) by light microscopy with 1000× magnification. Concerning taxonomic resolution, all taxa collected were identified mainly to species level. The total numbers of diatom and invertebrate taxa recorded from the 231 sites were respectively, 435 and 966. In order to decrease the importance of vagrant specimens and rare species in the analysis, all invertebrate abundances with only one specimen were eliminated, but only when that specimen represented less than 5% of that species sum of catches. Furthermore, all taxa represented by less than 15 specimens in total and distributed in more than five sites were not taken into account (Stroot, 1989; Dufrêne and Legendre, 1997). Concerning diatoms, only taxa representing at least 1% of the total assemblages were kept for the indicator value calculations. These procedures reduce the number of taxa in the analysis to 229 diatoms (53% of the initial taxa list) and 470 benthic invertebrates (50% of the initial taxa list).

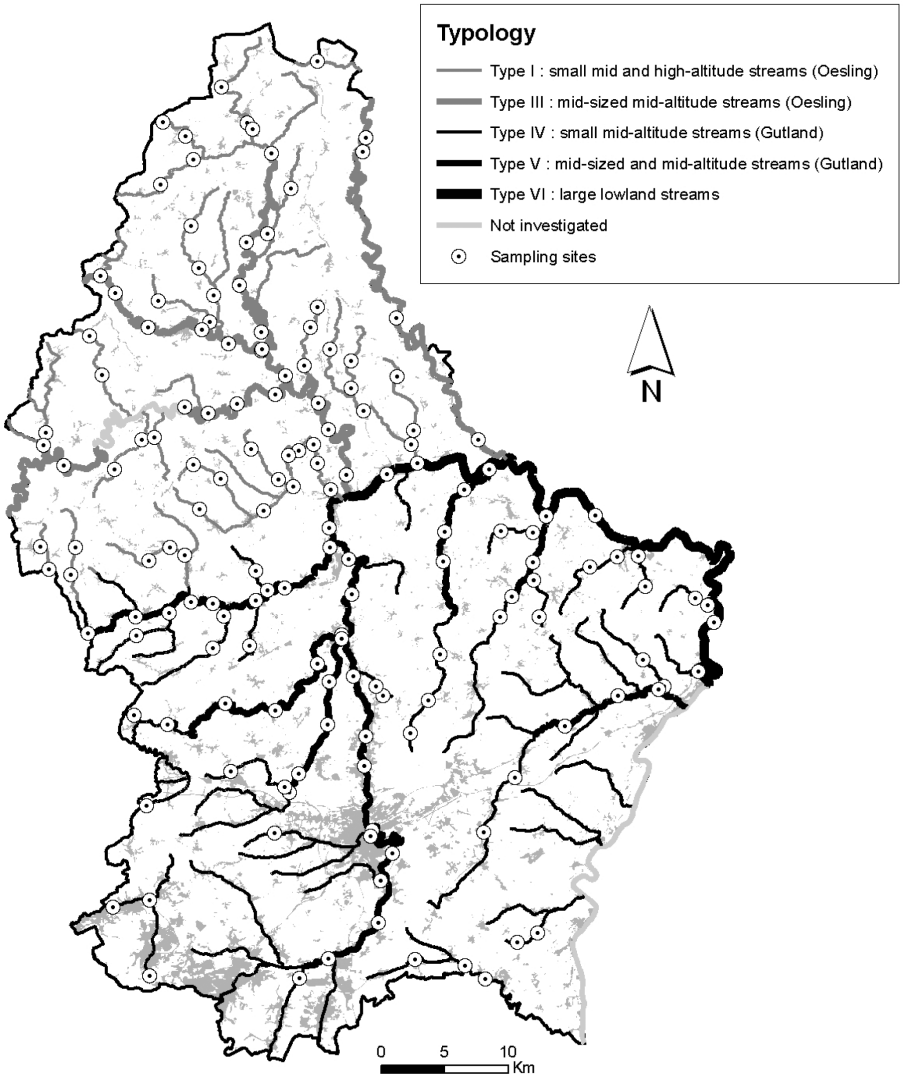


**Figure 1.** Location of the sampling sites within the stream typology of the Grand-Duchy of Luxembourg (only sites characterized by a catchment area ≥ 10 km$^2$ are shown on the map).

## *Typology*

In the context of the WFD implementation (European Council, 2000), an optimal "a priori" classification of streams in Luxembourg was defined and validated upon physio-geographical variables. Six stream types (I-VI) were identified in Luxembourg (Ferréol et al., 2005). Typological keys were principally the global size of the stream, the altitude and the water mineralization (carbonate hardness and conductivity). The latter was well correlated to the geological difference between the calcareous and non-calcareous areas of the country. Among these six stream types, two (types I and II) are of equivalent size (< 100 km$^2$), located in the same geological area (Oesling) and are

only distinguished by the altitudinal median values (one type attaining 390 masl and the second type reaching 280 masl). However, this altitudinal range is most likely not sufficient to induce distinct aquatic communities. Indeed, ordination analyses computed on particular groups like Trichoptera (Dohet et al., in press) or on the whole set of benthic invertebrates (Ferréol et al., 2008) do not enable to identify distinct species assemblages upon these two stream types. Consequently, to achieve greater accuracy and precision and, hence, more reliable assessments of the biological conditions, these two stream types were merged into type I. This is in accordance with the principle of achieving the most effective classifications by testing and refining physically derived classes with subsequent analyses of biological data (Gerritsen et al., 2000). Thus, the final typological map includes five stream types (fig. 1) denominated I (small mid and high-altitude streams in the Oesling), III (mid-sized mid-altitude streams in the Oesling), IV (small-sized mid-altitude streams in the Gutland), V (mid-sized low and mid-altitude streams in the Gutland) and VI (large lowland streams).

*Reference conditions*

The selection of reference sites is based on the REFCOND guidance (Wallin et al., 2003) and the criteria proposed for the selection of reference samples used in the WFD intercalibration process (Wasson, 2006). The REFCOND guidance specifies that the reference conditions are a state in the present or in the past corresponding to very low pressure, without the effects of major industrialization, urbanization and intensification of agriculture, and with only very minor modifications of physico-chemistry, hydromorphology and biology. The difficulty consists in defining precisely this very low pressure level that leads to insignificant or very low impact at the ecosystem level. The "insignificant impact" could be understood as "hardly distinguishable from natural (spatial and temporal) variability" at the level of the biological elements. Thus, realistic and WFD compliant "reference thresholds" were proposed for some important chemical (e.g. $BOD_5$, dissolved oxygen, $N\text{-}NH_4$, $P\text{-}PO_4$, $N\text{-}NO_3$) and land use parameters (e.g. % of artificial land use, % intensive agriculture) in order to harmonize the criteria to be applied for the selection of reference samples used in the intercalibration process. Thus, reference sites selected in this study have been screened against these agreed limits (Wasson, 2006) and have been validated through a strict procedure. This resulted in a reference dataset comprising 19 (type I), 4 (type III), 13 (type IV) and 2 (type V) reference sites. No reference site was found in the larger stream type (type VI) according to the criteria used.

*Indicator species analysis*

To find indicator species and species assemblages (benthic invertebrates and diatoms) characterizing stream types and reference conditions, the method IndVal (Dufrêne and Legendre, 1997) was used.

This is a simple method that enables to find indicator species and species assemblages characterizing groups of sites. The method combines a species relative abundance with its relative frequency of occurrence in the various groups of sites. Indicator species

are defined as the most characteristic species of each group, found mostly in a single group of the typology and present in the majority of the sites belonging to that group. This duality, which is of ecological interest, is rarely completely exploited in such analyses; often only the distribution of abundances in the various groups is used. In these cases, species occupying only one or two sites in one stream type and present only in that type (rare species) receive the same indicator value as species occupying all sites of that stream type and found only in that type. There is an important difference between these two species. The first one is an asymmetrical indicator: its presence cannot be predicted in all sites of one stream type but it contributes to the type specificity. The second species, on the contrary, is a true symmetrical indicator: its presence contributes to the group specificity and one can predict its presence in all sites of the group. Actually, the IndVal index (IV) is maximum when all individuals of a species are found in a single group of sites (high specificity) and when the species occurs in all sites of that group (high fidelity).

The other advantages of the method are the possibility of evaluating the statistical significance of the species indicator values using a randomization procedure; the opportunity to derive indicators from any a priori or a posteriori, hierarchical or non-hierarchical site classification; contrary to other widely used methods like TWINSPAN (Hill, 1979), the IndVal indicator index for a species is independent of the other species' relative abundances and there is no need to use "pseudo-species".

## Results

### *Benthic invertebrates and diatoms*

Overall, when considering the whole dataset (i.e. not restricted to reference sites) 55 diatom species and 81 benthic invertebrate species appear as significant indicators of the different stream types investigated in this study. Considering the total number of species used in the analyses, 23% of diatom species and 17% of benthic invertebrate species can be considered as characteristic species of the different groups of the typology. Most specific diatom indicator species (19 and 15 respectively) are found in the smaller stream types I (small mid and high-altitude streams in the Oesling) and IV (small-sized mid-altitude streams in the Gutland) (fig. 2a). The number of diatom indicator species decreases in stream types III (mid-sized mid-altitude streams in the Oesling) and V (mid-sized low and mid-altitude streams in the Gutland), with only 5 and 2 species, respectively. In the larger stream type VI (large lowland), a relative high number of characteristic species (11) is reached again. The invertebrates show a more or less inverse trend with few indicator species (8 and 3 respectively) in the small stream types (I and IV). A significant increase in specific benthic invertebrates is noticed in mid-sized stream types (III and V) with 21 and 19 species. The highest number of characteristic species (30) is achieved in the larger stream type VI.

If only reference sites are selected, the total number of indicator species drops to 24 for diatoms and 48 for benthic invertebrates (fig. 2b). This decline is at least partly related to the absence of any reference site for the larger stream type (VI) according to both bio-indicator groups and for mid-sized stream types (III and V) according to

diatoms. The distribution and proportion of characteristic species between stream types where reference conditions still can be achieved is comparable to those observed when the whole set of sites is exploited (fig. 2a) with the exception of the stream type I, where the proportion of indicator diatom species is twice less when only reference sites are selected.

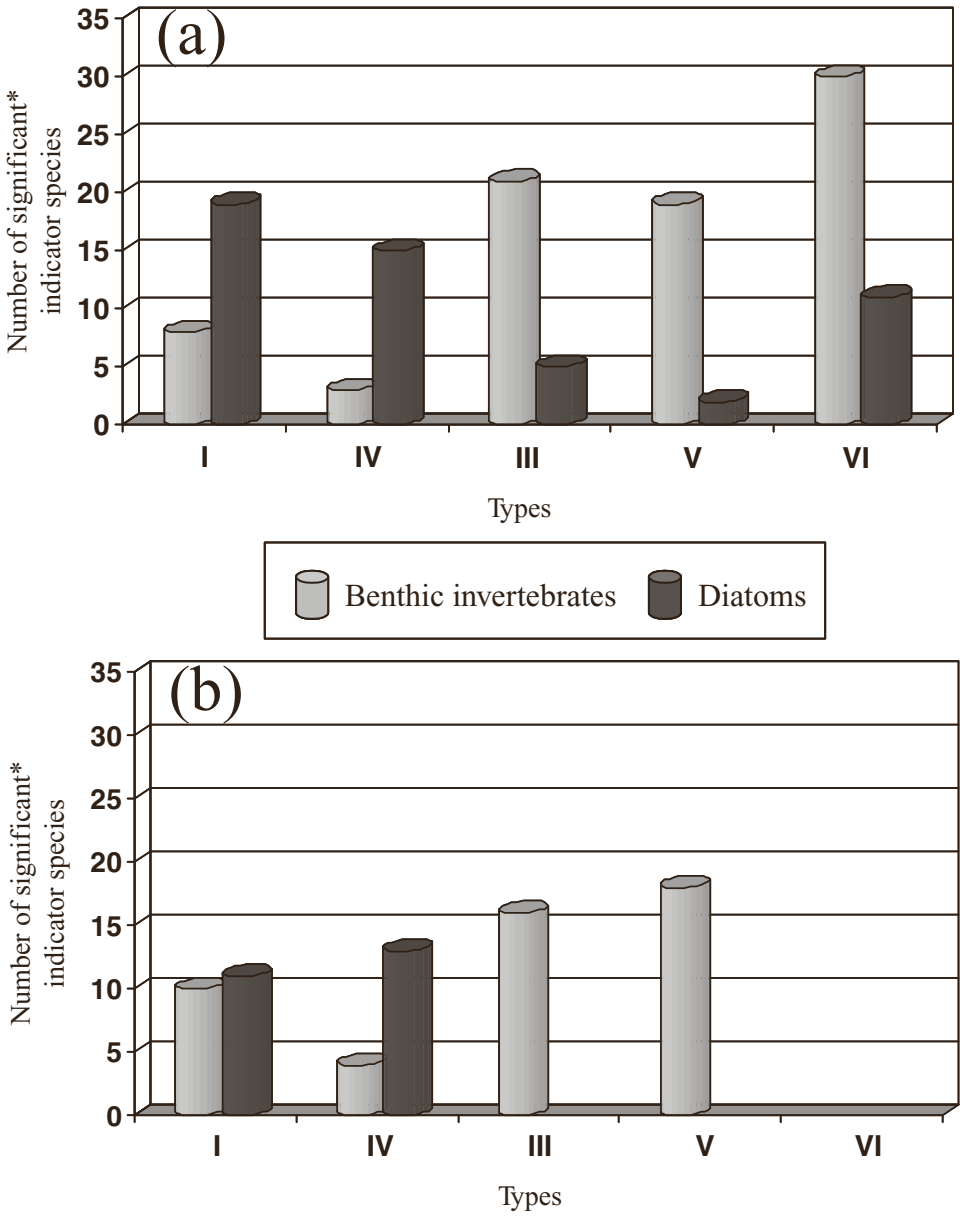


**Figure 2.** Total number of significant* indicator species among benthic invertebrates and diatoms in the different stream types investigated. (a) whole set of samples considered; (b) only reference samples are selected. * IndVal ≥ 25.0 and $p \leq 0.05$ (see legends of tables 1 and 2 for detailed explanation).

*Benthic invertebrate taxagroups*

Proportions and allocations of benthic invertebrate indicator species among types are relatively uneven and no clear trends emerge from the results (fig. 3a,b). However, Trichoptera, Hydrachnidia, Diptera and Ephemeroptera have often more species being

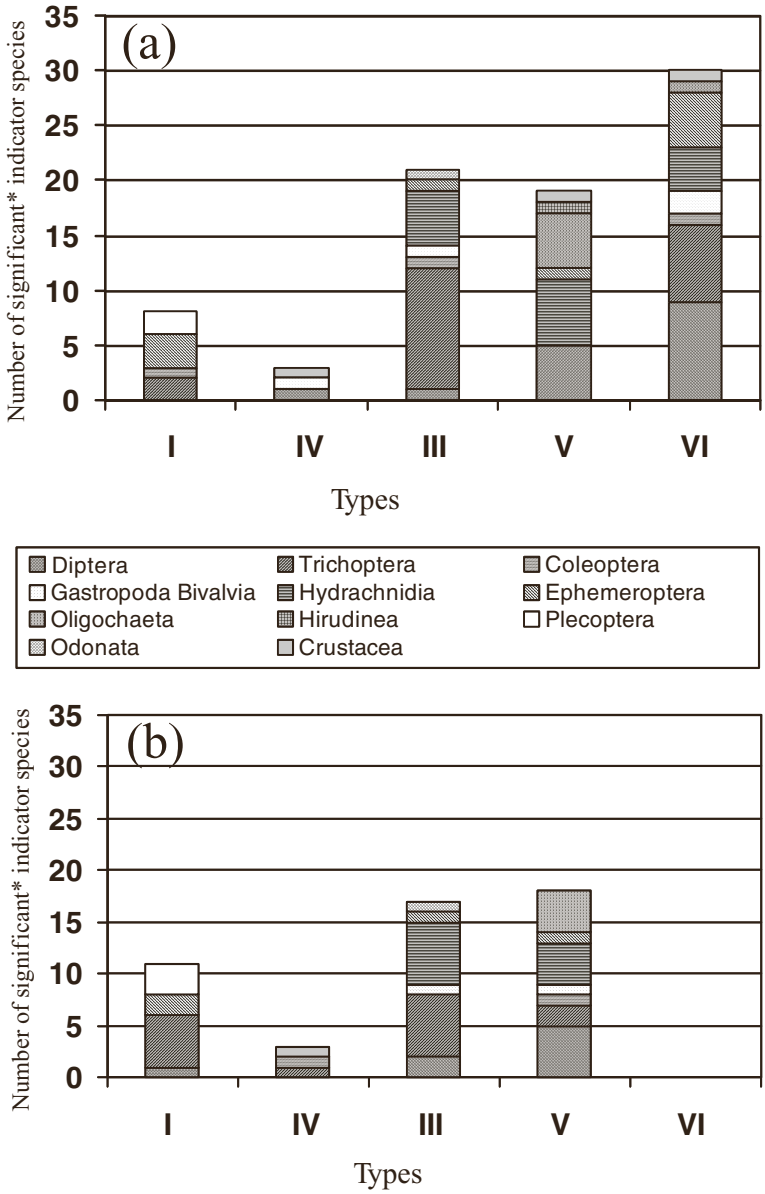


**Figure 3.** Total number of significant* indicator species among different organism groups of benthic invertebrates in the different stream types investigated. (a) whole set of samples considered; (b) only reference samples are selected. * IndVal ≥ 25.0 and $p \leq 0.05$ (see legends of tables 1 and 2 for detailed explanation).

characteristic of the different stream types, both in reference and non reference conditions. Plecoptera and Oligochaeta appear also as useful indicators for particular stream types (e.g. small stream size type in the Oesling for Plecoptera and mid-sized calcareous streams in the Gutland for Oligochaeta).

Generally, the selection of near natural reference sites (fig. 3b) is associated with a slight decrease of the number of significant indicator species in most of the groups. This tendency is especially obvious for Trichoptera in the stream type III, with a loss of about half the characteristic species when only reference sites are selected.

The ability of different groups of benthic invertebrates to respond to the different environmental conditions can be evaluated by summing significant indicator species in each situation investigated in this study (i.e. five stream types in reference condition or not) (fig. 4 and fig. 5). Notwithstanding the diversity inherent to the different taxa-groups (fig. 4), Trichoptera is by far the most advantageous group for the assessment of river health, with 34 species being indicative of one or another stream type in reference condition or not. Hydrachnidia, Diptera, Ephemeroptera and Oligochaeta follow with respectively 25, 24, 14 and 10 characteristic species of different environmental conditions.

Taking into account the biodiversity of each taxagroup (fig. 5), Hydrachnidia has the highest proportion of characteristic indicator species (66%), followed in decreasing order by Crustacea, Trichoptera, Ephemeroptera, Oligochaeta, Plecoptera and Odonata (40% to 33%).

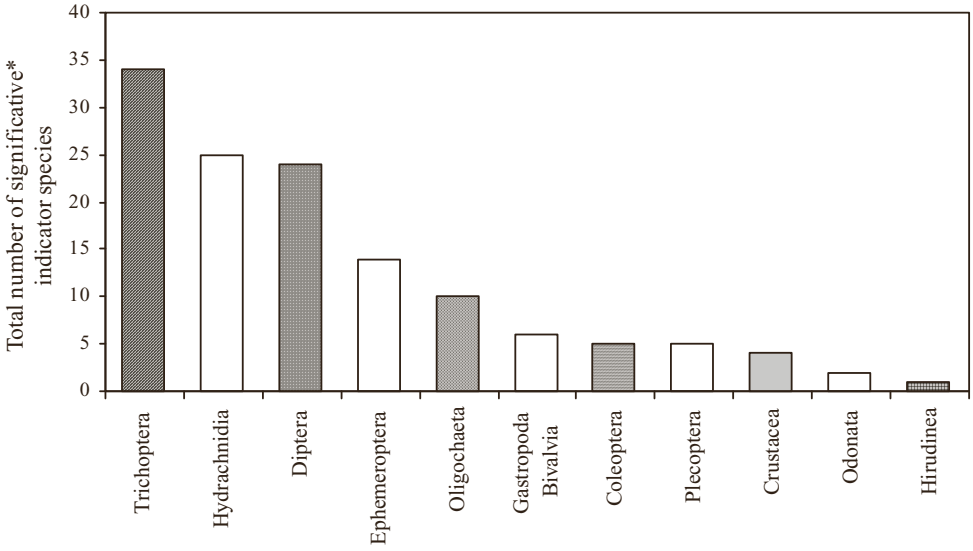


**Figure 4.** Different organism groups of benthic invertebrates ranked acoording to their total number of significant* indicator species in different stream types and environmental conditions (reference and not reference conditions). * IndVal ≥ 25.0 and p ≤ 0.05 (see legends of tables 1 and 2 for detailed explanation).

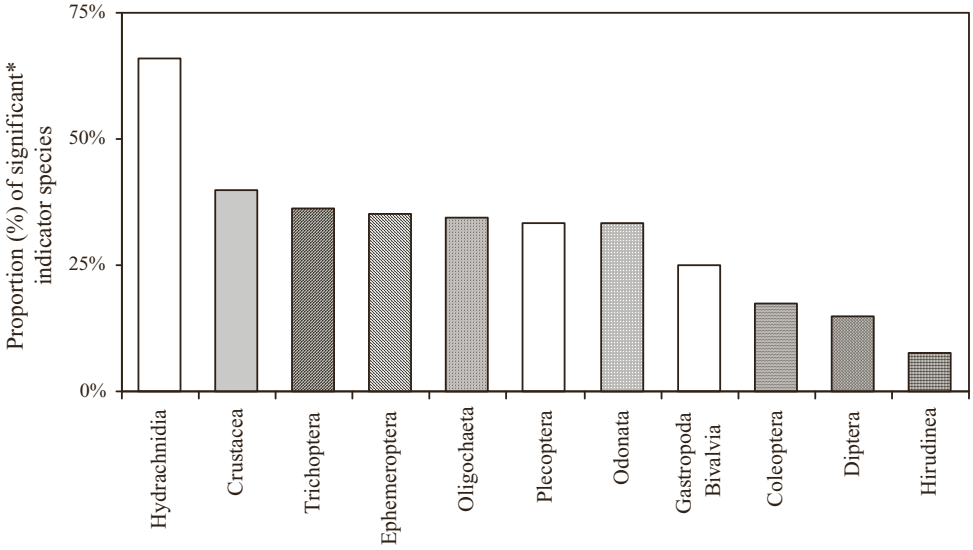


**Figure 5.** Different organism groups of benthic invertebrates ranked acoording to their proportions of indicator species (total number of significant* indicator species relative to the total number of species in each organism group) in different stream types and environmental conditions (reference and not reference conditions). * IndVal ≥ 25.0 and $p \leq 0.05$ (see legends of tables 1 and 2 in the appendix for detailed explanation).

### *Characterization of river types according to their specific invertebrate and diatom assemblages*

The lists of indicator species for different stream types are provided in table 1 (appendix) for all sites and table 2 (appendix) for sites considered as "reference". Species are sorted according to the groups they are indicative for (ascending) and by observed indicator value (descending). For each species, indicator values are given for the stream type with the highest affinity but also for all other stream types. Species that are considered as robust indicators of a particular stream type ($p \leq 0.05$ and indicator value ≥ 25) are marked in bold characters (tables 1, 2, in appendix).

*Type I (small mid and high-altitude streams in the Oesling) (80 sites with 19 "reference" sites).* This type merges small streams located in the higher areas of the Oesling and characterized by relatively low slopes with streams situated at an intermediate altitude, characterized by U-shaped valleys and a slightly meandering channel with anabranched sections and temporarily connected side arms. Sand of fine to coarse grain size is the predominant substrate in the former "sub-type"; mineral substrates ranging from large blocks to fine gravel distinguish the second "sub-type". Additional biotic substrates are floating riparian vegetation, fine roots of woody riparian vegetation and deposits of coarse and fine particulate organic matter.

Stream width varies between 1.5 and 7 m. The water is usually circum-neutral with pH values comprised between 6.9 and 7.8. Mineralization is low with most conductivity values below 300 $\mu S.cm^{-1}$ and total hardness below 0.9 $meq.L^{-1}$. Low organic contents (e.g. $BOD_5$ below 2 $mg.L^{-1}$) characterized streams not affected by anthropogenic disturbances.

The macroinvertebrate community is characterized by species preferring the hypocrenal to metarhithral zones. Plecoptera, Trichoptera and Ephemeroptera are the most abundant taxa. Some representative species are *Isoperla oxylepis*, *Perla marginata* and *Protonemura* sp. (Plecoptera); *Philopotamus ludificatus*, *Sericostoma personatum*, *Odontocerum albicorne*, *Glossosoma conformis* and *Oecismus monedula* (Trichoptera); *Habroleptoides confusa*, *Epeorus sylvicola* and *Rhithrogena semicolorata* (Ephemeroptera); *Atherix* sp. (Diptera) and *Hydraena gracilis* (Coleoptera). Due to the relatively low density of inhabitants in this part of the country, several near-natural stretches can still be found and organic pollution is usually low. Main degradation factors are the lack of woody vegetation, straightening, bank fixation and removal of coarse woody debris.

Characteristic diatom species for this stream type are: *Nitzschia archibaldii*, *Planothidium lanceolatum*, *Gomphonema calcifugum*, *Achnanthidium daonense*, *Meridion circulare*, *Reimeria sinuata*, *Fragilaria capucina*, *Encyonema silesiacum*, *Cocconeis lineata*, *Fragilaria vaucheriae*, *Diatoma mesodon*, *A. minutissimum*, *Craticula molestiformis*, *N. pusilla*, *Navicula cryptocephala*, *Nitzschia acidoclinata*, *Surirella angusta*, *N. tubicola* and *M. constrictum*.

*Type III (mid-sized mid-altitude streams in the Oesling) (32 sites with 4 "reference" sites).* The stream type is distributed from Belgium to the western parts of the Czech Republic. The geology is fairly homogeneous in the whole range and consists mainly of schists, mudstone and sandstone. These are generally middle gradient streams (average slopes varying between 2.5 and 6.2 $m.km^{-1}$) flowing through U-shaped valleys or meander valleys depending on their width. Characteristic mineral substrate fractions are mesolithal or macrolithal. Floating plants, mosses and fallen leaves are present in the channel or along the banks. Average stream width reaches up to 20 m, mean catchment area varies between 350 and 450 $km^2$. Due to the siliceous geology, conductivity is moderate (≈ 230 $\mu S.cm^{-1}$) and pH values range between 7.5 and 8.0.

Characteristic macroinvertebrate species are mainly found among Trichoptera and Hydrachnidia: *Brachycentrus maculatus*, *Oecetis testacea*, *Polycentropus flavomaculatus*, *Psychomyia pusilla*, *Rhyacophila dorsalis*, *Lasiocephala basalis*, *Lepidostoma hirtum*, *Mystacides azurea*, *Brachycentrus subnubilus*, *Hydropsyche siltalai*, *Silo piceus* and *Athripsodes cinereus* (Trichoptera); *Torrenticola amplexa*, *Lebertia porosa*, *Hydrodroma torrenticola*, *Atractides nodipalpis*, *Hygrobates calliger* and *Hygrobates longiporus* (Hydrachnidia). *Simulium reptans* and *Simulium angustipes* (Diptera), *Elmis maugetii* (Coleoptera), *Ancylus fluviatilis* (Gastropoda), *Paraleptophlebia submarginata* (Ephemeroptera) and *Calopteryx virgo* (Odonata) are also typical species of this mid-sized siliceous streams.

*Gomphonema minutum*, *Fragilaria rumpens*, *Cocconeis pseudolineata*, *Encyonema minutum* and *Nitzschia subacicularis* are the most likely predicted diatom species in the mid-sized mid-altitude streams of the Oesling region.

This stream type is widely distributed in the Oesling region (Our, upper and middle Sûre, Clerve and Wiltz rivers). Although a few unpolluted near-reference sites still remain where the floodplain is covered by dense deciduous forest, several streams are affected by agricultural land use. Numerous streams belonging to this type have a degraded morphology (straightening, scouring, damming and removal of natural floodplain). Further sources of degradation include tourism (camping) and cattle grazing.

*Type IV (small-sized mid-altitude streams in the Gutland) (66 sites with 13 "reference" sites).* These small streams are common in the Gutland region. Mean width varies between 1.5 and 4.5 m, their catchment being quite small (5-44 $km^2$). These are generally low to middle gradient streams (average slopes varying between 1.4 and 3.9 $m.km^{-1}$) flowing through U-shaped valleys (upper course) and more meandering lower reaches. If meso-lithal microhabitats dominate in most streams, a significant proportion of streams are characterized by fine to medium grain sized sediments. Organic substrates generally range between 10% and 50% (submerged and emergent macrophytes, mosses, algae, fallen leaves,…). Due to the calcareous geology, pH values range between 7.7 and 8.1. Total hardness is relatively variable with values ranging from 4 to 10 $meq.L^{-1}$. Conductivity is rather high with a mean value rising up to 760 $\mu S.cm^{-1}$.

A few species are characteristic of these small calcareous streams. Among them, *Plectrocnemia conspersa* (Trichoptera), *Gammarus fossarum* (Crustacea), *Prodiamesa olivacea* (Diptera), *Pisidium personatum* (Bivalvia) and Scirtidae gen. sp. (Coleoptera). Contrary to benthic invertebrates, numerous diatom species are indicative of this stream type: *Gomphonema olivaceum*, *G. micropus*, *Achnanthidium lauenburgianum*, *Planothidium frequentissimum*, *Rhoicosphenia abbreviata*, *Caloneis bacillum*, *Navicula tripunctata*, *Mayamaea atomus*, *Surirella brebissonii*, *G. pumilum* var. *elegans*, *N. reichardtiana*, *N. cryptotenella*, *A. pyrenaicum*, *Nitzschia recta* and *Platessa conspicua*.

These streams are often located in intensively farmed regions and lack buffer strips and bank-side trees. Organic pollution and impairment of stream morphology are the most important degradation factors. Nevertheless, smaller streams in forested areas sometimes remain in a good condition.

*Type V (mid-sized low and mid-altitude streams in the Gutland) (38 sites with 2 "reference" sites).* These middle to low gradient streams (average slopes varying between 1.8 and 4.8 $m.km^{-1}$) usually sinuate or meander within a broad floodplain. Upper reaches of rivers like the Attert, Eisch, Mamer, Alzette, Ernz noire, Ernz blanche and Syre are located at an altitudinal range of 250 – 350 m. Lower stretches usually reach the 150 – 250 m range. Due to erosion, prominent undercuts and slip slopes are frequent. The sediments are dominated by smaller grain fractions like sand and silt with gravels and cobbles generally limited to sections with high currents.

Average stream width reaches up to 17 m. Conductivity values range from 500 to 750 $\mu S.cm^{-1}$, total hardness from 3.8 to 6.2 $meq.L^{-1}$ and pH is close to 7.5.

Macroinvertebrate associations are dominated by Hydrachnidia, Diptera and Oligochaeta: *Lebertia fimbriata*, *Sperchon glanduosus*, *Hygrobates nigromaculatus*, *S. denticulatus*, *H. fluviatilis*, *L. inaequalis* and *Mideopsis* sp. (Hydrachnidia); *Polypedilum scalaenum*, *Thienemannimyia* sp., *Orthocladius obumbratus*, *Antocha* sp., *Tvetenia calvescens*, *Paratanytarsus dissimilis*, *Eukiefferiella claripennis* and *E. devonica/ilkleyensis* (Diptera); *Eiseniella tetraedra*, *Stylodrilus heringianus*, *Nais elinguis*, *Psammoryctides barbatus* and *Rhyacodrilus coccineus* (Oligochaeta); *Oreodytes sanmarkii*, *Platambus maculatus* (Coleoptera); *Baetis vernus* (Ephemeroptera); *Hydropsyche siltalai* (Trichoptera); *Erpobdella octoculata* (Hirudinea) and *Radix* sp. (Gastropoda).

Among diatoms, only *Amphora pediculus* and *Fallacia subhamulata* are characteristic species of mid-sized low and mid-altitude streams in the Gutland.

This stream type is highly modified by straightening, scouring and the removal of natural floodplain vegetation for the benefit of agricultural uses. Besides this, pollution from effluent as well as eutrophication and input of toxic substances from agricultural land use and industry result in heavily impacted water channels and the elimination of sensitive taxa.

*Type VI (large lowland streams) (6 sites with 0 "reference" site).* This stream type is restricted to the larger section of the lower Sûre river. Average stream width reaches up to 44 m and catchment area values are within a 3000 to 4000 $km^2$ range. Substrate consists mainly of boulders, blocks, bedrock and cobbles. Near the shoreline and in low current zones or pools, gravel and sand are deposited. Due to the low number of sites belonging to this type and the relative homogeneity of their environmental conditions, the range of key environmental parameters is narrow. Median pH, total hardness and conductivity values are respectively: 8.2, 5.1 $meq.L^{-1}$ and 483 $\mu S.cm^{-1}$.

The macroinvertebrate community consists of potamophilic species like: *Baetis fuscatus*, *B. scambus*, *Serratella ignita*, *Caenis luctuosa* and *Heptagenia sulphurea* (Ephemeroptera); *Simulium lineatum*, *Eukiefferiella clypeata*, *Cardiocladius fuscus*, *S. equinum*, *Rheotanytarsus sp.* and *Tvetenia* sp. (Diptera); *Hydropsyche incognita*, *Oecetis notata*, *H. contubernalis*, *Cheumatopsyche lepida*, *Rhyacophila dorsalis*, and *Mystacides* sp. (Trichoptera); *Atractides nodipalpis* and *Sperchon clupeifer* (Hydrachnidia); *Bithynia tentaculata* (Gastropoda); *Sphaerium corneum* (Bivalvia); *Stylaria lacustris* (Oligochaeta); *Echinogammarus berilloni* (Crustacea) and *Stenelmis canaliculata* (Coleoptera).

Epilithic diatom associations are characterized by *Nitzschia fonticola*, *Navicula antonii*, *Cyclotella meneghiniana*, *Navicula capitatoradiata*, *Nitzschia paleacea*, *N. inconspicua*, *Fistulifera saprophila*, *Ulnaria ulna*, *Gomphonema truncatum*, *Encyonema caespitosum*, *Cymbella aspera*, *Cocconeis pediculus*, *Gyrosigma attenuatum* and *Ulnaria acus*.

Morphology of this stream type located within a region characterized by a high density of inhabitants is particularly modified by human alterations. These essentially concern stream regulation like straightening, bank fixation, retention of bed load and impounding. Further sources of degradation include tourism (camping). Organic pollution, although still present, remains relatively moderate for this stream type.

## Discussion

Diatoms and benthic invertebrates are among the most popular organisms used in monitoring and assessment of water quality and stream biological integrity.

The IndVal analysis reveals that the proportion of species which appear as significant indicators of one or another stream type reaches 23% and 17% for diatoms and benthic invertebrates, respectively. This result suggests that a relatively high number of species has narrow and specific environmental requirements, attesting of the usefulness of these two organism groups as bioindicators. Indeed, ideal indicator organisms are

those whose presence can be predicted if physical, chemical, and nutritional requirements are being met. Therefore, if the environmental factors that are most commonly limiting for the species are known, the presence of the organism will indicate specific environmental conditions (Johnson et al., 1993). Applied to species assemblages and communities, it is important that these narrow and specific environmental tolerances are distributed among different species and for different levels of pollution, so that indicators in the whole range of the perturbation gradient are available.

Our results show also inverse proportions of characteristic diatom versus macroinvertebrate species in the different stream types considered in this study. Indeed, the number of diatom indicator species is higher in small-size types (i.e. type I and IV) whereas there are more macroinvertebrate species that are associated with larger stream types (i.e. types III, V and VI). This comparison of the number of strict indicator species present in the different ecological combinations (stream types; reference and non reference conditions) suggests complementary responses of these two organism groups. Comparing the application of indices of biotic integrity based on periphyton, macroinvertebrates, and fish from southern Rocky Mountain streams (USA), Griffith et al. (2005) concluded that these organism groups differ in their sensitivity to different stressors and advocated for the use of more than one assemblage to assess the biotic integrity of those streams. In Europe, detailed statistical analyses of large-scale geographical datasets of the European funded STAR and AQEM projects generally showed that organism/metric response to stress varied among organism groups/metrics and with different types of stress, supporting the conjecture that organism-responses were not redundant (Hering et al., 2006 c; Johnson et al., 2006 a,b). However, depending on the spatial scale or the stream type assessed, often two or more of the organism groups (among fish, benthic invertebrates, macrophytes and diatoms) were significantly related to the same stressors, which implies a certain degree of redundancy among the organism groups/metrics tested (Johnson et al., 2006 a,b; Grenouillet et al., 2007; Johnson et al., 2007). Hering et al. (2006 b) summarized these different results and proposed a general guide for which organism group/groups should be used in biomonitoring, according to the river types, the type of monitoring and the type of anthropogenic stress investigated. For instance, in case of different stressors affecting a river or of unknown stressor, (1) benthic diatoms (for eutrophication) and benthic invertebrates (for various stressors) are recommended in small mountain streams; (2) benthic diatoms or macrophytes (for eutrophication and land use effects) and benthic invertebrates or fish (for hydromorphological and land use effects) appear as the more suitable biological quality elements in medium-sized mountain streams and lowland streams.

Traditionally, Trichoptera, Ephemeroptera and Plecoptera are recognized as organism groups including numerous sensitive taxa, and thus are largely used (e.g. EPT metric: total number of taxa in the insect orders Ephemeroptera, Plecoptera and Trichoptera) in methods for the assessment of water quality (e.g. Lenat, 1988; Resh and Jackson, 1993; Fore et al., 1996; Wallace et al., 1996; Lenat and Resh, 2001; Dohet et al., 2002; Hering et al., 2004; Carter and Fend, 2005; Feld and Hering, 2007). On the contrary, organism groups like Oligochaeta, Diptera (especially Chironomids), Gastropoda or Hirudinea, are considered as representatives of the higher range (lower

ecological quality classes) of the perturbation gradient (e.g. Plafkin et al., 1989; Cairns and Pratt, 1993; Johnson et al., 1993; Nijboer et al., 2004; Feld and Hering, 2007). Expressed in total number (fig. 4) or in proportion (fig. 5) of significant indicator species present in the different stream types and environmental conditions investigated, this trend is especially verified for Trichoptera. Indeed, this group is ranked in the first place when the total diversity of species among Trichoptera is not taken into account (fig. 4) and in the third place (fig. 5) when the proportion of indicator species against the total number of species within the group, is considered. Ephemeroptera ranks at the fourth place with less than half the number of total indicator species reached by Trichoptera. Plecoptera has only 5 characteristic species and these are restricted to the stream type I (small mid and high-altitude streams in the Oesling) (fig. 3a,b). Proportions of truly indicator species among Ephemeroptera, Plecoptera and Trichoptera are, however, comparable (about 35%). This result confirms the reliability of a metric like EPT, in numerous multimetric methods developed nowadays for bioassessment (e.g. Buffagni et al., 2004; Hering et al., 2004; Lorenz et al., 2004; Griffith et al., 2005; Hering et al., 2006 a) and gives evidence to the predominant role of Trichoptera as ideal indicators of river ecosystem health. Indeed, among freshwater macroinvertebrates, they constitute one of the most diversified groups. Trichoptera display ecological and behavioral specializations which enable them to successfully colonize a vast range of lotic and lentic waters (e.g. Mackay and Wiggins, 1979; Stroot, 1989). This high taxonomical diversity of Trichoptera concurrently induces a high diversity of life history strategies that make this group one of the most suited to appraise the structure and functioning of aquatic ecosystems (Morse, 2003). Our findings confirm that even though caddisflies are present in a wide range of aquatic habitats, numerous species have very strict environmental requirements (Resh and Unzicker, 1975; Malicky, 1981; Stroot, 1989; Resh, 1993; Dohet, 2002). Most species of Plecoptera are very sensitive to organic pollution (e.g. Wiederholm, 1984; Giller and Malmqvist, 1998). However, most of them are restricted to small mid- and high-altitude streams (Céréghino et al., 2003) and are cold stenothermic aquatic insect species (Haidekker and Hering, 2007). Therefore, Plecoptera appear as useful indicators of these particular stream types (i.e. small mid- and high-altitude streams in Luxembourg), but do not cover the whole range of different environmental conditions. Oligochaeta, a group that has a proportion of characteristic species comparable to Trichoptera and Ephemeroptera, is restricted to larger stream types (in particular, stream type V: mid-sized low and mid-altitude streams in the Gutland). Unexpectedly, a relatively high number of sensitive species is found among Oligochaeta, a group mostly considered as tolerant to perturbations, when we restrict to near-reference sites (e.g. *Eisenella tetraedra*, *Stylodrilus heringianus*, Lumbriculidae gen. sp., *Nais elinguis*). Indeed, Oligochaetes are generally favored by high nutrient concentrations and high amounts of organic matter (Verdonschot, 1987, 1996). However, probably the most surprising result is the high number of Hydrachnidia species, which are significant indicators of the different stream types and environmental conditions considered. Actually, with a total of 25 characteristic species, they rank before Diptera, a group that counts more than four times more species in our dataset. Moreover, Hydrachnidia ranks at the first place, all organism groups confounded, when

proportions of indicator species relative to the total number of species analyzed, are calculated. This result is very interesting because Hydrachnidia are often neglected in inventories intended to assess the health of rivers (Resh and McElravy, 1993). Nevertheless, except Walter (1918) who attributed a low wastewater sensitivity to Hydrachnidia, numerous authors found a strong influence of organic pollution on the composition of the water mite communities (e.g. Bolle et al., 1977; Biesiadka and Kasprzak, 1977; Cicolani and Di Sabatino, 1988, 1991; Kowalik and Biesiadka, 1981; Petrova, 1985; Imamura and Kikuchi, 1986; Meyer, 1986; Gerecke and Schwoerbel, 1991; Van der Hammen and Smit, 1996). Furthermore, water mites are afflicted by two different ways: directly by the pollutants, as top predators in the aquatic food webs, and indirectly by the dependence on the host insect populations. The main reasons explaining the lack of this group in biomonitoring assessments are obviously the current state of taxonomic knowledge and the cost related to the expertise required for the identification of these organisms (Resh and McElravy, 1993).

The establishment of appropriate taxonomic resolution levels for biological water quality assessment is one of the most debated issues among scientists nowadays. We agree with Bouchard et al. (2005) that the question that must be answered is: "does the cost of finer taxonomic resolution outweigh the potential loss of information?" In many cases, the cost of increased resolution will be greater than the potential loss of information (e.g. Bailey et al., 2001). Studies interested in the detection of coarse between-site differences, studies in areas of known low diversity, and studies utilizing multimetric and multivariate techniques can utilize coarser taxonomic resolutions. However, studies dealing with conservation, life histories, indicator groups, and those looking at specific types of perturbation are likely to require genus-level or preferably species-level identifications (Lenat and Resh, 2001; King and Richardson, 2002; Lorenz et al., 2004; Schmidt-Kloiber and Nijboer, 2004). The reference species lists provided in this study can act as a starting point for a tiered-taxonomic resolution approach where only those taxa which have narrow and specific ecological requirements would be identified to finer levels. This approach is likely to be more cost-effective than identifying all taxa with fine-level resolution (Bailey et al., 2001; Chessman et al., 2007).

Tables 1 and 2 (appendix) list the species according to their indicator values for the different stream types and environmental conditions investigated in this study. Species marked in bold character are statistically significant indicators for the different stream types. The species listed in these tables can be seen on one hand, as reference species that could be used to give useful criteria for assessing conservation values of particular sites, and on the other hand, as short lists of critical species for which identification at the finest resolution (i.e. species level) would be recommended in order to increase precision and relevance in river health assessments.

## Conclusions

To ensure maximal coverage of a particular group by using specific collecting strategies and taking into account the taxonomic expertise available in a particular region, it may

be of interest to select only some organism groups, identifying them with the finest resolution level. The most useful groups are those, which have numerous species with narrow and specific environmental tolerances distributed all along the perturbation gradients of interest. Our results suggest that Trichoptera, Hydrachnidia, Diptera, Ephemeroptera and Oligochaeta could be good candidates for this purpose. In Central Europe, however, since taxonomic soundness and easy recognition are required, only Trichoptera and Ephemeroptera are the groups to be recommended. Indeed, software, which provides precise documentation of most species known from this geographical region is available (Lechthaler and Stockinger, 2005) or will be available soon (Bauernfeind and Lechthaler, in preparation).

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## Appendix

**Table 1.**

List of indicator species for the different stream types investigated. The "Avg" and "Max" columns refer to the indicator values for the given species (average and maximum value); "MaxGrp" is the type identifier for the group with the highest indicator value. The statistical significance of the observed indicator value is tested with a randomisation (Monte Carlo) procedure: "SD" is the Standard Deviation. "P" evaluates the statistical significance of the maximum indicator value recorded for given species. The probability of type I error is the proportion of times that the maximum indicator value from the randomized data set equals or exceeds the maximum indicator value from the actual data set. Species are ordered according to the groups they are indicative for (ascending) and by observed indicator value (descending). Significant indicators for a particular stream type (IndVal ≥ 25.0 and p ≤ 0.05) are marked in bold characters.

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | P |
| **EPHEMEROPTERA** | **LEPTOPHLEBIIDAE** | ***Habroleptoides confusa*** | **10** | **50** | **I** | **50** | **0** | **2** | **0** | **0** | **50.2** | **10.1** | **3.58** | **0.001** |
| **TRICHOPTERA** | **SERICOSTOMATIDAE** | ***Sericostoma schneideri/ personatum*** | **12** | **45** | **I** | **45** | **15** | **1** | **0** | **0** | **44.5** | **13.1** | **3.72** | **0.001** |
| **EPHEMEROPTERA** | **HEPTAGENIIDAE** | ***Epeorus sylvicola*** | **10** | **41** | **I** | **41** | **7** | **0** | **0** | **0** | **41.0** | **10.1** | **3.44** | **0.001** |
| **PLECOPTERA** | **PERLODIDAE** | ***Isoperla oxylepis*** | **6** | **31** | **I** | **31** | **0** | **0** | **0** | **0** | **31.1** | **6.4** | **2.83** | **0.001** |
| **COLEOPTERA** | **HYDRAENIDAE** | ***Hydraena gracilis* Ad.** | **9** | **30** | **I** | **30** | **12** | **1** | **1** | **0** | **30.3** | **11.4** | **3.69** | **0.004** |
| **PLECOPTERA** | **NEMOURIDAE** | ***Protonemura* sp.** | **7** | **28** | **I** | **28** | **0** | **7** | **0** | **0** | **27.8** | **9.2** | **3.44** | **0.006** |
| **TRICHOPTERA** | **ODONTOCERIDAE** | ***Odontocerum albicorne*** | **6** | **27** | **I** | **27** | **0** | **2** | **3** | **0** | **27.0** | **8.5** | **3.26** | **0.003** |
| **EPHEMEROPTERA** | **HEPTAGENIIDAE** | ***Rhithrogena semicolorata-Gr.*** | **6** | **26** | **I** | **26** | **1** | **3** | **0** | **0** | **25.8** | **8.8** | **3.40** | **0.003** |
| DIPTERA | ATHERICIDAE | *Atherix* sp. | 5 | 24 | I | 24 | 0 | 0 | 0 | 0 | 24.2 | 5.4 | 2.76 | 0.002 |
| PLECOPTERA | NEMOURIDAE | *Nemoura* sp. | 9 | 24 | I | 24 | 6 | 16 | 0 | 0 | 24.0 | 14.3 | 4.21 | 0.035 |
| DIPTERA | SIMULIIDAE | *Prosimulium* sp. | 5 | 24 | I | 24 | 0 | 0 | 0 | 0 | 23.7 | 8.7 | 3.76 | 0.011 |
| COLEOPTERA | DYTISCIDAE | Dytiscidae Gen. sp. Ad. | 6 | 24 | I | 24 | 0 | 4 | 0 | 0 | 23.6 | 7.7 | 3.46 | 0.011 |
| PLECOPTERA | TAENIOPTERYGIDAE | *Brachyptera risi* | 5 | 23 | I | 23 | 0 | 1 | 0 | 0 | 23.3 | 6.1 | 3.09 | 0.005 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche instabilis* | 5 | 23 | I | 23 | 0 | 0 | 2 | 0 | 22.9 | 7.1 | 3.19 | 0.007 |
| TRICHOPTERA | PHILOPOTAMIDAE | *Philopotamus ludificatus* | 5 | 23 | I | 23 | 0 | 0 | 0 | 0 | 22.7 | 4.8 | 2.64 | 0.001 |

**Table 1**. *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax* sp. | 5 | 23 | I | 23 | 0 | 2 | 0 | 0 | 22.7 | 7.7 | 3.48 | 0.009 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Agapetus fuscipes* | 5 | 22 | I | 22 | 0 | 2 | 0 | 0 | 22.2 | 10.4 | 3.63 | 0.018 |
| TRICHOPTERA | GOERIDAE | *Silo pallipes* | 5 | 21 | I | 21 | 0 | 2 | 0 | 0 | 21.3 | 6.8 | 3.14 | 0.010 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Glossosoma conformis* | 4 | 20 | I | 20 | 0 | 0 | 0 | 0 | 19.8 | 4.7 | 2.61 | 0.002 |
| EPHEMEROPTERA | BAETIDAE | *Alainites muticus* | 5 | 20 | I | 20 | 1 | 3 | 0 | 1 | 19.7 | 8.4 | 3.91 | 0.021 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Habrophlebia lauta* | 6 | 19 | I | 19 | 2 | 4 | 3 | 0 | 19.5 | 9.9 | 3.61 | 0.029 |
| TRICHOPTERA | SERICOSTOMATIDAE | Sericostomatidae Gen. sp. | 4 | 19 | I | 19 | 0 | 1 | 0 | 0 | 19.4 | 5.4 | 2.90 | 0.009 |
| EPHEMEROPTERA | EPHEMERIDAE | *Ephemera danica* | 6 | 18 | I | 18 | 5 | 3 | 2 | 0 | 18.3 | 10.8 | 3.91 | 0.051 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus* sp. | 7 | 18 | I | 18 | 13 | 1 | 3 | 1 | 17.8 | 10.7 | 3.70 | 0.046 |
| COLEOPTERA | ELMIDAE | *Elmis* sp. Lv. | 4 | 18 | I | 18 | 0 | 0 | 2 | 0 | 17.6 | 6.1 | 2.76 | 0.011 |
| TURBELARIA | PLANARIIDAE | *Polycelis felina* | 4 | 17 | I | 17 | 0 | 0 | 0 | 0 | 17.4 | 5.3 | 2.99 | 0.013 |
| TRICHOPTERA | SERICOSTOMATIDAE | *Oecismus monedula* | 3 | 15 | I | 15 | 0 | 0 | 0 | 0 | 15.3 | 3.9 | 2.36 | 0.006 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche fulvipes* | 3 | 14 | I | 14 | 0 | 2 | 0 | 0 | 14.3 | 5.1 | 2.73 | 0.020 |
| PLECOPTERA | PERLIDAE | *Perla marginata* | 3 | 14 | I | 14 | 2 | 0 | 0 | 0 | 14.1 | 4.7 | 2.75 | 0.017 |
| TRICHOPTERA | PHILOPOTAMIDAE | *Philopotamus montanus montanus* | 3 | 14 | I | 14 | 0 | 0 | 0 | 0 | 13.8 | 3.9 | 2.29 | 0.010 |
| ODONATA | CALOPTERYGIDAE | *Calopteryx* sp. | 3 | 14 | I | 14 | 0 | 0 | 0 | 2 | 13.8 | 4.8 | 2.65 | 0.018 |
| DIPTERA | CHIRONOMIDAE | *Eukiefferiella brevicalcar* | 3 | 13 | I | 13 | 0 | 1 | 0 | 0 | 13.1 | 6.0 | 2.79 | 0.027 |
| DIPTERA | SIMULIIDAE | *Prosimulium rufipes* | 3 | 13 | I | 13 | 0 | 0 | 0 | 0 | 12.7 | 4.3 | 2.68 | 0.022 |
| COLEOPTERA | ELMIDAE | *Limnius perrisi* Ad. | 4 | 13 | I | 13 | 0 | 6 | 0 | 0 | 12.6 | 6.6 | 3.34 | 0.055 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche saxonica* | 4 | 12 | I | 12 | 0 | 6 | 2 | 0 | 12.5 | 7.7 | 3.16 | 0.069 |
| PLECOPTERA | PERLODIDAE | *Perlodes microcephalus* | 2 | 12 | I | 12 | 0 | 0 | 0 | 0 | 11.6 | 4.0 | 2.43 | 0.024 |

*(Continued)*

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax cingulatus cingulatus* | 3 | 12 | I | 12 | 0 | 4 | 0 | 0 | 11.5 | 5.6 | 3.04 | 0.054 |
| PLECOPTERA | NEMOURIDAE | *Amphinemura sulcicollis/ triangularis* | 3 | 11 | I | 11 | 0 | 4 | 0 | 0 | 11.1 | 5.8 | 2.88 | 0.048 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus digitatus* | 3 | 11 | I | 11 | 2 | 4 | 0 | 0 | 11.1 | 7.2 | 3.37 | 0.093 |
| EPHEMEROPTERA | BAETIDAE | *Baetis melanonyx* | 2 | 11 | I | 11 | 0 | 1 | 0 | 0 | 11.0 | 4.3 | 2.45 | 0.028 |
| DIPTERA | BLEPHARICERIDAE | *Liponeura* sp. | 2 | 11 | I | 11 | 0 | 0 | 0 | 0 | 10.8 | 3.3 | 2.24 | 0.026 |
| EPHEMEROPTERA | EPHEMERIDAE | *Ephemera* sp. | 4 | 11 | I | 11 | 7 | 0 | 2 | 0 | 10.8 | 6.7 | 3.03 | 0.070 |
| DIPTERA | LIMONIIDAE | *Pilaria* sp. | 5 | 11 | I | 11 | 3 | 6 | 7 | 1 | 10.7 | 10.0 | 3.30 | 0.264 |
| DIPTERA | TABANIDAE | Tabanidae Gen. sp. | 3 | 11 | I | 11 | 2 | 3 | 0 | 0 | 10.5 | 6.2 | 2.96 | 0.072 |
| DIPTERA | SIMULIIDAE | *Simulium cryophilum* | 3 | 11 | I | 11 | 0 | 4 | 0 | 0 | 10.5 | 6.3 | 3.12 | 0.077 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra bidentata* | 2 | 10 | I | 10 | 0 | 1 | 0 | 0 | 10.0 | 4.6 | 2.49 | 0.034 |
| COLEOPTERA | HYDRAENIDAE | *Limnebius truncatellus* Ad. | 2 | 10 | I | 10 | 0 | 0 | 0 | 0 | 9.8 | 3.3 | 2.21 | 0.017 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus* sp. | 3 | 10 | I | 10 | 4 | 0 | 0 | 0 | 9.8 | 5.1 | 2.53 | 0.056 |
| COLEOPTERA | ELMIDAE | *Esolus angustatus* Ad. | 2 | 9 | I | 9 | 0 | 0 | 0 | 0 | 9.5 | 3.2 | 2.26 | 0.033 |
| COLEOPTERA | HYDROPHILIDAE | *Anacaena globulus* Ad. | 2 | 9 | I | 9 | 0 | 3 | 0 | 0 | 9.0 | 4.7 | 2.75 | 0.075 |
| EPHEMEROPTERA | BAETIDAE | *Nigrobaetis niger* | 2 | 9 | I | 9 | 0 | 0 | 0 | 0 | 8.5 | 3.1 | 2.21 | 0.023 |
| PLECOPTERA | PERLODIDAE | *Isoperla grammatica* | 2 | 9 | I | 9 | 0 | 0 | 0 | 0 | 8.5 | 2.9 | 2.25 | 0.041 |
| DIPTERA | TIPULIDAE | *Tipula saginata* | 2 | 8 | I | 8 | 0 | 1 | 0 | 0 | 8.4 | 3.8 | 2.60 | 0.065 |
| TURBELARIA | DUGESIIDAE | *Dugesia lugubris/ polychroa* | 2 | 8 | I | 8 | 1 | 0 | 1 | 1 | 8.3 | 4.5 | 2.50 | 0.082 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Glossosoma* sp. | 2 | 7 | I | 7 | 0 | 0 | 0 | 0 | 7.3 | 3.2 | 2.42 | 0.048 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Fridericia* sp. | 2 | 7 | I | 7 | 0 | 1 | 0 | 0 | 7.2 | 3.5 | 2.55 | 0.076 |
| HYDRACHNIDIA | HYGROBATIDAE | *Atractides* sp. | 2 | 7 | I | 7 | 2 | 0 | 0 | 0 | 7.0 | 4.6 | 3.02 | 0.118 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila praemorsa* | 1 | 7 | I | 7 | 0 | 0 | 0 | 0 | 6.7 | 3.4 | 2.72 | 0.066 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax latipennis* | 2 | 7 | I | 7 | 2 | 1 | 0 | 0 | 6.7 | 4.5 | 2.69 | 0.134 |
| TRICHOPTERA | GOERIDAE | Goeridae Gen. sp. | 2 | 7 | I | 7 | 0 | 0 | 0 | 1 | 6.6 | 4.1 | 2.50 | 0.116 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius frigidus* | 2 | 6 | I | 6 | 2 | 0 | 0 | 0 | 6.3 | 3.6 | 2.27 | 0.084 |
| DIPTERA | SIMULIIDAE | *Prosimulium hirtipes* | 2 | 6 | I | 6 | 2 | 1 | 0 | 0 | 6.3 | 5.8 | 2.94 | 0.298 |
| DIPTERA | LIMONIIDAE | *Hexatoma* sp. | 1 | 6 | I | 6 | 0 | 0 | 0 | 0 | 6.2 | 2.6 | 1.97 | 0.027 |
| EPHEMEROPTERA | BAETIDAE | *Cloeon dipterum-Gr.* | 1 | 6 | I | 6 | 0 | 0 | 0 | 0 | 6.2 | 2.7 | 1.84 | 0.036 |
| DIPTERA | CHIRONOMIDAE | *Trissopelopia* sp. | 1 | 6 | I | 6 | 0 | 0 | 0 | 0 | 6.2 | 2.8 | 2.39 | 0.055 |
| DIPTERA | CHIRONOMIDAE | *Diamesa dampfi-Gr.* | 2 | 6 | I | 6 | 3 | 0 | 0 | 0 | 5.8 | 4.7 | 2.44 | 0.206 |
| DIPTERA | CHIRONOMIDAE | *Apsectrotanypus trifascipennis* | 1 | 5 | I | 5 | 1 | 0 | 0 | 0 | 5.4 | 4.2 | 2.35 | 0.205 |
| TRICHOPTERA | LIMNEPHILIDAE | *Hydatophylax infumatus* | 1 | 5 | I | 5 | 0 | 0 | 0 | 0 | 5.3 | 2.9 | 2.28 | 0.066 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche silfvenii* | 1 | 5 | I | 5 | 0 | 0 | 0 | 0 | 5.1 | 2.3 | 1.83 | 0.062 |
| OLIGOCHETA | TUBIFICIDAE | *Spirosperma ferox* | 1 | 5 | I | 5 | 0 | 0 | 0 | 0 | 4.5 | 2.2 | 1.89 | 0.071 |
| PLECOPTERA | TAENIOPTERYGIDAE | *Brachyptera seticornis* | 1 | 5 | I | 5 | 0 | 0 | 0 | 0 | 4.5 | 2.4 | 1.98 | 0.073 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Leptophlebia marginata* | 1 | 5 | I | 5 | 0 | 0 | 0 | 0 | 4.5 | 2.4 | 2.06 | 0.090 |
| DIPTERA | TIPULIDAE | *Tipula maxima-Gr.* | 1 | 4 | I | 4 | 0 | 2 | 0 | 0 | 4.2 | 3.4 | 2.42 | 0.177 |
| TRICHOPTERA | LIMNEPHILIDAE | *Anomalopterygella chauviniana* | 1 | 4 | I | 4 | 2 | 0 | 0 | 0 | 3.8 | 3.0 | 2.30 | 0.226 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Habrophlebia fusca* | 2 | 4 | I | 4 | 1 | 1 | 3 | 0 | 3.8 | 4.4 | 2.69 | 0.467 |
| TRICHOPTERA | PHILOPOTAMIDAE | *Wormaldia* sp. | 1 | 3 | I | 3 | 0 | 1 | 0 | 0 | 3.4 | 2.8 | 2.34 | 0.198 |
| DIPTERA | CHIRONOMIDAE | *Natarsia* sp. | 1 | 3 | I | 3 | 2 | 0 | 0 | 0 | 3.3 | 2.9 | 1.99 | 0.287 |
| DIPTERA | DIXIDAE | *Dixa nebulosa* | 1 | 3 | I | 3 | 0 | 2 | 0 | 0 | 3.2 | 3.2 | 2.39 | 0.305 |
| EPHEMEROPTERA | EPHEMERELLIDAE | *Ephemerella mucronata* | 1 | 3 | I | 3 | 0 | 2 | 0 | 0 | 3.1 | 3.4 | 2.11 | 0.452 |
| TRICHOPTERA | GOERIDAE | *Silo nigricornis* | 1 | 3 | I | 3 | 0 | 0 | 0 | 0 | 2.8 | 1.8 | 1.84 | 0.132 |

*(Continued)*

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLECOPTERA | PERLODIDAE | *Isoperla goertzi* | 1 | 3 | I | 3 | 0 | 1 | 0 | 0 | 2.8 | 2.5 | 1.81 | 0.270 |
| COLEOPTERA | GYRINIDAE | *Orectochilus villosus* | 1 | 3 | I | 3 | 1 | 0 | 0 | 0 | 2.6 | 2.4 | 1.94 | 0.277 |
| TRICHOPTERA | BERAEIDAE | *Beraeodes minuta* | 1 | 2 | I | 2 | 0 | 1 | 0 | 0 | 2.4 | 3.0 | 2.13 | 0.468 |
| DIPTERA | CHIRONOMIDAE | *Paratrissocladius excerptus* | 1 | 2 | I | 2 | 0 | 2 | 2 | 0 | 2.1 | 4.3 | 3.01 | 0.938 |
| TRICHOPTERA | SERICOSTOMATIDAE | *Notidobia ciliaris* | 0 | 2 | I | 2 | 0 | 0 | 0 | 0 | 2.0 | 2.4 | 1.93 | 0.477 |
| COLEOPTERA | HALIPLIDAE | *Haliplus lineatocollis* Ad. | 1 | 2 | I | 2 | 0 | 1 | 0 | 0 | 1.8 | 2.4 | 1.71 | 0.610 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Agapetus delicatulus* | 0 | 2 | I | 2 | 0 | 0 | 0 | 0 | 1.7 | 1.5 | 1.61 | 0.218 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Diplectrona felix* | 0 | 2 | I | 2 | 0 | 0 | 0 | 0 | 1.7 | 1.5 | 1.40 | 0.218 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus curtus* | 0 | 2 | I | 2 | 0 | 0 | 0 | 0 | 1.7 | 1.6 | 1.64 | 0.234 |
| EPHEMEROPTERA | SIPHLONURIDAE | *Siphlonurus aestivalis* | 1 | 2 | I | 2 | 0 | 1 | 0 | 0 | 1.7 | 3.0 | 2.43 | 0.786 |
| EPHEMEROPTERA | SIPHLONURIDAE | *Siphlonurus lacustris* | 0 | 2 | I | 2 | 0 | 0 | 0 | 0 | 1.5 | 1.8 | 1.67 | 0.329 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax rotundipennis* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 1.3 | 2.1 | 1.92 | 0.619 |
| DIPTERA | SIMULIIDAE | *Prosimulium tomosvaryi* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 1.1 | 1.4 | 1.69 | 0.414 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus (Cricotopus)* sp. | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 1.1 | 1.3 | 1.36 | 0.563 |
| ODONATA | AESHNIDAE | *Aeshna cyanea* | 0 | 1 | I | 1 | 0 | 1 | 0 | 0 | 1.1 | 1.9 | 1.70 | 0.623 |
| DIPTERA | SIMULIIDAE | *Simulium noelleri* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 1.0 | 1.6 | 1.65 | 0.611 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Synagapetus iridipennis* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 0.9 | 1.7 | 1.80 | 0.666 |
| GASTROPODA & BIVALVIA | HYDROBIIDAE | *Bythinella dunkeri* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 0.6 | 1.1 | 1.22 | 1.000 |
| DIPTERA | CHIRONOMIDAE | *Psectrocladius* sp. | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 0.6 | 1.1 | 1.36 | 1.000 |
| GASTROPODA & BIVALVIA | PHYSIDAE | *Physella heterostropha* | 0 | 0 | I | 0 | 0 | 0 | 0 | 0 | 0.5 | 1.5 | 1.26 | 0.977 |
| DIPTERA | SIMULIIDAE | *Simulium posticatum* | 0 | 1 | I | 1 | 0 | 0 | 0 | 0 | 0.5 | 1.5 | 1.40 | 1.000 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TRICHOPTERA** | **LEPIDOSTOMATIDAE** | ***Lepidostoma hirtum*** | **17** | **78** | **III** | **0** | **78** | **0** | **2** | **3** | **78.3** | **12.4** | **4.59** | **0.001** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Oecetis testacea*** | **12** | **60** | **III** | **0** | **60** | **0** | **0** | **1** | **59.9** | **6.4** | **3.13** | **0.001** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Mystacides azurea*** | **14** | **57** | **III** | **0** | **57** | **0** | **0** | **12** | **56.9** | **7.9** | **3.35** | **0.001** |
| **HYDRACHNIDIA** | **TORRENTICOLIDAE** | **Torrenticolidae Gen. sp.** | **11** | **54** | **III** | **0** | **54** | **0** | **0** | **2** | **53.5** | **5.9** | **2.83** | **0.001** |
| **TRICHOPTERA** | **BRACHYCENTRIDAE** | ***Brachycentrus maculatus*** | **11** | **53** | **III** | **0** | **53** | **0** | **0** | **0** | **52.6** | **6.6** | **3.49** | **0.001** |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium reptans*** | **9** | **44** | **III** | **0** | **44** | **0** | **0** | **4** | **43.6** | **5.6** | **3.22** | **0.001** |
| **TRICHOPTERA** | **HYDROPSYCHIDAE** | ***Hydropsyche siltalai*** | **15** | **43** | **III** | **7** | **43** | **0** | **13** | **13** | **42.9** | **15.3** | **3.95** | **0.001** |
| **HYDRACHNIDIA** | **LEBERTIIDAE** | ***Lebertia porosa*** | **15** | **42** | **III** | **1** | **42** | **0** | **9** | **24** | **42.0** | **11.6** | **3.90** | **0.001** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates calliger*** | **11** | **42** | **III** | **0** | **42** | **0** | **8** | **4** | **41.5** | **10.0** | **3.79** | **0.002** |
| **HYDRACHNIDIA** | **TORRENTICOLIDAE** | ***Torrenticola amplexa*** | **9** | **41** | **III** | **1** | **41** | **0** | **2** | **2** | **41.1** | **6.3** | **2.97** | **0.001** |
| **TRICHOPTERA** | **POLYCENTROPODIATE** | ***Poiycentropus Havomaculatus*** | **12** | **36** | **III** | **0** | **38** | **0** | **0** | **20** | **37.8** | **6.6** | **3.05** | **0.001** |
| **EPHEMEROPTERA** | **LEPTOPHLEBIIDAE** | ***Paraleptophlebia submarginata*** | **9** | **33** | **III** | **9** | **33** | **0** | **2** | **0** | **33.1** | **9.6** | **3.32** | **0.001** |
| **GASTROPODA & BIVALVIA** | **VALVATIDAE** | ***Ancylus fluviatilis*** | **14** | **33** | **III** | **15** | **33** | **1** | **17** | **6** | **32.9** | **18.3** | **4.48** | **0.020** |
| **TRICHOPTERA** | **GOERIDAE** | ***Silo piceus*** | **7** | **33** | **III** | **2** | **33** | **0** | **2** | **0** | **32.6** | **8.0** | **3.39** | **0.002** |
| **ODONATA** | **CALOPTERYGIDAE** | ***Calopteryx virgo*** | **8** | **30** | **III** | **2** | **30** | **0** | **2** | **5** | **30.5** | **8.2** | **3.69** | **0.003** |
| **TRICHOPTERA** | **LEPIDOSTOMATIDAE** | ***Lasiocephala basalis*** | **7** | **30** | **III** | **1** | **30** | **0** | **2** | **0** | **30.1** | **7.5** | **3.16** | **0.002** |
| **TRICHOPTERA** | **BRACHYCENTRIDAE** | ***Brachycentrus subnubilus*** | **6** | **29** | **III** | **0** | **29** | **0** | **0** | **0** | **29.3** | **3.4** | **2.35** | **0.001** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates longiporus*** | **10** | **29** | **III** | **0** | **29** | **0** | **7** | **12** | **28.7** | **7.9** | **3.34** | **0.002** |
| **TRICHOPTERA** | **RHYACOPHILIDAE** | ***Rhyacophila* sp.** | **13** | **27** | **III** | **5** | **27** | **4** | **15** | **12** | **27.3** | **14.8** | **3.42** | **0.010** |
| **COLEOPTERA** | **ELMIDAE** | ***Elmis maugetii*** | **8** | **27** | **III** | **4** | **27** | **2** | **3** | **3** | **27.1** | **10.1** | **3.34** | **0.004** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Athripsodes cinereus*** | **7** | **25** | **III** | **0** | **25** | **0** | **1** | **12** | **24.9** | **4.8** | **2.71** | **0.001** |
| COLEOPTERA | HYDRAENIDAE | *Hydraena reyi* Ad. | 5 | 24 | III | 0 | 24 | 0 | 0 | 0 | 24.3 | 3.2 | 2.13 | 0.001 |

*(Continued)*

**Table 1.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | p |
| DIPTERA | CHIRONOMIDAE | *Orthocladius rivicola* | 6 | 23 | III | 2 | 23 | 0 | 0 | 6 | 22.7 | 6.1 | 3.22 | 0.005 |
| PLECOPTERA | LEUCTRIDAE | *Leuctra* sp. | 8 | 22 | III | 13 | 22 | 2 | 0 | 0 | 21.7 | 12.1 | 4.43 | 0.046 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Psychomyia pusilla* | 5 | 22 | III | 0 | 22 | 0 | 0 | 4 | 21.6 | 4.2 | 2.67 | 0.003 |
| EPHEMEROPTERA | EPHEMERELLIDAE | *Torleya major* | 10 | 19 | III | 14 | 19 | 0 | 14 | 1 | 18.9 | 19.7 | 4.64 | 0.511 |
| COLEOPTERA | ELMIDAE | *Oulimnius tuberculatus* | 8 | 19 | III | 3 | 19 | 0 | 14 | 5 | 18.5 | 10.8 | 3.79 | 0.049 |
| DIPTERA | CHIRONOMIDAE | *Tanytarsus* sp. | 7 | 17 | III | 1 | 17 | 0 | 10 | 9 | 17.4 | 8.4 | 3.63 | 0.030 |
| HYDRACHNIDIA | TORRENTICOLIDAE | *Torrenticola anomala* | 4 | 16 | III | 0 | 16 | 0 | 0 | 3 | 16.1 | 4.0 | 2.57 | 0.007 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea annulicornis* | 5 | 16 | III | 0 | 16 | 0 | 0 | 10 | 16.0 | 3.7 | 2.54 | 0.007 |
| DIPTERA | TIPULIDAE | *Tipula lateralis-Gr.* | 6 | 16 | III | 2 | 16 | 0 | 11 | 1 | 15.8 | 8.2 | 2.99 | 0.031 |
| DIPTERA | ATHERICIDAE | *Ibisia marginata* | 3 | 16 | III | 0 | 16 | 0 | 0 | 0 | 15.6 | 2.7 | 2.36 | 0.006 |
| TRICHOPTERA | LIMNEPHILIDAE | *Allogamus auricollis* | 3 | 15 | III | 0 | 15 | 0 | 0 | 0 | 15.4 | 3.0 | 1.99 | 0.008 |
| COLEOPTERA | ELMIDAE | *Elmis rioloides* Ad. | 4 | 15 | III | 4 | 15 | 0 | 0 | 0 | 15.4 | 5.5 | 2.75 | 0.015 |
| HYDRACHNIDIA | HYDRYPHANTIDAE | *Protzia invalvaris* | 3 | 15 | III | 1 | 15 | 0 | 0 | 0 | 15.2 | 3.4 | 2.38 | 0.010 |
| OLIGOCHETA | TUBIFICIDAE | *Peloscolex velutina* | 3 | 14 | III | 0 | 14 | 0 | 0 | 0 | 14.5 | 2.6 | 1.77 | 0.003 |
| TRICHOPTERA | LIMNEPHILIDAE | *Anabolia nervosa* | 3 | 14 | III | 3 | 14 | 0 | 0 | 0 | 14.3 | 4.2 | 2.62 | 0.013 |
| HYDRACHNIDIA | MIDEOPSIDAE | *Mideopsis orbicularis* | 4 | 14 | III | 3 | 14 | 0 | 1 | 0 | 14.3 | 5.1 | 2.93 | 0.025 |
| TRICHOPTERA | BRACHYCENTRIDAE | *Micrasema setiferum setiferum* | 3 | 14 | III | 0 | 14 | 0 | 0 | 0 | 14.1 | 2.5 | 2.41 | 0.009 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus torrentis* | 3 | 13 | III | 0 | 13 | 0 | 0 | 1 | 13.0 | 3.0 | 2.09 | 0.006 |
| HYDRACHNIDIA | SPERCHONTIDAE | *Sperchonopsis verrucosa* | 3 | 12 | III | 0 | 12 | 0 | 1 | 0 | 12.1 | 3.2 | 2.11 | 0.009 |
| DIPTERA | SIMULIIDAE | *Simulium angustipes* | 4 | 12 | III | 5 | 12 | 0 | 1 | 0 | 12.0 | 6.9 | 3.64 | 0.071 |
| GASTROPODA & BIVALVIA | PLANORBIDAE | *Gyraulus albus* | 4 | 12 | III | 1 | 12 | 0 | 1 | 4 | 11.7 | 5.3 | 2.89 | 0.046 |
| HIRUDINEA | ERPOBDELLIDAE | *Trocheta pseudodina* | 2 | 12 | III | 0 | 12 | 0 | 0 | 0 | 11.6 | 2.6 | 1.96 | 0.010 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Buchholzia appendiculata* | 2 | 12 | III | 0 | 12 | 0 | 0 | 0 | 11.6 | 2.5 | 2.01 | 0.014 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | CHIRONOMIDAE | *Cardiocladius capucinus* | 3 | 11 | III | 0 | 11 | 0 | 0 | 2 | 10.7 | 2.6 | 1.92 | 0.008 |
| TRICHOPTERA | LEPTOCERIDAE | *Athripsodes bilineatus* | 3 | 11 | III | 4 | 11 | 0 | 0 | 0 | 10.6 | 4.6 | 2.50 | 0.035 |
| OLIGOCHETA | LUMBRICIDAE | Lumbricidae Gen. sp. | 5 | 10 | III | 1 | 10 | 3 | 10 | 1 | 10.4 | 10.0 | 3.80 | 0.324 |
| DIPTERA | CHIRONOMIDAE | *Virgatanytarsus* sp. | 3 | 10 | III | 0 | 10 | 0 | 0 | 4 | 10.0 | 3.1 | 2.22 | 0.023 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax luctuosus* | 2 | 10 | III | 0 | 10 | 0 | 0 | 0 | 9.9 | 3.2 | 2.22 | 0.019 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus tesselatus* | 2 | 10 | III | 0 | 10 | 0 | 0 | 1 | 9.8 | 2.9 | 2.02 | 0.020 |
| TRICHOPTERA | GOERIDAE | *Goera pilosa* | 3 | 10 | III | 2 | 10 | 1 | 0 | 3 | 9.6 | 5.2 | 2.99 | 0.060 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia insignis* | 2 | 9 | III | 0 | 9 | 0 | 0 | 0 | 8.8 | 2.4 | 1.96 | 0.014 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Agapetus ochripes* | 2 | 9 | III | 0 | 9 | 0 | 0 | 0 | 8.7 | 2.4 | 1.70 | 0.007 |
| COLEOPTERA | ELMIDAE | *Esolus parallelepipedus* Ad. | 2 | 9 | III | 0 | 9 | 0 | 1 | 0 | 8.7 | 3.3 | 2.35 | 0.039 |
| COLEOPTERA | ELMIDAE | *Limnius opacus* | 2 | 8 | III | 0 | 8 | 0 | 0 | 0 | 8.5 | 2.5 | 1.97 | 0.027 |
| DIPTERA | CHIRONOMIDAE | *Diamesa insignipes* | 5 | 8 | III | 6 | 8 | 3 | 8 | 0 | 8.1 | 9.6 | 3.62 | 0.614 |
| ODONATA | CALOPTERYGIDAE | *Calopteryx splendens* | 2 | 8 | III | 1 | 8 | 0 | 0 | 0 | 8.0 | 3.1 | 2.48 | 0.042 |
| HYDRACHNIDIA | HYDRODROMIDAE | *Hydrodroma torrenticola* | 2 | 8 | III | 0 | 8 | 0 | 0 | 1 | 7.9 | 2.7 | 2.12 | 0.026 |
| EPHEMEROPTERA | BAETIDAE | *Centroptilum lutedum* | 4 | 8 | III | 4 | 8 | 5 | 1 | 0 | 7.9 | 8.2 | 3.35 | 0.409 |
| EPHEMEROPTERA | BAETIDAE | *Procloeon pennulatum* | 2 | 8 | III | 0 | 8 | 0 | 0 | 0 | 7.7 | 2.0 | 1.90 | 0.008 |
| DIPTERA | CHIRONOMIDAE | *Potthastia gaedii* | 3 | 7 | III | 0 | 7 | 0 | 2 | 7 | 7.5 | 3.5 | 2.51 | 0.051 |
| PLECOPTERA | CHLOROPERLIDAE | *Siphonoperla torrentium* | 2 | 7 | III | 5 | 7 | 0 | 0 | 0 | 6.9 | 5.9 | 3.59 | 0.212 |
| EPHEMEROPTERA | CAENIDAE | *Caenis* sp. | 2 | 6 | III | 0 | 6 | 0 | 0 | 3 | 6.3 | 2.6 | 2.15 | 0.048 |
| DIPTERA | CHIRONOMIDAE | *Eukiefferiella minor/ fittkaui* | 1 | 6 | III | 0 | 6 | 0 | 0 | 0 | 6.2 | 1.8 | 1.84 | 0.049 |
| DIPTERA | CHIRONOMIDAE | *Demicryptochironomus vulneratus* | 1 | 6 | III | 0 | 6 | 0 | 0 | 0 | 6.2 | 1.7 | 1.81 | 0.061 |
| EPHEMEROPTERA | CAENIDAE | *Caenis beskidensis* | 2 | 6 | III | 0 | 6 | 0 | 4 | 0 | 6.1 | 3.0 | 2.37 | 0.060 |

*(Continued)*

**Table 1.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | p |
| HYDRACHNIDIA | PIONIDAE | *Forelia variegator* | 2 | 6 | III | 0 | 6 | 0 | 2 | 0 | 5.5 | 3.6 | 2.66 | 0.101 |
| COLEOPTERA | HYDRAENIDAE | *Hydraena pulchella* Ad. | 1 | 5 | III | 0 | 5 | 0 | 0 | 0 | 4.7 | 1.6 | 1.61 | 0.052 |
| HYDRACHNIDIA | EYLAIDAE | *Eylais* sp. | 1 | 5 | III | 0 | 5 | 0 | 0 | 0 | 4.7 | 1.6 | 1.63 | 0.057 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus dispar* | 1 | 5 | III | 0 | 5 | 0 | 0 | 0 | 4.7 | 1.6 | 1.62 | 0.062 |
| HETEROPTERA | CORIXIDAE | *Micronecta poweri poweri* | 1 | 5 | III | 0 | 5 | 0 | 0 | 0 | 4.7 | 1.5 | 1.68 | 0.076 |
| DIPTERA | CHIRONOMIDAE | *Microtendipes tarsalis* | 1 | 5 | III | 0 | 5 | 0 | 0 | 0 | 4.7 | 1.6 | 1.87 | 0.093 |
| DIPTERA | CHIRONOMIDAE | *Ablabesmyia longistyla* | 2 | 4 | III | 0 | 4 | 0 | 0 | 4 | 4.3 | 2.6 | 1.90 | 0.115 |
| CRUSTACEA | NIPHARGIDAE | *Niphargus aquilex* | 1 | 4 | III | 0 | 4 | 0 | 2 | 0 | 4.0 | 3.0 | 2.22 | 0.164 |
| EPHEMEROPTERA | BAETIDAE | *Procloeon bifidum* | 1 | 4 | III | 2 | 4 | 0 | 0 | 0 | 3.7 | 2.8 | 2.08 | 0.202 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius rivicola-Gr.* | 1 | 3 | III | 2 | 3 | 0 | 0 | 0 | 3.2 | 2.7 | 1.98 | 0.246 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Fridericia alata* | 1 | 3 | III | 0 | 3 | 0 | 0 | 0 | 3.1 | 1.4 | 1.48 | 0.071 |
| TRICHOPTERA | LIMNEPHILIDAE | *Chaetopteryx major* | 1 | 3 | III | 0 | 3 | 2 | 0 | 0 | 3.1 | 2.8 | 1.96 | 0.278 |
| DIPTERA | CHIRONOMIDAE | *Eukiefferiella* sp. | 1 | 3 | III | 0 | 3 | 1 | 2 | 1 | 2.7 | 3.8 | 2.35 | 0.666 |
| DIPTERA | CHIRONOMIDAE | *Synorthocladius semivirens* | 1 | 2 | III | 0 | 2 | 0 | 0 | 0 | 2.2 | 2.0 | 1.61 | 0.309 |
| HYDRACHNIDIA | ARRENURIDAE | *Arrenurus* sp. | 1 | 2 | III | 0 | 2 | 0 | 1 | 0 | 2.0 | 2.1 | 1.93 | 0.316 |
| DIPTERA | CHIRONOMIDAE | *Heterotrissocladius marcidus* | 0 | 2 | III | 0 | 2 | 0 | 0 | 0 | 1.9 | 2.0 | 1.78 | 0.330 |
| DIPTERA | CHIRONOMIDAE | *Paratanytarsus* sp. | 1 | 2 | III | 0 | 2 | 0 | 1 | 1 | 1.6 | 2.6 | 2.25 | 0.695 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia dubia* | 0 | 1 | III | 0 | 1 | 0 | 0 | 0 | 1.4 | 1.6 | 1.65 | 0.300 |
| **CRUSTACEA** | **GAMMARIDAE** | ***Gammarus fossarum*** | **14** | **55** | **IV** | **2** | **0** | **55** | **10** | **5** | **54.6** | **19.5** | **5.79** | **0.002** |
| DIPTERA | SIMULIIDAE | *Simulium ornatum-Gr.* | 11 | 33 | IV | 4 | 1 | 33 | 19 | 0 | 33.4 | 22.7 | 6.38 | 0.052 |
| **DIPTERA** | **CHIRONOMIDAE** | ***Prodiamesa olivacea*** | **6** | **29** | **IV** | **1** | **0** | **29** | **1** | **1** | **28.7** | **10.6** | **4.22** | **0.010** |
| **GASTROPODA & BIVALVIA** | **SPHAERIIDAE** | ***Pisidium personatum*** | **6** | **28** | **IV** | **1** | **0** | **28** | **0** | **0** | **28.0** | **7.4** | **3.47** | **0.002** |
| TURBELARIA | DUGESIIDAE | *Dugesia gonocephala* | 6 | 24 | IV | 2 | 0 | 24 | 3 | 0 | 24.0 | 8.0 | 3.48 | 0.009 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GASTROPODA & BIVALVIA | | Gastropoda Gen. sp. | 6 | 24 | IV | 0 | 1 | 24 | 4 | 0 | 23.6 | 6.9 | 3.35 | 0.005 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra atrofasciata-Gr.* | 7 | 23 | IV | 1 | 0 | 23 | 10 | 0 | 23.0 | 14.0 | 5.01 | 0.052 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium casertanum ponderosum* | 4 | 22 | IV | 0 | 0 | 22 | 0 | 0 | 21.8 | 4.9 | 2.82 | 0.003 |
| TRICHOPTERA | POLYCENTROPODIDAE | *Plectrocnemia conspersa* | 4 | 19 | IV | 3 | 0 | 19 | 0 | 0 | 19.1 | 6.8 | 2.88 | 0.008 |
| GASTROPODA & BIVALVIA | LYMNAEIDAE | *Radix ovata* | 6 | 18 | IV | 11 | 0 | 18 | 0 | 0 | 18.1 | 9.1 | 3.81 | 0.031 |
| COLEOPTERA | SCIRTIDAE | Scirtidae Gen. sp. Lv. | 6 | 16 | IV | 14 | 0 | 16 | 0 | 0 | 16.4 | 8.1 | 2.97 | 0.029 |
| TRICHOPTERA | LIMNEPHILIDAE | *Chaetopteryx fusca/ villosa* | 5 | 16 | IV | 6 | 4 | 16 | 0 | 0 | 16.2 | 11.9 | 4.18 | 0.107 |
| CRUSTACEA | GAMMARIDAE | *Gammarus fossarum/ pulex-Gr.* | 3 | 16 | IV | 0 | 0 | 16 | 0 | 0 | 15.8 | 4.2 | 2.67 | 0.010 |
| DIPTERA | CHIRONOMIDAE | *Brillia* sp. | 3 | 15 | IV | 1 | 0 | 15 | 0 | 0 | 14.7 | 9.4 | 3.84 | 0.077 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Tinodes unicolor* | 3 | 14 | IV | 0 | 0 | 14 | 0 | 0 | 14.4 | 4.2 | 2.28 | 0.008 |
| DIPTERA | CHIRONOMIDAE | *Macropdopia* sp. | 3 | 14 | IV | 0 | 0 | 14 | 0 | 1 | 14.2 | 7.5 | 2.97 | 0.028 |
| TRICHOPTERA | LIMNEPHILIDAE | Limnephilini Gen. sp. | 5 | 14 | IV | 7 | 2 | 14 | 0 | 0 | 13.9 | 8.8 | 3.56 | 0.066 |
| MEGALOPTERA | SIALIDAE | *Sialis fuliginosa* | 5 | 14 | IV | 9 | 0 | 14 | 0 | 0 | 13.7 | 7.3 | 3.41 | 0.054 |
| DIPTERA | CHIRONOMIDAE | *Chironomus riparius-Agg* | 3 | 13 | IV | 0 | 0 | 13 | 0 | 0 | 13.1 | 4.2 | 2.56 | 0.021 |
| DIPTERA | CHIRONOMIDAE | *Rheocricotopus fuscipes* | 5 | 12 | IV | 2 | 1 | 12 | 11 | 0 | 12.3 | 9.7 | 3.95 | 0.162 |
| DIPTERA | CHIRONOMIDAE | *Conchapelopia* sp. | 6 | 12 | IV | 2 | 2 | 12 | 5 | 9 | 12.3 | 14.6 | 4.29 | 0.682 |
| DIPTERA | CHIRONOMIDAE | *Chironomus* sp. | 3 | 12 | IV | 0 | 0 | 12 | 1 | 1 | 12.0 | 5.0 | 2.94 | 0.025 |
| DIPTERA | SIMULIIDAE | *Simulium vernum* | 2 | 12 | IV | 0 | 0 | 12 | 0 | 0 | 11.7 | 5.3 | 2.64 | 0.027 |

*(Continued)*

**Table 1.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | p |
| DIPTERA | LIMONIIDAE | *Eloeophila* sp. | 5 | 12 | IV | 10 | 1 | 12 | 2 | 0 | 11.7 | 9.0 | 3.35 | 0.124 |
| MEGALOPTERA | SIALIDAE | *Sialis lutaria* | 2 | 11 | IV | 1 | 0 | 11 | 0 | 0 | 11.5 | 4.0 | 2.70 | 0.040 |
| DIPTERA | PSYCHODIDAE | Psychodidae Gen. sp. | 2 | 10 | IV | 1 | 1 | 10 | 0 | 0 | 10.4 | 4.9 | 2.94 | 0.050 |
| TRICHOPTERA | LIMNEPHILIDAE | *Drusus annulatus* | 3 | 10 | IV | 4 | 0 | 10 | 0 | 0 | 10.4 | 5.2 | 3.07 | 0.056 |
| DIPTERA | CHIRONOMIDAE | *Microtendipes pedellus* | 2 | 10 | IV | 1 | 0 | 10 | 0 | 0 | 9.7 | 3.8 | 2.59 | 0.032 |
| COLEOPTERA | HELOPHORIDAE | *Helophorus obscurus* Ad. | 2 | 10 | IV | 0 | 0 | 10 | 0 | 0 | 9.6 | 3.1 | 2.07 | 0.021 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia nebulosa* | 2 | 9 | IV | 0 | 0 | 9 | 1 | 0 | 9.2 | 4.0 | 2.58 | 0.041 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Rhithrogena hybrida-Gr.* | 2 | 8 | IV | 0 | 0 | 8 | 0 | 0 | 8.0 | 3.1 | 2.13 | 0.024 |
| GASTROPODA & BIVALVIA | HYDROBIIDAE | *Potamopyrgus antipodarum* | 3 | 8 | IV | 0 | 7 | 8 | 2 | 0 | 7.7 | 9.5 | 3.46 | 0.662 |
| OLIGOCHETA | TUBIFICIDAE | *Tubifex tubifex* | 2 | 8 | IV | 0 | 0 | 8 | 1 | 0 | 7.6 | 3.6 | 2.48 | 0.047 |
| DIPTERA | SIMULIIDAE | *Simulium trifasciatum* | 2 | 7 | IV | 2 | 0 | 7 | 1 | 0 | 7.4 | 5.6 | 2.88 | 0.179 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila tristis* | 1 | 7 | IV | 0 | 0 | 7 | 0 | 0 | 7.3 | 2.8 | 2.14 | 0.035 |
| COLEOPTERA | ELMIDAE | *Limnius* sp. Lv. | 2 | 7 | IV | 0 | 0 | 7 | 0 | 0 | 7.3 | 3.1 | 2.27 | 0.035 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Helobdella stagnalis* | 2 | 7 | IV | 0 | 0 | 7 | 2 | 3 | 6.9 | 5.4 | 2.94 | 0.189 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus sylvestris-Gr.* | 1 | 7 | IV | 0 | 0 | 7 | 0 | 0 | 6.7 | 3.2 | 2.26 | 0.052 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium subtruncatum* | 2 | 7 | IV | 1 | 0 | 7 | 1 | 0 | 6.6 | 5.0 | 3.02 | 0.148 |
| DIPTERA | LIMONIIDAE | Limoniidae Gen. sp. | 2 | 7 | IV | 1 | 1 | 7 | 0 | 1 | 6.5 | 4.5 | 2.60 | 0.129 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus radiatus* | 4 | 6 | IV | 6 | 3 | 6 | 2 | 1 | 6.5 | 7.8 | 3.00 | 0.633 |
| COLEOPTERA | HYDRAENIDAE | *Hydraena nigrita* Ad. | 1 | 6 | IV | 0 | 0 | 6 | 0 | 0 | 6.4 | 2.8 | 2.18 | 0.050 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius thienemanni* | 3 | 6 | IV | 0 | 4 | 6 | 1 | 2 | 5.9 | 6.3 | 2.96 | 0.446 |
| HIRUDINEA | ERPOBDELLIDAE | *Erpobdella vilnensis* | 2 | 6 | IV | 0 | 0 | 6 | 4 | 0 | 5.9 | 7.0 | 2.75 | 0.625 |
| DIPTERA | CHIRONOMIDAE | *Dicrotendipes notatus* | 1 | 6 | IV | 0 | 0 | 6 | 0 | 0 | 5.8 | 2.4 | 1.87 | 0.055 |
| COLEOPTERA | ELMIDAE | *Riolus subviolaceus* | 1 | 6 | IV | 0 | 0 | 6 | 0 | 0 | 5.7 | 2.5 | 1.82 | 0.046 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | LIMNEPHILIDAE | Drusinae Gen. sp. | 1 | 6 | IV | 1 | 0 | 6 | 0 | 0 | 5.7 | 4.3 | 2.24 | 0.163 |
| DIPTERA | CHIRONOMIDAE | *Tvetenia bavarica* | 1 | 6 | IV | 0 | 0 | 6 | 0 | 0 | 5.6 | 3.4 | 2.32 | 0.107 |
| DIPTERA | PTYCHOPTERIDAE | *Ptychoptera scutellaris* | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.3 | 2.2 | 1.96 | 0.047 |
| OLIGOCHETA | ENCHYTRAEIDAE | Enchytraeidae Gen. sp. | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.3 | 2.4 | 1.90 | 0.057 |
| DIPTERA | TIPULIDAE | *Tipula* sp. | 2 | 5 | IV | 2 | 1 | 5 | 0 | 2 | 5.3 | 5.5 | 2.70 | 0.352 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia salebrosa* | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.2 | 2.2 | 1.82 | 0.071 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Tinodes rostocki* | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.2 | 2.2 | 1.85 | 0.090 |
| DIPTERA | PTYCHOPTERIDAE | *Ptychoptera* sp. | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.1 | 2.7 | 1.94 | 0.052 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra notescens-Gr.* | 1 | 5 | IV | 1 | 0 | 5 | 0 | 0 | 5.1 | 3.0 | 2.23 | 0.134 |
| DIPTERA | CHIRONOMIDAE | *Diamesa cinerella/ zernyi-Gr.* | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 5.1 | 4.5 | 2.18 | 0.253 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Electrogena sp.* | 3 | 5 | IV | 5 | 4 | 5 | 0 | 1 | 5.1 | 7.1 | 3.22 | 0.760 |
| EPHEMEROPTERA | HEPTAGENIIDAE | Heptageniidae Gen. sp. | 1 | 5 | IV | 2 | 0 | 5 | 0 | 0 | 4.9 | 3.7 | 2.63 | 0.153 |
| DIPTERA | LIMONIIDAE | *Rhypholophus* sp. | 2 | 5 | IV | 3 | 0 | 5 | 0 | 0 | 4.8 | 3.5 | 2.23 | 0.161 |
| DIPTERA | CHIRONOMIDAE | *Psectrotanypus varius* | 1 | 5 | IV | 0 | 0 | 5 | 0 | 0 | 4.5 | 2.2 | 1.68 | 0.068 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia lineata* | 1 | 4 | IV | 0 | 0 | 4 | 0 | 0 | 4.4 | 2.3 | 1.85 | 0.102 |
| DIPTERA | CHIRONOMIDAE | *Parametriocnemus stylatus* | 1 | 4 | IV | 2 | 0 | 4 | 0 | 0 | 4.4 | 3.5 | 2.37 | 0.203 |
| DIPTERA | CHIRONOMIDAE | *Zavrelimyia* sp. | 1 | 4 | IV | 2 | 0 | 4 | 0 | 0 | 4.2 | 3.1 | 2.40 | 0.181 |
| DIPTERA | CHIRONOMIDAE | *Brillia flavifrons* | 1 | 4 | IV | 0 | 0 | 4 | 1 | 0 | 4.2 | 3.4 | 1.94 | 0.222 |
| GASTROPODA & BIVALVIA | PHYSIDAE | *Physella acuta* | 1 | 4 | IV | 0 | 0 | 4 | 0 | 0 | 4.0 | 2.5 | 1.80 | 0.108 |
| TRICHOPTERA | LIMNEPHILIDAE | *Limnephilus lunatus* | 1 | 4 | IV | 1 | 0 | 4 | 0 | 0 | 4.0 | 3.0 | 2.18 | 0.200 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra* sp. | 1 | 4 | IV | 1 | 0 | 4 | 2 | 1 | 3.9 | 5.1 | 2.50 | 0.645 |
| TRICHOPTERA | GOERIDAE | *Lithax obscurus* | 1 | 4 | IV | 0 | 0 | 4 | 0 | 0 | 3.8 | 1.8 | 1.68 | 0.067 |

*(Continued)*

**Table 1.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | p |
| DIPTERA | CHIRONOMIDAE | *Chironomus luridus-Agg.* | 1 | 4 | IV | 0 | 0 | 4 | 0 | 3 | 3.7 | 2.4 | 1.66 | 0.129 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium nitidum* | 1 | 4 | IV | 0 | 3 | 4 | 0 | 0 | 3.7 | 4.2 | 2.69 | 0.428 |
| PLECOPTERA | NEMOURIDAE | *Nemurella pictetii* | 1 | 4 | IV | 0 | 0 | 4 | 0 | 0 | 3.6 | 2.6 | 1.93 | 0.168 |
| GASTROPODA & BIVALVIA | LYMNAEIDAE | *Lymnaea stagnalis* | 1 | 3 | IV | 0 | 0 | 3 | 0 | 0 | 3.4 | 2.0 | 1.53 | 0.105 |
| DIPTERA | CHIRONOMIDAE | *Diplocladius cultriger* | 1 | 3 | IV | 0 | 0 | 3 | 0 | 0 | 3.4 | 2.7 | 2.17 | 0.196 |
| HYDRACHNIDIA | HYGROBATIDAE | *Atractides fonticolus* | 1 | 3 | IV | 0 | 0 | 3 | 0 | 0 | 3.0 | 1.8 | 1.82 | 0.129 |
| DIPTERA | DIXIDAE | *Dixa maculata* | 1 | 3 | IV | 1 | 0 | 3 | 0 | 0 | 3.0 | 2.6 | 2.22 | 0.232 |
| TRICHOPTERA | LIMNEPHILIDAE | *Micropterna sequax* | 1 | 3 | IV | 1 | 0 | 3 | 0 | 0 | 3.0 | 2.5 | 2.09 | 0.276 |
| DIPTERA | CHIRONOMIDAE | *Diamesa* sp. | 1 | 3 | IV | 0 | 0 | 3 | 2 | 0 | 2.7 | 3.6 | 2.05 | 0.632 |
| DIPTERA | CHIRONOMIDAE | *Procladius* sp. | 1 | 3 | IV | 0 | 2 | 3 | 2 | 0 | 2.6 | 3.7 | 2.30 | 0.675 |
| HYDRACHNIDIA | PIONIDAE | *Wettina podagrica* | 1 | 3 | IV | 0 | 0 | 3 | 0 | 0 | 2.5 | 2.0 | 1.74 | 0.207 |
| DIPTERA | CHIRONOMIDAE | Orthocladiinae Gen. sp. | 1 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.4 | 2.5 | 1.99 | 0.371 |
| DIPTERA | CHIRONOMIDAE | *Odontomesa fulva* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.3 | 1.4 | 1.54 | 0.130 |
| EPHEMEROPTERA | BAETIDAE | *Baetis alpinus* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.3 | 1.5 | 1.57 | 0.150 |
| DIPTERA | BLEPHARICERIDAE | Blephariceridae Gen. sp. | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.3 | 1.5 | 1.28 | 0.153 |
| DIPTERA | CHIRONOMIDAE | *Chaetocladius* sp. | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.3 | 1.5 | 1.29 | 0.188 |
| DIPTERA | CHIRONOMIDAE | *Macropelopia nebulosa* | 1 | 2 | IV | 1 | 0 | 2 | 1 | 1 | 2.3 | 4.1 | 2.55 | 0.865 |
| TRICHOPTERA | LIMNEPHILIDAE | *Melampophylax mucoreus* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.0 | 1.9 | 1.85 | 0.259 |
| HETEROPTERA | VELIIDAE | *Velia* sp. | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 2.0 | 2.0 | 1.49 | 0.368 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Lumbricillus lineatus* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 1.6 | 1.7 | 1.70 | 0.305 |
| DIPTERA | CHIRONOMIDAE | *Metriocnemus albolineatus* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 1.5 | 1.3 | 1.48 | 0.174 |
| COLEOPTERA | ELMIDAE | *Riolus cupreus* Ad. | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 1.5 | 1.3 | 1.56 | 0.187 |
| DIPTERA | CHIRONOMIDAE | *Chaetocladius piger-Gr.* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 1.5 | 1.5 | 1.62 | 0.244 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Synagapetus dubitans* | 0 | 2 | IV | 0 | 0 | 2 | 0 | 0 | 1.5 | 1.4 | 1.42 | 0.287 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | CHIRONOMIDAE | *Paracladius conversus* | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 1.5 | 1.5 | 1.42 | 0.367 |
| OLIGOCHETA | TUBIFICIDAE | *Potamothrix moldaviensis* | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 1.4 | 2.1 | 1.63 | 0.747 |
| DIPTERA | CHIRONOMIDAE | *Thienemanniella* sp. | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 1.3 | 1.7 | 1.43 | 0.581 |
| DIPTERA | CHIRONOMIDAE | Tanytarsini Gen. sp. | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 1.2 | 2.1 | 1.72 | 0.694 |
| DIPTERA | LIMONIIDAE | *Gnophomyia* sp. | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 1.1 | 1.8 | 1.86 | 0.539 |
| DIPTERA | CHIRONOMIDAE | *Hydrobaenus* sp. | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 0.8 | 1.1 | 1.26 | 0.609 |
| DIPTERA | CHIRONOMIDAE | *Chironomus annularius-Gr.* | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 0.8 | 1.1 | 1.18 | 0.613 |
| GASTROPODA & BIVALVIA | VALVATIDAE | *Valvata piscinalis piscinalis* | 0 | 1 | IV | 0 | 0 | 1 | 0 | 0 | 0.8 | 1.2 | 1.45 | 0.636 |
| **OLIGOCHETA** | **TUBIFICIDAE** | ***Psammoryctides barbatus*** | **11** | **55** | **V** | **0** | **0** | **1** | **55** | **0** | **55.1** | **9.0** | **3.88** | **0.001** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates fluviatilis*** | **14** | **49** | **V** | **1** | **9** | **1** | **49** | **8** | **48.6** | **14.0** | **4.39** | **0.001** |
| **EPHEMEROPTERA** | **BAETIDAE** | ***Baetis vernus*** | **11** | **46** | **V** | **1** | **0** | **4** | **46** | **4** | **45.6** | **11.3** | **4.38** | **0.002** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates nigromaculatus*** | **10** | **44** | **V** | **1** | **0** | **4** | **44** | **0** | **44.5** | **11.4** | **4.47** | **0.002** |
| **HIRUDINEA** | **ERPOBDELLIDAE** | ***Erpobdella octoculata*** | **12** | **42** | **V** | **2** | **4** | **6** | **42** | **6** | **42.2** | **16.7** | **4.77** | **0.006** |
| **CRUSTACEA** | **ASELLIDAE** | ***Asellus aquaticus*** | **9** | **41** | **V** | **0** | **0** | **3** | **41** | **2** | **41.3** | **8.4** | **3.74** | **0.001** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Tvetenia calvescens*** | **11** | **41** | **V** | **1** | **2** | **1** | **41** | **11** | **41.2** | **12.1** | **4.14** | **0.001** |
| **OLIGOCHETA** | **TUBIFICIDAE** | ***Psammoryctides* sp.** | **8** | **41** | **V** | **0** | **0** | **0** | **41** | **1** | **40.9** | **6.6** | **3.39** | **0.001** |
| **OLIGOCHETA** | **NAIDIDAE** | ***Nais elinguis*** | **9** | **40** | **V** | **0** | **4** | **1** | **40** | **0** | **40.2** | **8.2** | **3.61** | **0.001** |
| **HYDRACHNIDIA** | **LEBERTIIDAE** | ***Lebertia fimbriata*** | **9** | **38** | **V** | **1** | **4** | **1** | **38** | **0** | **38.0** | **11.0** | **4.22** | **0.002** |
| **HYDRACHNIDIA** | **LEBERTIIDAE** | ***Lebertia inaequalis*** | **11** | **34** | **V** | **1** | **11** | **0** | **34** | **6** | **34.5** | **12.0** | **3.99** | **0.004** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Paratanytarsus dissimilis*** | **8** | **33** | **V** | **0** | **0** | **0** | **33** | **5** | **33.2** | **6.8** | **3.43** | **0.001** |
| **OLIGOCHETA** | **LUMBRICIDAE** | ***Eiseniella tetraedra*** | **8** | **31** | **V** | **2** | **5** | **1** | **31** | **0** | **30.6** | **10.4** | **3.99** | **0.004** |

*(Continued)*

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DIPTERA** | **CHIRONOMIDAE** | ***Eukiefferiella claripennis*** | **8** | **30** | **V** | **1** | **0** | **10** | **30** | **0** | **30.4** | **12.2** | **4.14** | **0.008** |
| **OLIGOCHETA** | **LUMBRICIDAE** | ***Eiseniella tetraedra*** | **8** | **31** | **V** | **2** | **5** | **1** | **31** | **0** | **30.6** | **10.4** | **3.99** | **0.004** |
| **HYDRACHNIDIA** | **MIDEOPSIDAE** | ***Mideopsis* sp.** | **11** | **30** | **V** | **1** | **15** | **1** | **30** | **10** | **29.8** | **13.6** | **4.48** | **0.014** |
| EPHEMEROPTERA | BAETIDAE | *Baetis rhodani* | 18 | 29 | V | 10 | 7 | 25 | 29 | 19 | 29.1 | 34.5 | 8.27 | 0.747 |
| **DIPTERA** | **CHIRONOMIDAE** | ***Eukiefferiella devonica/ilkleyensis*** | **6** | **28** | **V** | **0** | **1** | **0** | **28** | **0** | **28.0** | **6.1** | **3.08** | **0.003** |
| **HYDRACHNIDIA** | **SPERCHONTIDAE** | ***Sperchon denticulatus*** | **10** | **27** | **V** | **0** | **15** | **1** | **27** | **8** | **27.2** | **10.7** | **4.20** | **0.014** |
| **DIPTERA** | **EMPIDIDAE** | **Empididae Gen. sp.** | **6** | **26** | **V** | **0** | **2** | **0** | **26** | **1** | **26.3** | **5.9** | **2.83** | **0.001** |
| OLIGOCHETA | TUBIFICIDAE | Tubificidae Gen. sp. | 12 | 25 | V | 10 | 8 | 13 | 25 | 4 | 24.9 | 25.8 | 7.19 | 0.472 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche pellucidula* | 6 | 24 | V | 2 | 1 | 0 | 24 | 1 | 24.3 | 6.6 | 3.23 | 0.005 |
| COLEOPTERA | ELMIDAE | *Elmis aenea* | 8 | 24 | V | 6 | 1 | 8 | 24 | 0 | 24.3 | 11.6 | 3.71 | 0.021 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum scalaenum-Gr.* | 7 | 24 | V | 0 | 1 | 2 | 24 | 6 | 24.0 | 7.3 | 3.46 | 0.012 |
| GASTROPODA & BIVALVIA | LYMNAEIDAE | *Radix* sp. | 8 | 24 | V | 1 | 13 | 1 | 24 | 3 | 23.8 | 8.8 | 3.39 | 0.006 |
| OLIGOCHETA | TUBIFICIDAE | *Tubificidae juv with setae* | 6 | 23 | V | 0 | 3 | 1 | 23 | 3 | 22.9 | 7.1 | 3.27 | 0.009 |
| DIPTERA | CHIRONOMIDAE | *Stictochironomus* sp. | 5 | 22 | V | 0 | 0 | 1 | 22 | 0 | 21.9 | 5.0 | 2.75 | 0.005 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius rubicundus* | 5 | 22 | V | 0 | 1 | 1 | 22 | 1 | 21.7 | 6.7 | 3.21 | 0.009 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum laetum* | 4 | 21 | V | 0 | 0 | 0 | 21 | 0 | 21.2 | 3.2 | 2.08 | 0.001 |
| HYDRACHNIDIA | SPERCHONTIDAE | *Sperchon compactilis* | 5 | 21 | V | 1 | 3 | 2 | 21 | 0 | 21.1 | 7.3 | 3.32 | 0.012 |
| DIPTERA | CHIRONOMIDAE | *Brillia bifida* | 4 | 21 | V | 0 | 0 | 0 | 21 | 0 | 20.9 | 4.0 | 2.39 | 0.002 |
| OLIGOCHETA | LUMBRICULIDAE | Lumbriculidae Gen. sp. | 11 | 20 | V | 1 | 20 | 1 | 20 | 12 | 20.4 | 11.9 | 4.00 | 0.041 |
| DIPTERA | CHIRONOMIDAE | *Microtendipes chloris-Gr.* | 10 | 20 | V | 0 | 13 | 0 | 20 | 14 | 20.2 | 8.7 | 3.43 | 0.021 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus bicinctus* | 7 | 20 | V | 0 | 1 | 7 | 20 | 10 | 20.1 | 9.7 | 4.03 | 0.032 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | CHIRONOMIDAE | *Orthocladius oblidens* | 4 | 20 | V | 0 | 0 | 0 | 20 | 1 | 19.9 | 4.6 | 2.77 | 0.008 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius* sp. | 11 | 20 | V | 6 | 13 | 4 | 20 | 12 | 19.8 | 15.9 | 4.60 | 0.132 |
| DIPTERA | CHIRONOMIDAE | *Rheocricotopus effusus* | 4 | 18 | V | 0 | 0 | 0 | 18 | 0 | 17.8 | 3.4 | 2.44 | 0.003 |
| DIPTERA | LIMONIIDAE | *Antocha* sp. | 8 | 18 | V | 0 | 16 | 0 | 18 | 5 | 17.8 | 7.5 | 3.10 | 0.017 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius obumbratus* | 6 | 18 | V | 6 | 3 | 2 | 18 | 3 | 17.7 | 11.6 | 4.14 | 0.063 |
| EPHEMEROPTERA | BAETIDAE | *Baetis vardarensis* | 10 | 17 | V | 0 | 14 | 0 | 17 | 17 | 17.1 | 7.8 | 3.58 | 0.033 |
| DIPTERA | CHIRONOMIDAE | *Thienemannimyia* sp. | 5 | 16 | V | 0 | 3 | 0 | 16 | 5 | 16.1 | 5.3 | 2.80 | 0.012 |
| HYDRACHNIDIA | SPERCHONTIDAE | *Sperchon glandulosus* | 3 | 15 | V | 0 | 0 | 0 | 15 | 0 | 15.4 | 4.8 | 2.52 | 0.008 |
| DIPTERA | ATHERICIDAE | *Atherix ibis* | 6 | 15 | V | 0 | 14 | 0 | 15 | 1 | 15.4 | 6.2 | 2.83 | 0.019 |
| DIPTERA | CHIRONOMIDAE | *Diamesa hamaticornis* | 3 | 15 | V | 0 | 1 | 0 | 15 | 0 | 15.3 | 3.7 | 2.87 | 0.015 |
| DIPTERA | CERATOPOGONIDAE | Ceratopogonidae Gen. sp. | 8 | 15 | V | 4 | 15 | 2 | 15 | 5 | 15.3 | 11.4 | 3.64 | 0.118 |
| TURBELARIA | PLANARIIDAE | *Polycelis nigra/tenuis* | 4 | 12 | V | 5 | 2 | 1 | 12 | 1 | 11.5 | 7.5 | 3.40 | 0.098 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche angustipennis* | 3 | 15 | V | 0 | 0 | 0 | 15 | 0 | 14.9 | 4.3 | 2.55 | 0.017 |
| COLEOPTERA | ELMIDAE | *Limnius volckmari* | 4 | 14 | V | 0 | 1 | 0 | 14 | 5 | 14.3 | 6.0 | 3.04 | 0.031 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum convictum* | 7 | 14 | V | 4 | 6 | 0 | 14 | 13 | 14.1 | 10.0 | 3.99 | 0.114 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia complanata* | 6 | 14 | V | 3 | 7 | 6 | 14 | 0 | 14.0 | 9.8 | 3.55 | 0.101 |
| OLIGOCHETA | LUMBRICULIDAE | *Stylodrilus heringianus* | 7 | 14 | V | 6 | 7 | 1 | 14 | 5 | 14.0 | 13.2 | 4.39 | 0.317 |
| OLIGOCHETA | TUBIFICIDAE | *Limnodrilus hoffmeisteri* | 4 | 14 | V | 0 | 1 | 1 | 14 | 4 | 13.9 | 5.4 | 3.02 | 0.027 |
| COLEOPTERA | DYTISCIDAE | *Oreodytes sanmarkii* | 5 | 13 | V | 5 | 0 | 5 | 13 | 0 | 12.8 | 7.6 | 3.12 | 0.064 |
| CRUSTACEA | GAMMARIDAE | *Gammarus pulex* | 7 | 12 | V | 1 | 2 | 12 | 12 | 8 | 12.4 | 10.0 | 4.06 | 0.173 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus annulator* | 3 | 12 | V | 0 | 0 | 0 | 12 | 1 | 11.8 | 4.1 | 2.55 | 0.030 |
| DIPTERA | CHIRONOMIDAE | *Paratrichocladius rufiventris* | 3 | 12 | V | 0 | 0 | 5 | 12 | 0 | 11.7 | 5.2 | 2.49 | 0.030 |

*(Continued)*

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | CHIRONOMIDAE | *Polycelis nigra/tenuis* | 4 | 12 | 5 | 5 | 2 | 1 | 12 | 1 | 11.5 | 7.5 | 3.40 | 0.098 |
| COLEOPTERA | DYTISCIDAE | *Platambus maculatus* | 4 | 11 | V | 2 | 8 | 1 | 11 | 0 | 10.7 | 6.3 | 2.59 | 0.067 |
| DIPTERA | CHIRONOMIDAE | *Tvetenia discoloripes/ verralli* | 6 | 10 | V | 1 | 10 | 5 | 10 | 4 | 10.4 | 9.9 | 4.21 | 0.285 |
| DIPTERA | CHIRONOMIDAE | *Orthocladiini COP* | 4 | 10 | V | 0 | 3 | 1 | 10 | 6 | 10.1 | 5.9 | 3.06 | 0.073 |
| BIVALVIA | SPHAERIIDAE | *Pisidium casertanum* | 3 | 10 | V | 0 | 5 | 0 | 10 | 1 | 9.8 | 4.2 | 2.45 | 0.039 |
| DIPTERA | CHIRONOMIDAE | *Thienemannimyia carnea* | 2 | 9 | V | 0 | 0 | 0 | 9 | 0 | 9.4 | 2.4 | 1.65 | 0.010 |
| OLIGOCHETA | TUBIFICIDAE | *Psammoryctides albicola* | 2 | 9 | V | 0 | 0 | 1 | 9 | 1 | 9.1 | 4.0 | 2.50 | 0.035 |
| DIPTERA | CHIRONOMIDAE | *Glyptotendipes pallens* | 2 | 9 | V | 0 | 0 | 0 | 9 | 0 | 9.0 | 2.1 | 1.85 | 0.011 |
| OLIGOCHETA | TUBIFICIDAE | *Limnodrilus udekemianus* | 2 | 9 | V | 0 | 0 | 0 | 9 | 0 | 9.0 | 2.5 | 1.89 | 0.020 |
| OLIGOCHETA | HAPLOTAXIDAE | *Haplotaxis gordioides* | 2 | 9 | V | 0 | 0 | 0 | 9 | 0 | 8.6 | 3.5 | 2.53 | 0.052 |
| CRUSTACEA | GAMMARIDAE | *Gammarus* sp. | 3 | 8 | V | 0 | 0 | 4 | 8 | 1 | 8.2 | 5.5 | 2.92 | 0.113 |
| DIPTERA | CHIRONOMIDAE | *Phaenopsectra* sp. | 2 | 8 | V | 0 | 0 | 0 | 8 | 0 | 7.9 | 2.5 | 1.99 | 0.017 |
| DIPTERA | SIMULIIDAE | *Simulium erythrocephalum* | 2 | 8 | V | 0 | 0 | 0 | 8 | 0 | 7.7 | 1.9 | 1.61 | 0.013 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus vierriensis* | 2 | 8 | V | 0 | 0 | 0 | 8 | 0 | 7.6 | 2.1 | 1.88 | 0.007 |
| DIPTERA | CHIRONOMIDAE | *Dicrotendipes nervosus* | 1 | 7 | V | 0 | 0 | 0 | 7 | 0 | 7.5 | 2.3 | 1.99 | 0.015 |
| GASTROPODA | PLANORBIDAE | *Bathyomphalus contortus* | 2 | 8 | V | 0 | 0 | 0 | 8 | 0 | 7.5 | 2.1 | 1.98 | 0.020 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum cultellatum* | 2 | 7 | V | 0 | 2 | 0 | 7 | 0 | 7.4 | 3.3 | 2.43 | 0.056 |
| DIPTERA | CHIRONOMIDAE | *Rheocricotopus chalybeatus* | 3 | 7 | V | 0 | 0 | 0 | 7 | 6 | 7.2 | 4.3 | 2.59 | 0.081 |
| TRICHOPTERA | LEPTOCERIDAE | *Mystacides nigra* | 2 | 7 | V | 0 | 2 | 0 | 7 | 1 | 6.6 | 3.4 | 2.49 | 0.082 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HYDRACHNIDIA | HYDRYPHANTIDAE | *Protzia* sp. | 1 | 6 | V | 0 | 0 | 0 | 6 | 0 | 6.3 | 2.0 | 1.80 | 0.039 |
| HYDRACHNIDIA | SPERCHONTIDAE | *Sperchon setiger* | 2 | 6 | V | 3 | 1 | 2 | 6 | 0 | 5.9 | 6.3 | 3.21 | 0.409 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium* sp. | 4 | 6 | V | 6 | 0 | 5 | 6 | 1 | 5.9 | 7.4 | 3.59 | 0.596 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius rivulorum* | 1 | 6 | V | 0 | 0 | 1 | 6 | 0 | 5.7 | 2.6 | 1.89 | 0.056 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum albicorne* | 3 | 6 | V | 1 | 3 | 3 | 6 | 2 | 5.6 | 7.0 | 3.45 | 0.601 |
| DIPTERA | CHIRONOMIDAE | *Paracladopelma* sp. | 1 | 6 | V | 0 | 0 | 0 | 6 | 0 | 5.5 | 2.4 | 1.97 | 0.061 |
| DIPTERA | CHIRONOMIDAE | *Paratendipes albimanus* | 3 | 6 | V | 0 | 1 | 4 | 6 | 3 | 5.5 | 6.4 | 3.08 | 0.521 |
| DIPTERA | CHIRONOMIDAE | *Paracricotopus niger* | 1 | 5 | V | 0 | 0 | 0 | 5 | 0 | 5.1 | 1.7 | 1.59 | 0.060 |
| DIPTERA | CHIRONOMIDAE | *Nanocladius bicolor* | 1 | 5 | V | 0 | 0 | 1 | 5 | 0 | 4.9 | 2.5 | 2.00 | 0.077 |
| OLIGOCHETA | TUBIFICIDAE | *Potamothrix hammoniensis* | 1 | 5 | V | 0 | 0 | 2 | 5 | 0 | 4.8 | 3.1 | 2.34 | 0.124 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Lype reducta* | 1 | 4 | V | 0 | 1 | 0 | 4 | 0 | 4.2 | 2.9 | 2.01 | 0.115 |
| DIPTERA | CHIRONOMIDAE | *Cladotanytarsus* sp. | 1 | 4 | V | 0 | 0 | 0 | 4 | 0 | 4.1 | 2.1 | 1.75 | 0.091 |
| DIPTERA | CHIRONOMIDAE | "Thienemannimyia Gr. Gen. indet." | 1 | 4 | V | 0 | 0 | 1 | 4 | 0 | 4.1 | 2.7 | 2.04 | 0.133 |
| TRICHOPTERA | LEPTOCERIDAE | *Mystacides longicornis/nigra* | 2 | 4 | V | 0 | 3 | 1 | 4 | 2 | 4.1 | 4.5 | 2.86 | 0.397 |
| TRICHOPTERA | HYDROPTILIDAE | *Ithytrichia lamellaris* | 1 | 4 | V | 0 | 0 | 0 | 4 | 0 | 4.0 | 2.3 | 1.78 | 0.090 |
| TRICHOPTERA | LIMNEPHILIDAE | *Chaetopteryx/ Annitella* sp. | 1 | 4 | V | 0 | 1 | 0 | 4 | 0 | 4.0 | 3.1 | 2.37 | 0.171 |
| DIPTERA | CHIRONOMIDAE | *Cyphomella cornea* | 1 | 4 | V | 0 | 0 | 0 | 4 | 0 | 3.8 | 1.5 | 1.56 | 0.067 |
| DIPTERA | CHIRONOMIDAE | *Monodiamesa nitida* | 1 | 4 | V | 0 | 0 | 0 | 4 | 0 | 3.8 | 1.5 | 1.75 | 0.084 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia rivulorum* | 1 | 4 | V | 0 | 0 | 0 | 4 | 0 | 3.5 | 1.9 | 1.61 | 0.096 |
| BIVALVIA | SPHAERIIDAE | *Sphaerium rivicola* | 1 | 4 | V | 0 | 0 | 0 | 4 | 3 | 3.5 | 1.9 | 1.78 | 0.123 |
| DIPTERA | CHIRONOMIDAE | *Potthastia longimana* | 1 | 3 | V | 0 | 0 | 1 | 3 | 1 | 3.5 | 3.3 | 2.37 | 0.297 |

*(Continued)*

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | BRACHYCENTRIDAE | *Brachycentrus montanus* | 1 | 3 | V | 1 | 0 | 0 | 3 | 0 | 3.3 | 2.3 | 1.87 | 0.146 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia stigmatifera* | 1 | 3 | V | 0 | 0 | 0 | 3 | 0 | 3.3 | 1.9 | 1.84 | 0.159 |
| GASTROPODA & BIVALVIA | LYMNAEIDAE | *Galba truncatula* | 1 | 3 | V | 1 | 0 | 2 | 3 | 0 | 3.3 | 5.5 | 2.79 | 0.893 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila obliterata* | 1 | 3 | V | 0 | 0 | 2 | 3 | 2 | 3.1 | 2.9 | 2.25 | 0.282 |
| DIPTERA | MUSCIDAE | *Limnophora* sp. | 1 | 3 | V | 0 | 0 | 3 | 3 | 1 | 2.9 | 3.5 | 2.44 | 0.453 |
| COLEOPTERA | HALIPLIDAE | *Haliplus fluviatilis* | 1 | 3 | V | 0 | 0 | 0 | 3 | 0 | 2.8 | 2.1 | 1.62 | 0.174 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Lumbricillus rivalis* | 1 | 3 | V | 0 | 0 | 0 | 3 | 0 | 2.6 | 1.3 | 1.40 | 0.084 |
| DIPTERA | CHIRONOMIDAE | *Xenochironomus xenolabis* | 1 | 3 | V | 0 | 0 | 0 | 3 | 0 | 2.6 | 1.4 | 1.72 | 0.107 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum pedestre* | 1 | 3 | V | 0 | 0 | 1 | 3 | 1 | 2.5 | 3.0 | 2.02 | 0.470 |
| HETEROPTERA | CORIXIDAE | *Micronecta* sp. | 1 | 2 | V | 2 | 1 | 0 | 2 | 0 | 2.4 | 3.8 | 2.46 | 0.726 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Hemiclepsis marginata* | 1 | 2 | V | 0 | 0 | 1 | 2 | 0 | 2.1 | 2.2 | 2.02 | 0.358 |
| CRUSTACEA | ASELLIDAE | *Proasellus meridianus* | 0 | 2 | V | 0 | 0 | 0 | 2 | 0 | 1.9 | 1.6 | 1.65 | 0.249 |
| TRICHOPTERA | LIMNEPHILIDAE | *Annitella obscurata* | 0 | 2 | V | 0 | 0 | 0 | 2 | 0 | 1.9 | 1.9 | 1.60 | 0.335 |
| TRICHOPTERA | LIMNEPHILIDAE | Chaetopterygini Gen. sp. | 1 | 1 | V | 1 | 0 | 1 | 1 | 0 | 1.4 | 2.9 | 2.21 | 0.828 |
| HYDRACHNIDIA | OXIDAE | *Oxus longisetus* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 1.3 | 1.1 | 1.42 | 0.315 |
| OLIGOCHETA | TUBIFICIDAE | *Limnodrilus profundicola* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 1.3 | 1.0 | 0.92 | 0.319 |
| CRUSTACEA | TALITRIDAE | *Orchestia cavimana* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 1.3 | 1.1 | 1.17 | 0.359 |
| TURBELARIA | DENDROCOELIDAE | *Dendrocoelum lacteum* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 1.2 | 1.6 | 1.73 | 0.458 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Tinodes waeneri* | 1 | 1 | V | 1 | 1 | 0 | 1 | 0 | 1.2 | 2.7 | 2.02 | 0.903 |
| GASTROPODA & BIVALVIA | ACROLOXIDAE | *Acroloxus lacustris* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 1.1 | 1.6 | 1.68 | 0.456 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Fridericia galba* | 0 | 1 | V | 0 | 1 | 0 | 1 | 0 | 1.0 | 2.1 | 1.68 | 0.842 |
| HYDRACHNIDIA | TEUTONIIDAE | *Teutonia cometes* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 0.9 | 1.5 | 1.53 | 0.635 |
| DIPTERA | CHIRONOMIDAE | *Corynoneura* sp. | 0 | 1 | V | 0 | 1 | 0 | 1 | 0 | 0.9 | 1.7 | 1.53 | 0.733 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | CHIRONOMIDAE | *Polypedilum nubeculosum* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 0.8 | 1.7 | 1.88 | 0.780 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia verrucata* | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 0.8 | 1.7 | 1.57 | 0.804 |
| **EPHEMEROPTERA** | **BAETIDAE** | ***Baetis fuscatus*** | **19** | **91** | **VI** | **0** | **4** | **0** | **0** | **91** | **90.9** | **6.2** | **3.24** | **0.001** |
| **TRICHOPTERA** | **HYDROPSYCHIDAE** | ***Hydropsyche incognita*** | **18** | **72** | **VI** | **0** | **19** | **0** | **1** | **72** | **72.2** | **7.8** | **3.42** | **0.001** |
| **HYDRACHNIDIA** | **SPERCHONTIDAE** | ***Sperchon* sp.** | **16** | **65** | **VI** | **0** | **16** | **0** | **1** | **65** | **65.2** | **7.9** | **3.38** | **0.001** |
| **EPHEMEROPTERA** | **BAETIDAE** | ***Baetis scambus*** | **16** | **64** | **VI** | **1** | **7** | **0** | **7** | **64** | **64.1** | **12.7** | **4.76** | **0.001** |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium* sp.** | **16** | **61** | **VI** | **2** | **1** | **3** | **15** | **61** | **60.7** | **19.1** | **5.62** | **0.001** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Oecetis notata*** | **11** | **57** | **VI** | **0** | **0** | **0** | **0** | **57** | **56.9** | **3.3** | **2.04** | **0.001** |
| **GASTROPODA & BIVALVIA** | **HYDROBIIDAE** | ***Bithynia tentaculata*** | **11** | **56** | **VI** | **0** | **0** | **0** | **0** | **56** | **55.8** | **2.8** | **2.38** | **0.001** |
| **HYDRACHNIDIA** | **TORRENTICOLIDAE** | ***Torrenticola* sp.** | **12** | **52** | **VI** | **1** | **7** | **0** | **1** | **52** | **52.3** | **6.8** | **3.19** | **0.001** |
| **EPHEMEROPTERA** | **EPHEMERELLIDAE** | ***Serratella ignita*** | **12** | **51** | **VI** | **1** | **9** | **0** | **0** | **51** | **51.2** | **9.5** | **3.89** | **0.001** |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium lineatum*** | **10** | **50** | **VI** | **0** | **0** | **0** | **0** | **50** | **49.9** | **2.1** | **2.06** | **0.001** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Eukiefferiella clypeata*** | **10** | **47** | **VI** | **0** | **1** | **0** | **1** | **47** | **47.0** | **4.3** | **2.34** | **0.001** |
| **EPHEMEROPTERA** | **CAENIDAE** | ***Caenis luctuosa*** | **10** | **44** | **VI** | **0** | **3** | **0** | **0** | **44** | **44.5** | **3.4** | **2.24** | **0.001** |
| **EPHEMEROPTERA** | **HEPTAGENIIDAE** | ***Heptagenia sulphurea*** | **10** | **44** | **VI** | **0** | **8** | **0** | **0** | **44** | **43.6** | **3.8** | **2.47** | **0.001** |
| **TRICHOPTERA** | **HYDROPSYCHIDAE** | ***Hydropsyche contubernalis*** | **9** | **43** | **VI** | **0** | **0** | **0** | **3** | **43** | **42.7** | **3.3** | **2.40** | **0.001** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Atractides nodipalpis nodipalpis*** | **12** | **40** | **VI** | **1** | **15** | **1** | **4** | **40** | **39.9** | **9.5** | **3.80** | **0.001** |
| **TRICHOPTERA** | **HYGROBATIDAE** | ***Cheumatopsyche lepida*** | **12** | **38** | **VI** | **0** | **20** | **0** | **0** | **38** | **38.4** | **4.4** | **2.61** | **0.001** |
| **OLIGOCHETA** | **NAIDIDAE** | ***Stylaria lacustris*** | **9** | **38** | **VI** | **0** | **0** | **0** | **7** | **38** | **38.2** | **5.2** | **2.85** | **0.001** |
| **TRICHOPTERA** | **RHYACOPHILIDAE** | ***Rhyacophila dorsalis-Gr.*** | **16** | **36** | **VI** | **5** | **23** | **2** | **14** | **36** | **36.1** | **15.9** | **3.37** | **0.003** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Cardiocladius fuscus*** | **8** | **35** | **VI** | **0** | **1** | **0** | **4** | **35** | **35.5** | **3.7** | **2.60** | **0.001** |

*(Continued)*

**Table 1.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | VI | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 176 | 64 | 132 | 78 | 12 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | IndVal | Mean | SD | p |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium equinum*** | **8** | **35** | **VI** | **0** | **0** | **0** | **6** | **35** | **35.0** | **3.9** | **2.72** | **0.001** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Rheotanytarsus* sp.** | **9** | **34** | **VI** | **1** | **4** | **0** | **4** | **34** | **34.3** | **6.2** | **2.98** | **0.001** |
| **HYDRACHNIDIA** | **SPERCHONTIDAE** | ***Sperchon clupeifer*** | **14** | **34** | **VI** | **1** | **15** | **0** | **19** | **34** | **34.2** | **12.8** | **4.21** | **0.005** |
| **TRICHOPTERA** | **HYDROPSYCHIDAE** | ***Hydropsyche* sp.** | **12** | **32** | **VI** | **11** | **11** | **0** | **6** | **32** | **32.3** | **14.4** | **4.07** | **0.009** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Tvetenia* sp.** | **7** | **32** | **VI** | **0** | **0** | **0** | **1** | **32** | **31.6** | **4.2** | **2.52** | **0.001** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Mystacides* sp.** | **9** | **31** | **VI** | **0** | **12** | **0** | **0** | **31** | **31.3** | **4.4** | **2.77** | **0.001** |
| **COLEOPTERA** | **ELMIDAE** | ***Stenelmis canaliculata*** | **6** | **29** | **VI** | **0** | **1** | **0** | **0** | **29** | **29.2** | **2.3** | **1.99** | **0.001** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Cricotopus trifascia*** | **9** | **29** | **VI** | **0** | **0** | **1** | **14** | **29** | **28.6** | **6.3** | **3.22** | **0.002** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Cricotopus tremulus*** | **7** | **26** | **VI** | **1** | **4** | **0** | **3** | **26** | **26.1** | **5.9** | **2.99** | **0.002** |
| **CRUSTACEA** | **GAMMARIDAE** | ***Echinogammarus berilloni*** | **5** | **25** | **VI** | **0** | **0** | **0** | **0** | **25** | **25.0** | **1.6** | **1.67** | **0.001** |
| DIPTERA | CHIRONOMIDAE | *Cricotopus patens* | 5 | 23 | VI | 0 | 3 | 0 | 0 | 23 | 23.1 | 3.9 | 2.53 | 0.003 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius ashei* | 7 | 22 | VI | 1 | 8 | 0 | 2 | 22 | 22.0 | 7.6 | 3.32 | 0.009 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum* sp. | 5 | 22 | VI | 0 | 0 | 0 | 3 | 22 | 21.8 | 3.4 | 2.28 | 0.002 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia* sp. | 6 | 20 | VI | 0 | 4 | 0 | 3 | 20 | 20.0 | 4.1 | 2.24 | 0.002 |
| TRICHOPTERA | LEPTOCERIDAE | *Athripsodes albifrons* | 6 | 18 | VI | 0 | 8 | 0 | 2 | 18 | 17.6 | 5.1 | 3.01 | 0.010 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea dissimilis* | 4 | 17 | VI | 0 | 5 | 0 | 0 | 17 | 17.0 | 3.3 | 2.34 | 0.003 |
| TRICHOPTERA | HYDROPTILIDAE | *Allotrichia pallicornis* | 3 | 15 | VI | 0 | 0 | 0 | 0 | 15 | 14.9 | 1.9 | 1.85 | 0.004 |
| DIPTERA | SIMULIIDAE | *Simulium intermedium* | 3 | 14 | VI | 2 | 1 | 0 | 1 | 14 | 13.7 | 4.7 | 2.82 | 0.021 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche botosaneanui* | 3 | 13 | VI | 0 | 5 | 0 | 0 | 13 | 12.7 | 2.4 | 1.83 | 0.007 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia concolor* | 3 | 13 | VI | 0 | 0 | 0 | 0 | 13 | 12.5 | 2.3 | 1.82 | 0.003 |
| HIRUDINEA | ERPOBDELLIDAE | *Dina punctata* | 3 | 12 | VI | 0 | 0 | 0 | 0 | 12 | 12.1 | 2.3 | 1.98 | 0.009 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Theromyzon tessulatum* | 3 | 12 | VI | 0 | 0 | 0 | 1 | 12 | 11.6 | 2.7 | 2.14 | 0.017 |
| ODONATA | PLATYCNEMIDIDAE | *Platycnemis pennipes* | 4 | 11 | VI | 0 | 8 | 0 | 0 | 11 | 11.2 | 3.6 | 2.56 | 0.023 |
| ODONATA | GOMPHIDAE | *Onychogomphus forcipatus forcipatus* | 3 | 11 | VI | 0 | 3 | 0 | 0 | 11 | 10.8 | 2.3 | 2.08 | 0.019 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus insignis* | 4 | 11 | VI | 0 | 9 | 0 | 0 | 11 | 10.7 | 2.9 | 2.20 | 0.018 |

**Table 1.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 176 | III 64 | IV 132 | V 78 | VI 12 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | CHIRONOMIDAE | *Cricotopus albiforceps* | 3 | 10 | VI | 0 | 3 | 0 | 0 | 10 | 10.1 | 2.5 | 1.86 | 0.014 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus* sp. | 3 | 10 | VI | 0 | 1 | 0 | 5 | 10 | 10.0 | 3.9 | 2.47 | 0.022 |
| TRICHOPTERA | HYDROPTILIDAE | *Hydroptila* sp. | 5 | 10 | VI | 0 | 0 | 7 | 8 | 10 | 9.7 | 10.9 | 4.12 | 0.554 |
| GASTROPODA & BIVALVIA | LYMNAEIDAE | *Radix auricularia* | 2 | 9 | VI | 0 | 0 | 0 | 2 | 9 | 9.3 | 2.3 | 1.84 | 0.012 |
| DIPTERA | SIMULIIDAE | *Simulium argyreatum* | 2 | 8 | VI | 0 | 0 | 0 | 0 | 8 | 8.4 | 2.4 | 1.66 | 0.012 |
| DIPTERA | CHIRONOMIDAE | *Rheopelopia maculipennis* | 2 | 8 | VI | 0 | 0 | 0 | 0 | 8 | 8.0 | 1.6 | 1.58 | 0.031 |
| TRICHOPTERA | LEPTOCERIDAE | *Athripsodes* sp. | 4 | 8 | VI | 4 | 8 | 0 | 1 | 8 | 8.0 | 6.8 | 2.81 | 0.226 |
| DIPTERA | SIMULIIDAE | *Simulium variegatum* | 2 | 8 | VI | 0 | 0 | 0 | 0 | 8 | 7.7 | 2.4 | 1.59 | 0.022 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea nigronervosa* | 2 | 7 | VI | 0 | 0 | 0 | 0 | 7 | 7.2 | 1.5 | 1.64 | 0.044 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus venosus* | 2 | 7 | VI | 0 | 3 | 0 | 1 | 7 | 6.8 | 2.6 | 2.28 | 0.052 |
| HIRUDINEA | PISCICOLIDAE | *Piscicola geometra* | 2 | 6 | VI | 0 | 0 | 0 | 2 | 6 | 6.0 | 1.9 | 1.47 | 0.028 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Heptagenia* sp. | 2 | 6 | VI | 0 | 4 | 0 | 1 | 6 | 5.8 | 3.5 | 2.17 | 0.109 |
| HIRUDINEA | ERPOBDELLIDAE | *Erpobdella* sp. | 2 | 6 | VI | 3 | 0 | 0 | 2 | 6 | 5.6 | 3.7 | 2.22 | 0.121 |
| CRUSTACEA | GAMMARIDAE | *Gammarus roeselii* | 2 | 5 | VI | 0 | 0 | 1 | 3 | 5 | 5.1 | 2.8 | 1.89 | 0.088 |
| DIPTERA | CHIRONOMIDAE | *Cryptochironomus* sp. | 2 | 5 | VI | 0 | 0 | 0 | 4 | 5 | 5.1 | 2.7 | 2.03 | 0.090 |
| OLIGOCHETA | TUBIFICIDAE | *Potamothrix vejdovskyi* | 1 | 5 | VI | 0 | 3 | 0 | 0 | 5 | 4.8 | 1.9 | 1.79 | 0.077 |
| DIPTERA | CHIRONOMIDAE | *Conchapelopia melanops* | 1 | 4 | VI | 0 | 0 | 0 | 0 | 4 | 4.2 | 2.1 | 1.78 | 0.095 |
| COLEOPTERA | HALIPLIDAE | *Haliplus laminatus* | 1 | 3 | VI | 0 | 0 | 2 | 0 | 3 | 2.8 | 3.0 | 2.23 | 0.314 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche dinarica* | 1 | 3 | VI | 0 | 0 | 0 | 2 | 3 | 2.7 | 2.7 | 1.88 | 0.331 |

**Table 2.**
List of indicator species for different stream types in "reference condition". The "Avg" and "Max" columns refer to the indicator values for the given species (average and maximum value); "MaxGrp" is the type identifier for the group with the highest indicator value. The statistical significance of the observed indicator value is tested with a randomisation (Monte Carlo) procedure: "SD" is the Standard Deviation. "P" evaluates the statistical significance of the maximum indicator value recorded for given species. The probability of type I error is the proportion of times that the maximum indicator value from the randomized data set equals or exceeds the maximum indicator value from the actual data set. Species are ordered according to the groups they are indicative for (ascending) and by observed indicator value (descending). Significant indicators for a particular stream type (IndVal ≥ 25.0 and p ≤ 0.05) are marked in bold characters.

| | | | Types | | | I | III | IV | V | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 34 | 8 | 22 | 3 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | IndVal | Mean | SD | p |
| **EPHEMEROPTERA** | **LEPTOPHLEBIIDAE** | ***Habroleptoides confusa*** | **8** | **52** | **I REF** | **52** | **0** | **7** | **0** | **52.3** | **10.5** | **6.60** | **0.001** |
| **TRICHOPTERA** | **PHILOPOTAMIDAE** | ***Philopotamus ludificatus*** | **5** | **41** | **I REF** | **41** | **0** | **0** | **0** | **41.1** | **6.9** | **6.60** | **0.010** |
| **DIPTERA** | **ATHERICIDAE** | ***Atherix* sp.** | **5** | **41** | **I REF** | **41** | **0** | **0** | **0** | **40.6** | **6.9** | **5.58** | **0.005** |
| **TRICHOPTERA** | **SERICOSTOMATIDAE** | ***Sericostoma schneideri/ personatum*** | **8** | **39** | **I REF** | **39** | **14** | **5** | **0** | **39.3** | **12.2** | **6.13** | **0.006** |
| **PLECOPTERA** | **PERLODIDAE** | ***Isoperla oxylepis*** | **5** | **38** | **I REF** | **38** | **0** | **1** | **0** | **38.0** | **7.7** | **5.57** | **0.008** |
| **EPHEMEROPTERA** | **HEPTAGENIIDAE** | ***Epeorus sylvicola*** | **6** | **37** | **I REF** | **37** | **4** | **1** | **0** | **36.7** | **10.4** | **6.21** | **0.010** |
| **PLECOPTERA** | **PERLIDAE** | ***Perla marginata*** | **4** | **36** | **I REF** | **36** | **0** | **0** | **0** | **35.7** | **6.7** | **6.02** | **0.010** |
| **TRICHOPTERA** | **ODONTOCERIDAE** | ***Odontocerum albicorne*** | **6** | **34** | **I REF** | **34** | **0** | **12** | **1** | **33.7** | **9.6** | **6.29** | **0.011** |
| **PLECOPTERA** | **NEMOURIDAE** | ***Protonemura* sp.** | **6** | **33** | **I REF** | **33** | **0** | **11** | **0** | **33.3** | **10.1** | **6.95** | **0.019** |
| **TRICHOPTERA** | **GLOSSOSOMATIDAE** | ***Glossosoma conformis*** | **4** | **29** | **I REF** | **29** | **0** | **0** | **0** | **29.2** | **6.5** | **5.59** | **0.005** |
| **TRICHOPTERA** | **SERICOSTOMATIDAE** | ***Oecismus monedula*** | **3** | **27** | **I REF** | **27** | **0** | **0** | **0** | **26.9** | **6.0** | **6.01** | **0.018** |
| PLECOPTERA | TAENIOPTERYGIDAE | *Brachyptera risi* | 4 | 24 | I REF | 24 | 0 | 3 | 0 | 24.1 | 7.7 | 5.97 | 0.030 |
| COLEOPTERA | ELMIDAE | *Elmis* sp. Lv. | 3 | 22 | I REF | 22 | 0 | 0 | 0 | 22.4 | 7.5 | 5.66 | 0.030 |
| COLEOPTERA | HYDRAENIDAE | *Hydraena gracilis* Ad. | 6 | 22 | I REF | 22 | 4 | 6 | 0 | 22.0 | 10.8 | 5.55 | 0.047 |

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLECOPTERA | NEMOURIDAE | *Amphinemura sulcicollis/ triangularis* | 3 | 22 | I REF | 22 | 1 | 0 | 0 | 21.9 | 7.4 | 5.99 | 0.037 |
| DIPTERA | SIMULIIDAE | *Prosimulium* sp. | 3 | 21 | I REF | 21 | 0 | 0 | 0 | 20.6 | 10.1 | 6.88 | 0.080 |
| EPHEMEROPTERA | BAETIDAE | *Baetis melanonyx* | 2 | 20 | I REF | 20 | 0 | 0 | 0 | 20.2 | 6.2 | 5.80 | 0.042 |
| DIPTERA | TIPULIDAE | *Tipula saginata* | 2 | 20 | I REF | 20 | 0 | 1 | 0 | 20.0 | 5.8 | 5.59 | 0.034 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche fulvipes* | 3 | 20 | I REF | 20 | 0 | 1 | 0 | 19.9 | 6.7 | 5.33 | 0.041 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Rhithrogena semicolorata-Gr.* | 4 | 18 | I REF | 18 | 4 | 3 | 0 | 18.4 | 9.7 | 6.89 | 0.084 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche instabilis* | 4 | 18 | I REF | 18 | 0 | 0 | 8 | 18.0 | 8.2 | 6.01 | 0.056 |
| DIPTERA | BLEPHARICERIDAE | *Liponeura* sp. | 2 | 18 | I REF | 18 | 0 | 0 | 0 | 17.6 | 4.9 | 4.75 | 0.035 |
| PLECOPTERA | TAENIOPTERYGIDAE | *Brachyptera seticornis* | 2 | 17 | I REF | 17 | 0 | 0 | 0 | 17.2 | 3.8 | 4.25 | 0.029 |
| TRICHOPTERA | HYDROPSYCHIDAE | *Hydropsyche saxonica* | 3 | 16 | I REF | 16 | 0 | 2 | 3 | 16.0 | 8.6 | 5.88 | 0.088 |
| EPHEMEROPTERA | EPHEMERELLIDAE | *Torleya major* | 5 | 16 | I REF | 16 | 2 | 0 | 13 | 16.0 | 18.4 | 7.67 | 0.509 |
| COLEOPTERA | ELMIDAE | *Esolus angustatus* Ad. | 2 | 16 | I REF | 16 | 0 | 0 | 0 | 15.7 | 5.1 | 4.98 | 0.052 |
| DIPTERA | SIMULIIDAE | *Prosimulium rufipes* | 2 | 15 | I REF | 15 | 0 | 0 | 0 | 15.0 | 6.2 | 6.21 | 0.069 |
| PLECOPTERA | PERLODIDAE | *Isoperla grammatica* | 2 | 14 | I REF | 14 | 0 | 0 | 0 | 14.4 | 4.8 | 5.19 | 0.066 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila praemorsa* | 2 | 14 | I REF | 14 | 0 | 0 | 0 | 14.1 | 5.5 | 5.89 | 0.074 |
| COLEOPTERA | HYDRAENIDAE | *Limnebius truncatellus* Ad. | 2 | 14 | I REF | 14 | 0 | 0 | 0 | 14.0 | 5.6 | 5.68 | 0.102 |
| TURBELARIA | DUGESIIDAE | *Dugesia lugubris/polychroa* | 2 | 13 | I REF | 13 | 0 | 0 | 0 | 12.9 | 6.9 | 6.47 | 0.115 |
| COLEOPTERA | HYDROPHILIDAE | *Anacaena globulus* Ad. | 2 | 11 | I REF | 11 | 0 | 9 | 0 | 11.3 | 6.3 | 4.95 | 0.123 |

*(Continued)*

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPHEMEROPTERA | EPHEMERIDAE | *Ephemera* sp. | 3 | 10 | I REF | 10 | 1 | 0 | 0 | 9.8 | 7.8 | 6.42 | 0.195 |
| TRICHOPTERA | PHILOPOTAMIDAE | *Philopotamus montanus montanus* | 2 | 9 | I REF | 9 | 0 | 0 | 0 | 9.2 | 6.0 | 6.39 | 0.152 |
| TURBELARIA | PLANARIIDAE | *Polycelis nigra/tenuis* | 2 | 9 | I REF | 9 | 1 | 0 | 0 | 8.6 | 8.5 | 6.09 | 0.301 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Glossosoma* sp. | 1 | 8 | I REF | 8 | 0 | 0 | 0 | 7.5 | 4.9 | 4.99 | 0.170 |
| PLECOPTERA | PERLODIDAE | *Perlodes microcephalus* | 1 | 7 | I REF | 7 | 0 | 0 | 0 | 6.7 | 6.4 | 6.47 | 0.303 |
| DIPTERA | TIPULIDAE | *Tipula maxima-Gr.* | 1 | 7 | I REF | 7 | 0 | 4 | 0 | 6.6 | 5.7 | 5.96 | 0.223 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus* sp. | 2 | 6 | I REF | 6 | 3 | 0 | 0 | 6.3 | 6.8 | 5.37 | 0.335 |
| DIPTERA | TABANIDAE | Tabanidae Gen. sp. | 2 | 6 | I REF | 6 | 0 | 6 | 0 | 6.3 | 7.7 | 6.44 | 0.428 |
| TRICHOPTERA | BRACHYCENTRIDAE | *Brachycentrus montanus* | 1 | 6 | I REF | 6 | 0 | 0 | 0 | 6.1 | 4.1 | 5.06 | 0.166 |
| DIPTERA | LIMONIIDAE | *Hexatoma* sp. | 1 | 6 | I REF | 6 | 0 | 0 | 0 | 6.0 | 4.6 | 5.20 | 0.190 |
| OLIGOCHETA | ENCHYTRAEIDAE | *Fridericia* sp. | 1 | 5 | I REF | 5 | 0 | 1 | 0 | 5.4 | 5.6 | 5.64 | 0.270 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax rotundipennis* | 1 | 5 | I REF | 5 | 0 | 0 | 0 | 5.3 | 4.0 | 5.45 | 0.187 |
| DIPTERA | TIPULIDAE | *Tipula* sp. | 2 | 4 | I REF | 4 | 2 | 4 | 0 | 3.7 | 6.9 | 5.10 | 0.765 |
| DIPTERA | DIXIDAE | *Dixa nebulosa* | 1 | 3 | I REF | 3 | 0 | 1 | 0 | 3.5 | 5.0 | 4.83 | 0.450 |
| COLEOPTERA | GYRINIDAE | *Orectochilus villosus* | 0 | 3 | I REF | 3 | 0 | 0 | 0 | 2.8 | 4.2 | 5.20 | 0.409 |
| TRICHOPTERA | GOERIDAE | *Silo nigricornis* | 0 | 2 | I REF | 2 | 0 | 0 | 0 | 2.4 | 3.3 | 4.73 | 0.360 |
| **TRICHOPTERA** | **BRACHYCENTRIDAE** | ***Brachycentrus maculatus*** | **9** | **63** | **III REF** | **0** | **63** | **0** | **0** | **63.3** | **7.8** | **6.22** | **0.001** |
| **TRICHOPTERA** | **LEPTOCERIDAE** | ***Oecetis testacea*** | **8** | **53** | **III REF** | **0** | **53** | **0** | **0** | **52.6** | **8.2** | **6.97** | **0.004** |
| **ODONATA** | **CALOPTERYGIDAE** | ***Calopteryx virgo*** | **7** | **51** | **III REF** | **0** | **51** | **0** | **0** | **50.7** | **9.5** | **7.52** | **0.006** |
| **HYDRACHNIDIA** | **TORRENTICOLIDAE** | **Torrenticolidae Gen. sp.** | **7** | **48** | **III REF** | **0** | **48** | **0** | **0** | **48.2** | **7.6** | **6.41** | **0.004** |
| **TRICHOPTERA** | **POLYCENTROPODIDAE** | ***Polycentropus flavomaculatus*** | **8** | **48** | **III REF** | **0** | **48** | **0** | **0** | **47.8** | **8.1** | **6.09** | **0.003** |
| **HYDRACHNIDIA** | **TORRENTICOLIDAE** | ***Torrenticola amplexa*** | **7** | **41** | **III REF** | **0** | **41** | **0** | **0** | **41.1** | **7.8** | **5.75** | **0.004** |

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HYDRACHNIDIA** | **LEBERTIIDAE** | ***Lebertia porosa*** | **9** | **37** | **III REF** | **0** | **37** | **0** | **1** | **36.6** | **11.3** | **6.28** | **0.009** |
| **EPHEMEROPTERA** | **HEPTAGENIIDAE** | ***Ecdyonurus venosus*** | **4** | **31** | **III REF** | **0** | **31** | **0** | **0** | **31.5** | **4.3** | **5.41** | **0.008** |
| **TRICHOPTERA** | **PSYCHOMYIIDAE** | ***Psychomyia pusilla*** | **4** | **31** | **III REF** | **0** | **31** | **0** | **0** | **30.8** | **6.2** | **6.13** | **0.010** |
| **HYDRACHNIDIA** | **HYDRODROMIDAE** | ***Hydrodroma torrenticola*** | **4** | **31** | **III REF** | **0** | **31** | **0** | **0** | **30.6** | **4.4** | **5.36** | **0.008** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Atractides nodipalpis nodipalpis*** | **7** | **30** | **III REF** | **0** | **30** | **2** | **0** | **30.1** | **10.1** | **6.81** | **0.029** |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium reptans*** | **5** | **29** | **III REF** | **0** | **29** | **0** | **0** | **28.9** | **6.8** | **5.70** | **0.012** |
| **GASTROPODA** | **VALVATIDAE** | ***Ancylus fluviatilis*** | **9** | **29** | **III REF** | **10** | **29** | **1** | **5** | **28.9** | **15.6** | **6.50** | **0.046** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates calliger*** | **8** | **26** | **III REF** | **0** | **26** | **0** | **18** | **26.4** | **10.4** | **6.95** | **0.035** |
| **DIPTERA** | **SIMULIIDAE** | ***Simulium angustipes*** | **3** | **26** | **III REF** | **1** | **26** | **0** | **0** | **26.3** | **8.4** | **7.26** | **0.030** |
| **TRICHOPTERA** | **RHYACOPHILIDAE** | ***Rhyacophila dorsalis-Gr.*** | **9** | **25** | **III REF** | **1** | **25** | **1** | **9** | **25.2** | **13.3** | **5.11** | **0.042** |
| **TRICHOPTERA** | **LEPIDOSTOMATIDAE** | ***Lasiocephala basalis*** | **4** | **25** | **III REF** | **0** | **25** | **0** | **0** | **24.6** | **8.7** | **6.69** | **0.031** |
| DIPTERA | CHIRONOMIDAE | *Tvetenia discoloripes/verralli* | 5 | 23 | III REF | 0 | 23 | 0 | 3 | 22.9 | 10.3 | 6.56 | 0.041 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus* sp. | 5 | 22 | III REF | 6 | 22 | 1 | 6 | 22.1 | 11.1 | 6.95 | 0.065 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Ecdyonurus torrentis* | 3 | 21 | III REF | 0 | 21 | 0 | 0 | 21.0 | 5.2 | 6.08 | 0.044 |
| GASTROPODA | HYDROBIIDAE | *Potamopyrgus antipodarum* | 4 | 21 | III REF | 0 | 21 | 0 | 0 | 21.0 | 10.5 | 7.17 | 0.066 |
| HYDRACHNIDIA | TORRENTICOLIDAE | *Torrenticola anomala* | 4 | 20 | III REF | 0 | 20 | 0 | 7 | 19.6 | 6.4 | 6.24 | 0.036 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax latipennis* | 3 | 20 | III REF | 4 | 20 | 0 | 0 | 19.6 | 6.6 | 5.81 | 0.037 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Paraleptophlebia submarginata* | 6 | 20 | III REF | 2 | 20 | 0 | 2 | 19.6 | 9.9 | 6.23 | 0.062 |
| COLEOPTERA | ELMIDAE | *Elmis maugetii* | 5 | 18 | III REF | 3 | 18 | 1 | 0 | 18.4 | 10.4 | 6.19 | 0.088 |
| GASTROPODA | PLANORBIDAE | *Gyraulus albus* | 3 | 18 | III REF | 0 | 18 | 0 | 0 | 18.0 | 6.8 | 5.74 | 0.048 |

*(Continued)*

**Table 2.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 34 | 8 | 22 | 3 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | IndVal | Mean | SD | p |
| COLEOPTERA | HYDRAENIDAE | *Hydraena reyi* Ad. | 3 | 18 | III REF | 0 | 18 | 0 | 0 | 17.7 | 5.1 | 5.28 | 0.048 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax luctuosus* | 3 | 17 | III REF | 0 | 17 | 0 | 5 | 16.6 | 5.3 | 5.57 | 0.049 |
| TRICHOPTE RA | LIMNEPHILIDAE | *Allogamus auricollis* | 2 | 16 | III REF | 0 | 16 | 0 | 0 | 16.2 | 4.7 | 4.92 | 0.032 |
| HIRUDINEA | ERPOBDELLIDAE | *Trocheta pseudodina* | 2 | 15 | III REF | 0 | 15 | 0 | 0 | 15.4 | 4.8 | 6.37 | 0.067 |
| COLEOPTERA | ELMIDAE | *Oulimnius tuberculatus* | 5 | 14 | III REF | 1 | 14 | 1 | 1 | 14.1 | 10.6 | 5.43 | 0.176 |
| PLECOPTERA | LEUCTRIDAE | *Leuctra* sp. | 5 | 13 | III REF | 11 | 13 | 10 | 1 | 13.2 | 11.7 | 7.32 | 0.242 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea dissimilis* | 3 | 13 | III REF | 0 | 13 | 0 | 0 | 13.0 | 5.3 | 5.72 | 0.090 |
| EPHEMEROPTERA | BAETIDAE | *Baetis vardarensis* | 5 | 13 | III REF | 0 | 13 | 0 | 7 | 12.9 | 9.1 | 6.79 | 0.160 |
| PLECOPTERA | CHLOROPERLIDAE | *Siphonoperla torrentium* | 2 | 13 | III REF | 4 | 13 | 0 | 0 | 12.8 | 7.1 | 6.00 | 0.102 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium nitidum* | 2 | 13 | III REF | 0 | 13 | 0 | 0 | 12.7 | 5.7 | 5.42 | 0.068 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea annulicornis* | 3 | 13 | III REF | 0 | 13 | 0 | 0 | 12.7 | 5.7 | 5.91 | 0.092 |
| DIPTERA | ATHERICIDAE | *Atherix ibis* | 4 | 12 | III REF | 0 | 12 | 0 | 11 | 12.3 | 7.6 | 6.01 | 0.134 |
| EPHEMEROPTERA | CAENIDAE | *Caenis beskidensis* | 2 | 12 | III REF | 0 | 12 | 0 | 0 | 12.2 | 4.8 | 5.55 | 0.071 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia* sp. | 3 | 12 | III REF | 0 | 12 | 0 | 0 | 11.6 | 6.4 | 6.04 | 0.136 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia complanata* | 4 | 11 | III REF | 0 | 11 | 1 | 0 | 11.4 | 10.0 | 6.26 | 0.247 |
| TRICHOPTERA | LIMNEPHILIDAE | *Anabolia nervosa* | 2 | 11 | III REF | 1 | 11 | 0 | 0 | 11.0 | 6.4 | 6.67 | 0.132 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum cultellatum* | 2 | 11 | III REF | 0 | 11 | 0 | 0 | 10.9 | 5.3 | 5.82 | 0.115 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus tesselatus* | 2 | 10 | III REF | 0 | 10 | 0 | 0 | 10.5 | 4.9 | 5.59 | 0.104 |
| EPHEMEROPTERA | BAETIDAE | *Procloeon pennulatum* | 1 | 10 | III REF | 0 | 10 | 0 | 0 | 9.7 | 3.7 | 5.18 | 0.083 |

**Table 2.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 34 | 8 | 22 | 3 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | IndVal | Mean | SD | p |
| DIPTERA | CHIRONOMIDAE | *Demicryptochi-ronomus vulneratus* | 1 | 9 | III REF | 0 | 9 | 0 | 0 | 9.5 | 3.4 | 5.06 | 0.062 |
| DIPTERA | CHIRONOMIDAE | *Cardiocladius capucinus* | 2 | 9 | III REF | 0 | 9 | 0 | 0 | 8.6 | 4.3 | 5.38 | 0.098 |
| DIPTERA | CHIRONOMIDAE | *Cricotopus albiforceps* | 2 | 8 | III REF | 0 | 8 | 0 | 0 | 7.8 | 4.6 | 5.90 | 0.137 |
| DIPTERA | CHIRONOMIDAE | *Microtendipes tarsalis* | 1 | 8 | III REF | 0 | 8 | 0 | 0 | 7.7 | 3.1 | 4.62 | 0.073 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium casertanum casertanum* | 2 | 7 | III REF | 0 | 7 | 0 | 0 | 7.5 | 5.9 | 4.99 | 0.237 |
| TRICHOPTERA | LIMNEPHILIDAE | *Anomalopterygella chauviniana* | 1 | 7 | III REF | 1 | 7 | 0 | 0 | 7.0 | 4.8 | 5.08 | 0.180 |
| TRICHOPTERA | LEPTOCERIDAE | *Ceraclea nigronervosa* | 1 | 7 | III REF | 0 | 7 | 0 | 0 | 6.5 | 2.8 | 4.05 | 0.099 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia insignis* | 1 | 6 | III REF | 0 | 6 | 0 | 0 | 6.3 | 4.6 | 6.08 | 0.157 |
| DIPTERA | CHIRONOMIDAE | *Potthastia gaedii* | 2 | 6 | III REF | 0 | 6 | 0 | 0 | 5.9 | 5.3 | 5.16 | 0.227 |
| EPHEMEROPTERA | BAETIDAE | *Procloeon bifidum* | 1 | 6 | III REF | 3 | 6 | 0 | 0 | 5.8 | 4.9 | 5.35 | 0.240 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius rivulorum* | 1 | 4 | III REF | 0 | 4 | 0 | 0 | 4.5 | 4.5 | 5.50 | 0.248 |
| COLEOPTERA | HYDRAENIDAE | *Hydraena pulchella* Ad. | 1 | 4 | III REF | 0 | 4 | 0 | 0 | 4.4 | 2.6 | 4.07 | 0.115 |
| DIPTERA | CHIRONOMIDAE | *Procladius* sp. | 1 | 4 | III REF | 0 | 4 | 1 | 0 | 4.4 | 6.1 | 5.99 | 0.448 |
| EPHEMEROPTERA | SIPHLONURIDAE | *Siphlonurus aestivalis* | 1 | 4 | III REF | 0 | 4 | 0 | 0 | 4.3 | 4.8 | 5.16 | 0.311 |
| DIPTERA | CHIRONOMIDAE | *Thienemanniella* sp. | 1 | 4 | III REF | 0 | 4 | 0 | 0 | 4.0 | 3.1 | 4.53 | 0.162 |
| DIPTERA | CHIRONOMIDAE | *Eukiefferiella minor/fittkaui* | 1 | 4 | III REF | 0 | 4 | 0 | 0 | 4.0 | 3.2 | 4.47 | 0.175 |
| TRICHOPTERA | BERAEIDAE | *Beraeodes minuta* | 1 | 3 | III REF | 0 | 3 | 0 | 0 | 3.4 | 5.2 | 5.96 | 0.467 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila obliterata* | 1 | 3 | III REF | 0 | 3 | 0 | 0 | 2.8 | 5.0 | 5.69 | 0.548 |
| DIPTERA | CHIRONOMIDAE | Tanytarsini Gen. sp. | 0 | 2 | III REF | 0 | 2 | 0 | 0 | 2.0 | 3.3 | 4.14 | 0.528 |

*(Continued)*

**Table 2.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | Observed | IndVal | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 34 | 8 | 22 | 3 | IndVal | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | | Mean | SD | p |
| **TRICHOPTERA** | **POLYCENTROPODIDAE** | ***Plectrocnemia conspersa*** | **6** | **47** | **IV REF** | **1** | **0** | **47** | **0** | **47.1** | **8.6** | **6.64** | **0.006** |
| **CRUSTACEA** | **GAMMARIDAE** | ***Gammarus fossarum/pulex-Gr.*** | **3** | **25** | **IV REF** | **0** | **0** | **25** | **0** | **25.4** | **5.9** | **5.82** | **0.027** |
| **COLEOPTERA** | **SCIRTIDAE** | **Scirtidae Gen. sp. Lv.** | **5** | **25** | **IV REF** | **12** | **0** | **25** | **0** | **25.2** | **9.5** | **6.88** | **0.044** |
| TURBELARIA | DUGESIIDAE | *Dugesia gonocephala* | 4 | 23 | IV REF | 2 | 4 | 23 | 0 | 23.5 | 9.0 | 6.56 | 0.042 |
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium casertanum ponderosum* | 3 | 23 | IV REF | 0 | 0 | 23 | 0 | 23.2 | 6.6 | 5.60 | 0.027 |
| PLECOPTERA | NEMOURIDAE | *Nemoura* sp. | 7 | 23 | IV REF | 21 | 2 | 23 | 0 | 23.2 | 14.2 | 7.80 | 0.103 |
| TRICHOPTERA | LIMNEPHILIDAE | *Drusus annulatus* | 3 | 23 | IV REF | 1 | 0 | 23 | 0 | 22.9 | 6.9 | 5.60 | 0.024 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Rhithrogena hybrida-Gr.* | 3 | 23 | IV REF | 0 | 0 | 23 | 0 | 22.7 | 4.9 | 5.45 | 0.032 |
| COLEOPTERA | ELMIDAE | *Limnius perrisi* Ad. | 3 | 20 | IV REF | 6 | 0 | 230 | 0 | 20.5 | 7.9 | 6.19 | 0.044 |
| TRICHOPTERA | LIMNEPHILIDAE | Limnephilini Gen. sp. | 4 | 20 | IV REF | 1 | 1 | 20 | 2 | 20.0 | 9.5 | 6.47 | 0.062 |
| EPHEMEROPTERA | HEPTAGENIIDAE | *Electrogena* sp. | 3 | 20 | IV REF | 4 | 2 | 20 | 0 | 19.6 | 8.2 | 6.18 | 0.058 |
| EPHEMEROPTERA | EPHEMERIDAE | *Ephemera danica* | 4 | 19 | IV REF | 7 | 3 | 19 | 2 | 18.6 | 11.3 | 7.15 | 0.118 |
| MEGALOPTERA | SIALIDAE | *Sialis fuliginosa* | 3 | 18 | IV REF | 4 | 0 | 18 | 0 | 17.8 | 8.5 | 6.63 | 0.070 |
| EPHEMEROPTERA | HEPTAGENIIDAE | Heptageniidae Gen. sp. | 2 | 17 | IV REF | 0 | 2 | 17 | 0 | 17.2 | 5.9 | 5.83 | 0.065 |
| DIPTERA | LIMONIIDAE | Limoniidae Gen. sp. | 2 | 16 | IV REF | 0 | 0 | 16 | 0 | 15.8 | 6.8 | 5.68 | 0.064 |
| GASTROPODA & BIVALVIA | | Gastropoda Gen. sp. | 4 | 16 | IV REF | 0 | 0 | 16 | 5 | 15.6 | 8.1 | 5.92 | 0.087 |
| DIPTERA | LIMONIIDAE | *Eloeophila* sp. | 4 | 15 | IV REF | 6 | 0 | 15 | 4 | 15.5 | 9.7 | 6.34 | 0.118 |
| EPHEMEROPTERA | BAETIDAE | *Centroptilum luteolum* | 3 | 15 | IV REF | 1 | 6 | 15 | 0 | 15.4 | 9.1 | 6.45 | 0.100 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra notescens-Gr.* | 2 | 14 | IV REF | 1 | 0 | 14 | 0 | 14.3 | 5.1 | 6.03 | 0.061 |

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | IndVal Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIPTERA | LIMONIIDAE | *Rhypholophus* sp. | 2 | 14 | IV REF | 1 | 0 | 14 | 0 | 14.3 | 6.1 | 5.94 | 0.087 |
| COLEOPTERA | ELMIDAE | *Limnius* sp. Lv. | 2 | 13 | IV REF | 1 | 0 | 13 | 0 | 13.5 | 5.2 | 5.42 | 0.081 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Tinodes unicolor* | 2 | 13 | IV REF | 0 | 0 | 13 | 4 | 13.3 | 6.0 | 6.08 | 0.078 |
| DIPTERA | PTYCHOPTERIDAE | *Ptychoptera* sp. | 1 | 13 | IV REF | 0 | 0 | 13 | 0 | 13.0 | 4.2 | 4.76 | 0.044 |
| EPHEMEROPTERA | BAETIDAE | *Alainites muticus* | 4 | 13 | IV REF | 8 | 0 | 13 | 0 | 12.8 | 9.2 | 6.65 | 0.164 |
| TRICHOPTERA | LIMNEPHILIDAE | *Potamophylax cingulatus cingulatus* | 3 | 12 | IV REF | 8 | 0 | 12 | 0 | 11.9 | 7.1 | 5.67 | 0.136 |
| DIPTERA | DIXIDAE | *Dixa maculata* | 1 | 12 | IV REF | 1 | 0 | 12 | 0 | 11.8 | 4.8 | 6.24 | 0.105 |
| DIPTERA | LIMONIIDAE | *Pilaria* sp. | 4 | 12 | IV REF | 2 | 0 | 12 | 6 | 11.7 | 10.1 | 6.02 | 0.239 |
| HIRUDINEA | GLOSSIPHONIIDAE | *Glossiphonia nebulosa* | 2 | 11 | IV REF | 0 | 0 | 11 | 0 | 11.4 | 6.2 | 5.29 | 0.137 |
| PLECOPTERA | NEMOURIDAE | *Nemurella pictetii* | 1 | 11 | IV REF | 0 | 0 | 11 | 0 | 11.3 | 4.2 | 5.22 | 0.063 |
| TRICHOPTERA | LIMNEPHILIDAE | *Halesus radiatus* | 3 | 11 | IV REF | 2 | 3 | 11 | 3 | 10.8 | 9.0 | 6.40 | 0.229 |
| DIPTERA | CHIRONOMIDAE | *Microtendipes pedellus* | 2 | 10 | IV REF | 0 | 0 | 10 | 0 | 10.0 | 5.5 | 5.03 | 0.125 |
| COLEOPTERA | HYDRAENIDAE | *Hydraena nigrita* Ad. | 1 | 10 | IV REF | 0 | 0 | 10 | 0 | 9.8 | 4.8 | 5.26 | 0.099 |
| HETEROPTERA | VELIIDAE | *Velia* sp. | 1 | 9 | IV REF | 0 | 0 | 9 | 0 | 8.6 | 3.4 | 4.51 | 0.065 |
| COLEOPTERA | ELMIDAE | *Riolus subviolaceus* | 1 | 9 | IV REF | 0 | 0 | 9 | 0 | 8.6 | 4.6 | 6.05 | 0.109 |
| HYDRACHNIDIA | PIONIDAE | *Wettina podagrica* | 1 | 9 | IV REF | 0 | 0 | 9 | 0 | 8.5 | 3.4 | 4.56 | 0.068 |
| DIPTERA | SIMULIIDAE | *Simulium vernum* | 2 | 8 | IV REF | 0 | 0 | 8 | 0 | 7.8 | 6.7 | 6.23 | 0.202 |
| EPHEMEROPTERA | EPHEMERELLIDAE | *Ephemerella mucronata* | 1 | 8 | IV REF | 0 | 0 | 8 | 0 | 7.7 | 5.1 | 5.43 | 0.138 |
| DIPTERA | LIMONIIDAE | *Gnophomyia* sp. | 1 | 7 | IV REF | 0 | 0 | 7 | 0 | 7.4 | 3.5 | 4.87 | 0.087 |
| GASTROPODA | LYMNAEIDAE | *Radix ovata* | 2 | 7 | IV REF | 7 | 0 | 7 | 0 | 7.4 | 9.7 | 6.23 | 0.523 |
| DIPTERA | CHIRONOMIDAE | *Micropsectra bidentata* | 2 | 6 | IV REF | 5 | 0 | 6 | 0 | 6.4 | 6.3 | 5.64 | 0.293 |

*(Continued)*

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GASTROPODA & BIVALVIA | SPHAERIIDAE | *Pisidium* sp. | 2 | 6 | IV REF | 0 | 0 | 6 | 5 | 6.3 | 8.6 | 6.97 | 0.506 |
| TRICHOPTERA | LIMNEPHILIDAE | *Chaetopteryx major* | 1 | 6 | IV REF | 0 | 2 | 6 | 0 | 6.0 | 4.9 | 5.55 | 0.211 |
| DIPTERA | SIMULIIDAE | *Simulium cryophilum* | 2 | 6 | IV REF | 2 | 1 | 6 | 0 | 6.0 | 7.6 | 6.19 | 0.466 |
| DIPTERA | PSYCHODIDAE | Psychodidae Gen. sp. | 2 | 6 | IV REF | 3 | 1 | 6 | 0 | 5.9 | 6.8 | 6.23 | 0.403 |
| TRICHOPTERA | RHYACOPHILIDAE | *Rhyacophila tristis* | 1 | 6 | IV REF | 0 | 0 | 6 | 0 | 5.8 | 4.8 | 5.65 | 0.218 |
| TRICHOPTERA | PHILOPOTAMIDAE | *Wormaldia* sp. | 1 | 5 | IV REF | 1 | 0 | 5 | 0 | 5.4 | 4.7 | 5.69 | 0.234 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Synagapetus dubitans* | 1 | 4 | IV REF | 0 | 0 | 4 | 0 | 4.5 | 2.3 | 3.61 | 0.098 |
| DIPTERA | CHIRONOMIDAE | *Macropelopia nebulosa* | 1 | 4 | IV REF | 0 | 0 | 4 | 0 | 4.0 | 6.1 | 5.98 | 0.511 |
| HYDRACHNIDIA | LEBERTIIDAE | *Lebertia salebrosa* | 1 | 3 | IV REF | 0 | 0 | 3 | 0 | 3.5 | 4.0 | 5.13 | 0.322 |
| TRICHOPTERA | LIMNEPHILIDAE | *Micropterna sequax* | 1 | 3 | IV REF | 1 | 0 | 3 | 0 | 3.4 | 4.4 | 5.31 | 0.362 |
| TRICHOPTERA | LIMNEPHILIDAE | *Hydatophylax infumatus* | 1 | 3 | IV REF | 3 | 0 | 3 | 0 | 3.4 | 5.4 | 6.17 | 0.462 |
| TRICHOPTERA | LIMNEPHILIDAE | *Limnephilus lunatus* | 1 | 3 | IV REF | 0 | 0 | 3 | 0 | 3.2 | 4.6 | 4.96 | 0.443 |
| ODONATA | AESHNIDAE | *Aeshna cyanea* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 3.1 | 3.5 | 4.66 | 0.314 |
| CRUSTACEA | ASELLIDAE | *Proasellus meridianus* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 3.0 | 3.1 | 4.44 | 0.258 |
| HYDRACHNIDIA | TEUTONIIDAE | *Teutonia cometes* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.8 | 2.9 | 4.70 | 0.238 |
| TRICHOPTERA | GLOSSOSOMATIDAE | *Synagapetus iridipennis* | 1 | 3 | IV REF | 2 | 0 | 3 | 0 | 2.7 | 3.5 | 5.25 | 0.342 |
| DIPTERA | CHIRONOMIDAE | *Odontomesa fulva* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.6 | 3.1 | 4.76 | 0.288 |
| DIPTERA | CHIRONOMIDAE | *Heterotrissocladius marcidus* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.6 | 3.6 | 4.94 | 0.360 |
| HYDRACHNIDIA | ARRENURIDAE | *Arrenurus* sp. | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.6 | 4.1 | 5.69 | 0.405 |

**Table 2.** *(Cont.,)*

| Taxa Group | Familly | *Species* | Types Number of items Avg | Max | MaxGrp | I 34 | III 8 | IV 22 | V 3 | Observed IndVal | IndVal randomized groups Mean | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRICHOPTERA | LIMNEPHILIDAE | *Melampophylax mucoreus* | 0 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.5 | 3.5 | 4.64 | 0.374 |
| TRICHOPTERA | PSYCHOMYIIDAE | *Tinodes rostocki* | 1 | 3 | IV REF | 0 | 0 | 3 | 0 | 2.5 | 4.3 | 5.57 | 0.470 |
| **COLEOPTERA** | **DYTISCIDAE** | ***Oreodytes sanmarkii*** | **9** | **70** | **V REF** | **2** | **0** | **4** | **70** | **70.2** | **8.9** | **6.61** | **0.002** |
| **HYDRACHNIDIA** | **LEBERTIIDAE** | ***Lebertia fimbriata*** | **9** | **63** | **V REF** | **0** | **1** | **1** | **63** | **62.8** | **11.3** | **7.19** | **0.003** |
| **EPHEMEROPTERA** | **BAETIDAE** | ***Baetis vernus*** | **7** | **54** | **V REF** | **0** | **0** | **0** | **54** | **54.2** | **11.4** | **7.43** | **0.005** |
| **OLIGOCHETA** | **LUMBRICIDAE** | ***Eiseniella tetraedra*** | **8** | **54** | **V REF** | **1** | **1** | **0** | **54** | **53.8** | **10.4** | **6.63** | **0.004** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Polypedilum scalaenum-Gr.*** | **7** | **49** | **V REF** | **0** | **1** | **0** | **49** | **49.2** | **8.5** | **6.08** | **0.003** |
| **OLIGOCHETA** | **LUMBRICULIDAE** | **Lumbriculidae Gen. sp.** | **8** | **47** | **V REF** | **0** | **5** | **0** | **47** | **46.9** | **11.9** | **7.67** | **0.009** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Thienemannimyia* sp.** | **6** | **44** | **V REF** | **0** | **3** | **0** | **44** | **43.9** | **7.0** | **6.19** | **0.004** |
| **HYDRACHNIDIA** | **SPERCHONTIDAE** | ***Sperchon glandulosus*** | **5** | **41** | **V REF** | **0** | **0** | **0** | **41** | **41.3** | **6.7** | **6.32** | **0.004** |
| **HYDRACHNIDIA** | **HYGROBATIDAE** | ***Hygrobates nigromaculatus*** | **7** | **41** | **V REF** | **0** | **0** | **1** | **41** | **41.0** | **11.9** | **8.18** | **0.018** |
| **OLIGOCHETA** | **LUMBRICULIDAE** | ***Stylodrilus heringianus*** | **7** | **40** | **V REF** | **0** | **4** | **0** | **40** | **39.6** | **12.9** | **7.21** | **0.015** |
| **GASTROPODA** | **LYMNAEIDAE** | ***Radix* sp.** | **7** | **37** | **V REF** | **0** | **14** | **0** | **37** | **36.9** | **9.3** | **6.09** | **0.009** |
| **DIPTERA** | **CHIRONOMIDAE** | ***Orthocladius obumbratus*** | **5** | **30** | **V REF** | **0** | **1** | **0** | **30** | **30.1** | **12.3** | **7.50** | **0.031** |
| **DIPTERA** | **LIMONIIDAE** | ***Antocha* sp.** | **6** | **28** | **V REF** | **0** | **2** | **0** | **28** | **28.0** | **8.4** | **5.77** | **0.016** |
| **TRICHOPTERA** | **HYDROPSYCHIDAE** | ***Hydropsyche siltalai*** | **10** | **28** | **V REF** | **1** | **20** | **0** | **28** | **27.9** | **13.4** | **5.80** | **0.029** |
| **DIPTERA** | **EMPIDIDAE** | **Empididae Gen. sp.** | **5** | **27** | **V REF** | **0** | **0** | **0** | **27** | **27.1** | **7.3** | **5.30** | **0.013** |
| **TRICHOPTERA** | **RHYACOPHILIDAE** | ***Rhyacophila* sp.** | **9** | **27** | **V REF** | **0** | **19** | **3** | **27** | **26.9** | **12.5** | **4.96** | **0.024** |
| **OLIGOCHETA** | **NAIDIDAE** | ***Nais elinguis*** | **6** | **26** | **V REF** | **0** | **0** | **0** | **26** | **26.0** | **9.6** | **7.25** | **0.030** |
| **HYDRACHNIDIA** | **SPERCHONTIDAE** | ***Sperchon denticulatus*** | **7** | **26** | **V REF** | **0** | **4** | **0** | **26** | **25.9** | **11.3** | **7.35** | **0.037** |

*(Continued)*

**Table 2.** *(Cont.,)*

| | | | Types | | | I | III | IV | V | IndVal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of items | | | 34 | 8 | 22 | 3 | Observed | randomized groups | | |
| Taxa Group | Familly | *Species* | Avg | Max | MaxGrp | | | | | IndVal | Mean | SD | p |
| DIPTERA | SIMULIIDAE | *Simulium ornatum-Gr.* | 7 | 24 | V REF | 0 | 1 | 1 | 24 | 24.0 | 20.5 | 9.30 | 0.231 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Habrophlebia fusca* | 3 | 22 | V REF | 3 | 0 | 0 | 22 | 22.2 | 6.4 | 6.11 | 0.036 |
| EPHEMEROPTERA | LEPTOPHLEBIIDAE | *Habrophlebia lauta* | 5 | 22 | V REF | 5 | 1 | 9 | 22 | 22.0 | 10.9 | 7.31 | 0.072 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum laetum* | 4 | 20 | V REF | 0 | 0 | 0 | 20 | 19.7 | 5.5 | 6.57 | 0.039 |
| OLIGOCHETA | TUBIFICIDAE | Tubificidae Gen. sp. | 8 | 20 | V REF | 0 | 1 | 0 | 20 | 19.7 | 23.2 | 9.51 | 0.560 |
| DIPTERA | CHIRONOMIDAE | *Orthocladius* sp. | 7 | 17 | V REF | 0 | 5 | 0 | 17 | 17.4 | 14.9 | 7.57 | 0.225 |
| DIPTERA | CHIRONOMIDAE | *Rheocricotopus fuscipes* | 4 | 17 | V REF | 0 | 0 | 0 | 17 | 16.8 | 10.7 | 7.80 | 0.124 |
| HYDRACHNIDIA | HYDRYPHANTIDAE | *Protzia* sp. | 2 | 17 | V REF | 0 | 0 | 0 | 17 | 16.6 | 3.8 | 5.32 | 0.039 |
| DIPTERA | CHIRONOMIDAE | *Thienemannimyia carnea* | 2 | 15 | V REF | 0 | 0 | 0 | 15 | 15.1 | 4.1 | 5.17 | 0.041 |
| OLIGOCHETA | HAPLOTAXIDAE | *Haplotaxis gordioides* | 2 | 15 | V REF | 0 | 0 | 0 | 15 | 14.5 | 5.4 | 5.26 | 0.067 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum convictum* | 4 | 14 | V REF | 0 | 1 | 0 | 14 | 14.2 | 11.0 | 7.04 | 0.195 |
| DIPTERA | CHIRONOMIDAE | *Diamesa dampfi-Gr.* | 2 | 14 | V REF | 0 | 0 | 0 | 14 | 13.9 | 6.1 | 5.34 | 0.058 |
| COLEOPTERA | ELMIDAE | *Limnius volckmari* | 3 | 13 | V REF | 1 | 5 | 1 | 13 | 12.6 | 7.5 | 6.10 | 0.134 |
| TRICHOPTERA | LIMNEPHILIDAE | Chaetopterygini Gen. sp. | 2 | 12 | V REF | 0 | 0 | 0 | 12 | 11.6 | 4.9 | 5.57 | 0.080 |
| TRICHOPTERA | LIMNEPHILIDAE | *Chaetopteryx fusca/villosa* | 3 | 8 | V REF | 3 | 1 | 7 | 8 | 7.5 | 11.6 | 6.82 | 0.776 |
| COLEOPTERA | DYTISCIDAE | *Platambus maculatus* | 3 | 7 | V REF | 0 | 6 | 0 | 7 | 7.1 | 7.8 | 6.15 | 0.371 |
| DIPTERA | CHIRONOMIDAE | *Diamesa insignipes* | 3 | 7 | V REF | 0 | 0 | 0 | 7 | 6.6 | 10.3 | 6.68 | 0.724 |
| HYDRACHNIDIA | SPERCHONTIDAE | *Sperchon setiger* | 2 | 5 | V REF | 0 | 0 | 0 | 5 | 4.6 | 8.0 | 6.39 | 0.687 |
| DIPTERA | CHIRONOMIDAE | *Polypedilum pedestre* | 1 | 4 | V REF | 0 | 0 | 0 | 4 | 3.7 | 4.8 | 5.26 | 0.391 |