Jber. Biol. Stn Lunz 15: 23 - 31 (1995)

PRELIMINARY RESULTS ON DIET OF STREAM INVERTEBRATE SPECIES: THE MEIOFAUNAL ASSEMBLAGES

J.M. Schmid-Araya & P.E. Schmid

ABSTRACT

Gut contents of 32 invertebrate predator species inhabiting the bed sediments of a gravel stream were investigated. In addition, video techniques were used to assess the feeding habits of meiofaunal species.
Rotifera and larval instars of Chironomidae were among the most common food resources of small-sized plecopterans and tanypods. Rotifers were also a common food item of other meiofaunal taxa such as predatory microturbellarians, nematodes, oligochaetes, and rotifers. The feeding mechanisms such as filter-feeding, suspension feeding and/or browsing of many meiofaunal taxa, suggest a strong impact on the biofilm coating different particle size-classes. Some species seem to select particular food items within the biofilm layer, while others ingest whole particles depending on oral aperture.

INTRODUCTION

Meiofauna was originally defined in marine biology as taxa ranging between 100 µm and 1000 µm (Mare 1942), whereas Fenchel (1978) stated that meiofaunal taxa are organisms passing through a 500 µm mesh net. Lately Meyer (1994), defined it as taxa ranging between 50 µm-500 µm in running waters.
In stream ecosystems, meiofauna defined by size-ranges may have created some degree of term confusion. Many authors have included taxa such as the chironomids in the meiofauna assemblage, while Chironomidae specialists regard this group as part of the macroinvertebrates, particularly in lentic environments. Mac Intyre (1969), used the term "permanent meiofaunal members" for small-sized groups, which spend the whole life cycle in marine systems. Equivalent groups in running waters could comprise: large Ciliates (>50µm), Microturbellaria (namely Rhabdocoela), Gastrotricha, Rotifera, Oligochaeta (some families), Microcrustacea (Copepoda, Cladocera) and Tardigrada. In addition, the meiofauna includes some "temporary members" as early instar larvae and juvenile stages of taxa that belong in later stages to the macrofauna (many Oligochaeta families, Chironomidae, Ostracoda and Hydrachnellae).
The increasing awareness for meiofaunal taxa inhabiting the epibenthic and hyporheic zone of streams is confirmed by the raising number of published research in recent years (Palmer 1990, 1991, Rundle & Hildrew 1990, Schmid-Araya 1993a, 1994a and in press). In marine habitats, it has been already shown that the meiofauna plays a significant role as an important trophic link between bacteria and larger fauna, and enhances the rate of (a) carbon mineralization by stimulating microbial activity through predation, and/or (b) consumption of detritus by larger deposit-feeding invertebrates (Tenore et al. 1977, Findlay & Tenore 1982, de Morais & Bodiu 1984).
In streams, some debate has developed among authors, who support the idea that meiofauna may or may not influence bacterial production. At least for one taxon, Perlmutter & Meyer (1991) demonstrated that harpacticoid copepods are able to consume bacterial C in 1-4 orders of magnitudes higher than some macroinvertebrate taxa.
On the other hand, meiofaunal taxa, namely microcrustaceans, have been observed as prey for macroinvertebrates by Hildrew, Townsend & Hasham (1985) and Lancaster & Roberston (1995). To our knowledge only Schmid (1994) has reported meiofaunal taxa other than microcrustaceans as main prey of larval tanypod Chironomidae. Soft-bodied meiofaunal taxa (i.e. rotifers, gastrotrichs, microturbellarians, nematodes) have received little attention in the subject of food-web and predator-prey interactions.
What species feed upon is an important subject particularly to the understanding of aspects of benthic food-webs. Food-web theory has been developed largely since some decades, but there is still a lack of information of food web descriptions for streams, and to date only that of Hildrew, Townsend & Hasham (1985) and Lancaster & Roberston (1995) have been reported.
The objective of this paper is to contribute further about the food resources used by invertebrate predators inhabiting the bed sediments of a gravel stream, which size ranges are between 80 µm to 31 mm in length. In addition, the feeding habits of important meiofaunal taxa are also examined.

MATERIAL AND METHODS

Material was collected from the 100 m experimental reach of the stream Oberer Seebach in Lower Austria during autumn 1992, 1993, and 1994. The invertebrate assemblage of the stream is with 569 recorded species quiet complex.
The invertebrates examined here were collected by the following sampling methods: modified Hess sampler (surface area 2.83 dm^2, mesh net 50 µm), freeze-core with electropositioning (Bretschko & Klemens 1986, Schmid 1993b), stand-pipe traps (Bretschko & Klemens 1986) and drift samplers (Siegl 1993, Schmid-Araya, unpublished data). Freeze core samples were usually preserved in 2-4 % formalin, while all other samples were examined live.

Using video techniques we identified: (a) ciliates accordingly to Kahl (1935) and Curds (1982); (b) microturbellarians following Luther (1960), Bauchhenss (1971), and (c) rotifers accordingly to Bartos (1951), Koste (1978), Donner (1965). Nematodes were identified by mounting individuals on slides in glycerine (Andrassy 1993). Oligochaetes were mounted on slide in Berlese, and identified following Brinkhurst & Jamieson (1971), and Sperber (1950). Chironomids and plecopterans were examined by mounting the individuals on slides in Euparal after Schmid (1993a), and Rozkosny (1980) respectively.
Behavioural feeding habits for meiofaunal taxa were observed with an Olympus BH-2 microscope equipped with a 3-CCD-JVC videocamera connected to a recorder enabling frame to frame analyses.

RESULTS AND DISCUSSION

The invertebrate community of the Oberer Seebach includes micro-meio and macrofaunal components with a wide range of sizes (Fig. 1).
Meio- and macrofaunal predators examined fed on a wide variety of freshwater organisms, as well as fine and ultrafine particulate organic matter and diatoms (Tab. 1). FPOM is an important energy source due to the biofilm-associated layer, which increases with sediment depth in this gravel stream (Leichtfried, 1991). Meiofaunal predators such as ciliates, turbellarians, rotifers and oligochaetes revealed no ontogenetic shifts through their life-cycles. Their diet is composed of a mixture of other meiofaunal species, and some undeterminable material, probably ciliates, other protozoans and FPOM.
In contrast, insect predators shift their prey spectrum from small-sized to larger-sized items, but continued to include some smaller prey sizes. Small-sized stonefly nymphs of *Isoperla difformis* (Klapalek), *Dinocras cephalotes* (Curtis), *Chloroperla susemicheli* (Zwick) fed upon a number of meiofaunal taxa among which rotifers were the most abundant (Table 1). Feminella & Stewart (1986) listed some meiofaunal taxa within the diet of leaf-associated stoneflies, but did not resolve to species level. In addition, all tanypod predators (Chironomidae) and *Dinacrota sp.* (Limoniidae) fed actively on rotifers. Schmid (1994) demonstrated this feeding pattern for three tanypod species. The results found here emphasize that within the benthic food-web,

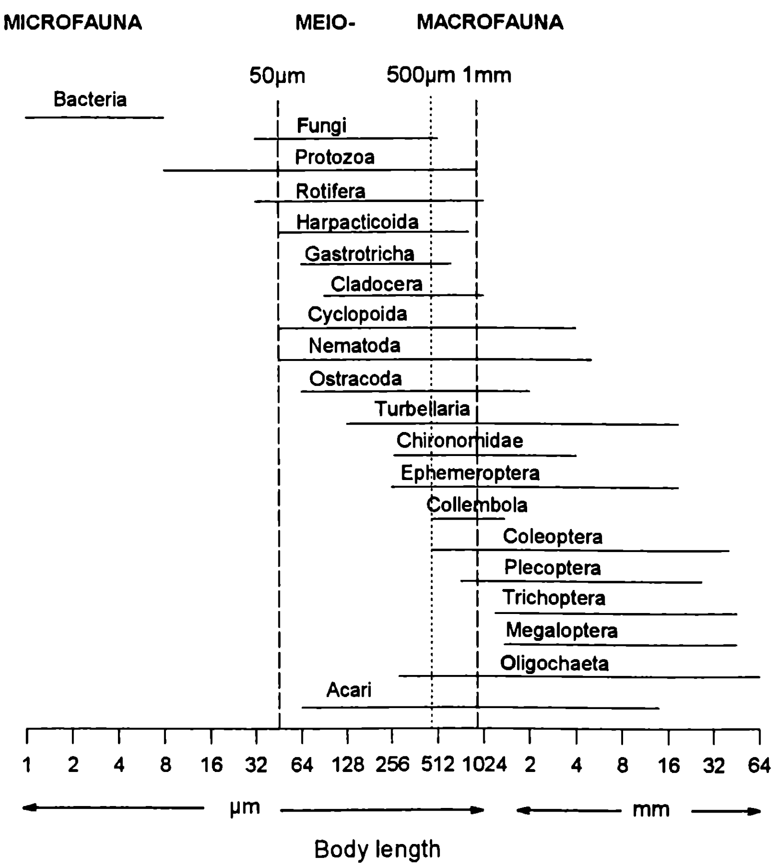

Fig. 1: Size classification by body length of microfauna and invertebrates inhabiting the gravel stream Oberer Seebach.

meiofaunal taxa obviously play an important role as food for larger invertebrates.

Moreover, the majority of permanent meiofaunal members such as gastrotrichs, microturbellarians, rotifers, nematodes, small-sized oligochaetes, cladocerans and harpacticoid copepods have feeding mechanisms such as filter-feeding, suspension feeding, or browsing (Tab. 2). Thus, these taxa fed on varying sizes of particles coated with biofilm (fungi, diatoms and bacteria and their extracellular secretions). Some studies have demonstrated a significant effect of harpacticoid copepods on detritus-associated bacteria (Perlmutter & Meyer 1991), while others suggest that meiofaunal taxa ingest only a small fraction of the bacterial production (Borchardt & Bott 1995). However, the latter approach made estimates based on counts of intact bacteria, which may lead to underestimate the significance of bacterial carbon utilization by invertebrates (Goedkoop & Johnson 1994). In marine habitats, harpacticoid copepods utilizing bacterial exopolymer secretions have been only shown by Decho & Moriarty (1990), while such attempts have not been made in freshwater systems. Our observations from video recordings evidence diverse pattern of feeding behaviour, which is species specific. Many rotifer species seemed to select particular items within the particle surfaces, other species such as harpacticoid copepods or other rotifers species select food items on basis of particle sizes.

The increased taxonomic resolution demonstrate that meio- and macroinvertebrate predators feed on a wider range of prey species than previously reported. Thus, the position of taxa such as rotifers within the benthic food-web of streams and rivers can not be neglected. The rotifer community comprised a higher species richness than other meiofaunal taxa in the same stream, thereby increasing the potential for predators to encounter potential prey items. At the same time, our observations also suggest that these invertebrate predators have no strong impact on the prey community mostly due to the heterogeneity and the spatio-temporal variability of the environment.

On the other hand, trophic interactions can be established based on diet analyses performed on field-collected material, and additional behavioural feeding observations must always be considered before performing feeding experiments. In streams, the effects of the meiofauna upon bacterial production and/or biofilm components requires further examination, particularly when many assumptions lead to the belief that only ciliates play a major role. Undoubtedly, the role of bioturbation in the bed sediments either by meio- or macrofaunal assemblages requires a careful approach when performing feeding studies (van de Bund, Goedkoop & Johnson (1994).

ACKNOWLEDGEMENTS

The study formed part of grants P8007-BIO, P8035-BIO, P9597-BIO and P9822-BIO supported by the Austrian Fonds zur Förderung der wissenschaftlichen Forschung.

REFERENCES

Andrassy, I. (1993) A taxonomic survey of the family Mononchidae (Nematoda). *Acta Zoologica Hungarica 39:* 13-60.

Bartos, E. (1951) The Czechoslovak Rotatoria of the Order Bdelloidea. *Vestník Cs. zoologické spolecnosti 15:* 241-500.

Bauchhenss, J. (1971) Die Kleinturbellarien Frankens. Ein Beitrag zur Systematik und Ökologie der Turbellaria excl. Tricladida in Süddeutschland. *Internationale Revue der gesamten Hydrobiologie 56:* 609-666.

Borchardt, M.A. & T.L. Bott (1995) Meiofaunal grazing of bacteria and algae in a Piedmont stream. *Journal of the North American Benthological Society 14:* 278-298.

Bretschko, G. & W. Klemens (1986) Quantitative methods and aspects in the study of the interstitial fauna of running waters. *Stygologia 2:* 279-316.

Brinkhurst, R.O. & B.G.M. Jamieson (1971) *Aquatic Oligochaeta of the World.* Oliver & Boyd, Edinburgh.

Curds, C.R. (1982) British and other Freshwater Ciliated Protozoa. *Synopsis of the British Fauna no.22* (Eds. Kermack, D.M. & R.S.K. Barnes), Cambridge University Press, Cambridge.

Donner, J. (1965) *Ordnung Bdelloidea.* Akademie Verlag, 297pp.

Fenchel, T.M. (1978) The ecology of micro- and meiozoobenthos. *Annual Reviews in Ecology and Systematics 9:* 99-121.

Findlay, S. & K.R. Tenore (1982) Effect of a free-living marine nematode (*Diplolaimella chitwoodi*) on detrital carbon mineralization. *Marine Ecology Progress Series* 8: 161-166.

Goedkoop, W. & R.K. Johnson (1994) Exploitation of sediment bacterial carbon by juveniles of the amphipod Monoporeia affinis. *Freshwater Biology 32:* 553-563.

Hildrew, A.G., C.R. Townsend & A. Hasham (1985) The predatory Chironomidae of an iron-rich stream: feeding ecology and food web structure. *Ecological Entomology 10:* 403-413.

Kahl, A. (1935) Urtiere oder Protozoa. I. Wimpertiere oder Ciliata (Infusoria). *Die Tierwelt Deutschlands und der angrenzenden Meeresteile* (Ed. F. Dahl). Verlag Gustav Fischer, Jena.

Koste, W. (1978) Rotatoria. *Die Rädertiere Mitteleuropas* begründet von Max Voigt. 2vols. Borntraeger, Stuttgart.

Lancaster, J. & A.L. Roberston (1995) Micro-crustacean prey and macroinvertebrate predators in a stream food web. *Freshwater Biology 34:* 123-134.

Leichtfried, M. (1991) POM in a gravel stream (Ritrodat-Lunz Study Area, Austria, Europe). *Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte Limnologie 24:* 1921-1925.

Luther, A. (1960) Die Turbellarien Ostfenno-skandiens. I. Acoela, Catenulida, Macrostomida, Lecithoepitheliata, Prolecithophora, und Proseriata. *Fauna Fennica 7:* 3-155.

Mare, M.F. (1942) A study of a marine benthic community with special references to the micro-organisms. *Journal of the Marine Biological Association, U.K. 25:* 517-554.

McIntyre, A.D. (1969) Ecology of marine meiobenthos. *Biological Reviews 44:* 245-290.

Meyer J.L. (1994) The microbial loop in flowing waters. *Microbial Ecology 28:* 195-199.

Morais, L.T. de & J.Y. Bodiu (1984) Predation on meiofauna by juvenile fish in a Western Mediterranean flatfish nursery. *Marine Biology 82:* 209-215.

Palmer, M.A. (1990) Understanding the movement dynamics of a stream-dwelling meiofauna community using marine analogs. *Stygologia 5:* 67-74.

Palmer, M.A. (1991) Temporal and spatial dynamics of meiofauna within the hyporheic zone of Goose Creek, Virginia. *Journal of the North American Benthological Society 9:* 17-25.

Perlmutter, D.G. & J.L. Meyer (1991) The impact of a stream-dwelling harpacticoid copepod upon detritally-associated bacteria. *Ecology 72:* 2170-2180.

Roskosny, R. (1980) *Klíc vodních larev hmyzu.* Ceskoslovenska Akademie Ved, Praha.

Rundle, S.D. & A.G. Hildrew (1990) The distribution of micro-arthropods in some southern English streams: the influence of physicochemistry. *Freshwater Biology 23:* 411-431.

Schmid, P.E. (1993a) A key to the larval Chironomidae and their instars from Austrian Danube Region stream and rivers- with particular reference to a numerical taxonomic approach. Part I: Diamesinae, Prodiamesinae and Orthocladiinae. *Wasser und Abwasser Supplement 3:* 1-514.

Schmid, P.E. (1993b) Random patch dynamics of larval Chironomidae (Diptera) in the bed sediments of a gravel stream. *Freshwater Biology 30:* 239-255.

Schmid, P.E. (1994) Is prey selectivity by predatory Chironomidae a random process? *Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte Limnologie 25:* 1656-1660.

Schmid-Araya, J.M. (1993) Benthic Rotifera inhabiting the bed sediments of a mountain gravel stream. *Jahresbericht der Biologischen Station Lunz 14:* 75-101.

Schmid-Araya, J.M. (1994) Spatial and temporal distribution of micro-meiofaunal groups in an alpine gravel stream. *Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte Limnologie 25:* 1649-1655.

Siegl, W.A. K. (1993) Drift und Driftkompensation. *Ms.Sc. thesis* Vienna University. 77pp.

Sperber, C. (1950) A guide for the determination of European Naididae. *Zoologiska Bidrag Uppsala 29:* 45-81.

Tenore, K.R., J.H. Tietjen & J.J.Lee (1977) Effect of meiofauna on incorporation of aged eelgrass, Zostera marina, detritus by the polychaete Nephthys incisa. *Journal of the Fisheries Research Board of Canada 34:* 563-567.

Van de Bund, W.J., W. Goedkoop & R.K. Johnson (1994) Effects of deposit-feeder activity on bacterial production and abundance in profundal lake sediment. *Journal of the North American Benthological Society 13:* 532-539.

Tab. 1: Prey organisms eaten by diverse invertebrate predator species inhabiting the gravel stream Oberer Seebach. Ranges of predator size-classes for plecopterans are given in mm.

SPECIES	FOOD ITEMS
CILIATA	
Dileptus sp.	ROTIFERA: *Colurella sp., Proales similis, P. theodora*
Trachelius sp.	ROTIFERA: *Notholca sp., Proales similis*
CNIDARIA	
Hydra viridis	CHIRONOMIDAE: *Parorthocladius nudipennis*
Hydra sp.	CHIRONOMIDAE: *Brillia modesta, Micropsectra sp.* OSTRACODA
TURBELLARIA	
Geocentrophora sp.	ROTIFERA: *Proales theodora, Cephalodella forceps, Philodina nemoralis, Philodinavus paradoxus*
ROTIFERA	
Cephalodella gibba (EHRB.)	Biofilm ROTIFERA: *Colurella sp., Philodinavus paradoxus*
Dicranophorus forcipatus (O.F.M.)	ROTIFERA: *Proales theodora*
Encentrum incisum WULF.	BACILLLARIOPHICEAE ROTIFERA: *Colurella sp., Proales theodora, Cephalodella forceps, Philodina nemoralis*
NEMATODA	
Prionchulus punctatus COBB	ROTIFERA: *Proales theodora, Philodinavus paradoxus*
Anatonchus tridentatus DE MAN	ROTIFERA: *Proales similis, P. theodora, Cephalodella gibba, Philodina flaviceps* Oligochaeta: *Nais sp.*
OLIGOCHAETA	
Chaetogaster cristallinus VEJDOVSKY	ROTIFERA: *Colurella sp., Proales theodora Cephalodella gibba, Trichocerca porcellus, Dicranophorus sp., Aspelta sp., Paraencentrum longipes*
Chaetogaster langui BRETSCHER	BACILLLARIOPHICEAE: *Navicula sp.,* ROTIFERA: *Proales theodora*
PLECOPTERA	
Isoperla difformis (KLAPALEK)	
1-2mm	FPOM & sand grains BACILLLARIOPHICEAE: *Diatoma sp., Cocconeis sp.* PROTOZOA: *Difflugia sp.* OLIGOCHAETA: *Nais sp.* ROTIFERA: *Colurella sp., Lepadella sp., Proales similis, Proales theodora, Proales sp., Cephalodella gibba, C. cf. gobio, C. cf. incila, Trichocerca taurocephala., Encentrum sp., Paraencentrum longipes, Philodina sp., Philodina nemoralis, Embata laticeps,* TARDIGRADA CHIRONOMIDAE: *Corynoneura sp., Orthocladius sp. 1, Orthocladius sp. 1+2, Rheocricotopus effusus, Synorthocladius semivirens, Symposiocladius lignicola, Tvetenia calvescens, Micropsectra sp.*
≥3-13mm	FPOM & grains Leaf fragments Filamentous algae BACILLAROPHICEAE: *Navicula sp., Diatoma sp.* PROTOZOA: *Difflugia sp.* ROTIFERA: *Proales sp.* OLIGOCHAETA: *Nais sp., Naididae gen.sp.* TARDIGRADA EPHEMEROPTERA: *Baetis sp.* PLECOPTERA: *Nemoura sp., Isoperla difformis* TRICHOPTERA CHIRONOMIDAE: *Nilotanypus dubius, Diamesa hamaticornis* pupae, *Corynoneura sp., Eukiefferiella clypeata, Orthocladius frigidus, Orthocladius sp.1, Orthocladius sp.2, Parametriocnemus oreoalpinus, Parorthocladius nudipennis, Synorthocladius semivirens, Rheocricotopus effusus, Tvetenia calvescens, Micropsectra sp., Rheotanytarsus nigricauda*

Isoperla grammatica (Poda)	
2mm	FPOM & sand grains Bacillariophyceae Ephemeroptera: *Baetis sp.* Chironomidae: *Eukiefferiella brevicalcar, Orthocladius sp.2, Thienemaniella partita*
≥3-6mm	FPOM & sand grains Leaf fragments Ephemeroptera: *Baetis sp.* Plecoptera: *Nemoura sp.* Chironomidae: *Orthocladius sp. 7, Tvetenia calvescens*
Perlodes intricata (Pictet)	
5-6mm	FPOM & sand grains Chironomidae: *Corynoneura sp., Micropsectra sp., Neozavrelia bernensis*
≥7-14mm	FPOM & sand grains Leaf fragments Bacillariophyceae: *Diatoma sp.* Ephemeroptera: *Baetis sp.* Plecoptera Chironomidae: *Diamesa hamaticornis, Eukiefferiella similis, Orthocladius frigidus, Orthocladius sp. 2, Parorthocladius nudipennis, Tvetenia calvescens*
Perlodes microcephala (Pictet)	
5mm	FPOM & sand grains Bacillariophyceae
Dinocras cephalotes Curtis	
1-2mm	FPOM & sand grains Rotifera: *Proales sp., Encentrum sp., Paraencentrum longipes, Philodina sp., Embata laticeps* Chironomidae: *Corynoneura sp.*
≥3-31mm	FPOM Hydrachnellae: *Atractides* nymphs Ephemeroptera: *Baetis sp., Baetis rhodani, Ecdyonurus sp,* Heptageniidae gen. sp. Plecoptera: *Nemoura sp., Isoperla sp.* Trichoptera: Limnephilidae, Sericostomatidae Coleoptera Chironomidae: *Diamesa hamaticornis, Chaetocladius sp., Corynoneura sp., Cricotopus curtus, Heterotrissocladius marcidus, Orthocladius excavatus, O. frigidus, Orthocladius sp., Orthocladius frigidus (*pupae), *Paratrichocladius skirwithensis, Synorthocladius semivirens, Thienemanniella partita, Tvetenia calvescens, Micropsectra sp., Rheotanytarsus sp.* Amphipoda: *Gammarus fossarum*
Dinocras sp.	
≥12-31mm	FPOM & sand grains Plecoptera: *Perlodes intricata* Ephemeroptera: *Baetis sp.* Trichoptera: Sericostomatidae Chironomidae: *Corynoneura sp., Thienemanniella partita, Tvetenia calvescens* Simuliidae Amphipoda: *Gammarus fossarum*
Perla marginata (Panzer)	
≥4-20mm	FPOM & grains Bacillariophyceae Hydrachnellae: *Atractides walteri* Ephemeroptera: *Baetis sp.,* Heptageniidae Plecoptera: *Nemoura sp.* Chironomidae: *Corynoneura sp., Orthocladius sp.*
Perla maxima Scopoli	
18mm	FPOM & sand grains Ephemeroptera: Chironomidae: *Diamesa hamaticornis*
Chloroperla susemicheli (Zwick)	
3mm	FPOM & grains Protozoa: *Difflugia sp.* Rotifera: Bdelloidea *gen.sp.,* Chironomidae: *Corynoneura sp.* Harpacticoida

Chloroperla susemicheli (ZWICK)	
≥4-6mm	FPOM & grains
	Filamentous algae
	Leaf fragments
	OLIGOCHAETA: *Chaetogaster sp., Nais sp.*
	TARDIGRADA
	HYDRACHNELLAE
	ROTIFERA: *Cephalodella gibba, C. rigida, Proales theodora, Proales sp., Trichocerca taurocephala, Paraencentrum longipes, Philodina sp.*
	EPHEMEROPTERA: *Baetis sp.*
	PLECOPTERA: *Nemoura sp.*
	CHIRONOMIDAE: *Nilotanypus dubius, Diamesa hamaticornis, Corynoneura sp., Orthocladius rivulorum, Orthocladius sp., Parorthocladius nudipennis, Thienemanniella partita*
	CLADOCERA: *Chydorus sp.*
	HARPACTICOIDA
	OSTRACODA
MEGALOPTERA	
Sialis fuliginosa PICTET	FPOM & sand grains
	CHIRONOMIDAE: 7 SPECIES
	COPEPODA nauplii
	OSTRACODA
DIPTERA CHIRONOMIDAE	
Conchapelopia pallidula (MEIGEN)	in Schmid & Schmid-Araya (in prep.)
Macropelopia notata (MEIGEN)	FPOM & sand grains
	BACILLARIOPHYCEAE
	ROTIFERA: 14 species
	EPHEMEROPTERA: 2 species
	PLECOPTERA: 2 species
	CHIRONOMIDAE: 29 species
	OSTRACODA
Nilotanypus dubius (MEIGEN)	in Schmid & Schmid-Araya (in prep.)
Paramerina divisa (WALKER)	FPOM & sand grains
	BACILLARIOPHYCEAE
	ROTIFERA: *Cephalodella gibba, Philodina nemoralis*
	CHIRONOMIDAE: 1species
Thienemannimyia geijskesi (GOET.)	in Schmid & Schmid-Araya (in prep.)
T. laeta (MEIGEN)	FPOM & sand grains
	BACILLARIOPHYCEAE
	ROTIFERA: *Colurella colurus, Lepadella ovalis, Proales fallaciosa, P. globulifera, Cephalodella rigida, Trichocerca porcellus, Encentrum mucronatum, Paraencentrum longipes, Philodina nemoralis, Embata laticeps*
	TARDIGRADA
	CHIRONOMIDAE: 3 species
Trissopelopia longimana (STAEGER)	FPOM & sand grains
	BACILLARIOPHYCEAE
	ROTIFERA: *Notholca foliacea, Lepadella sp., Dicranophorus lütkeni-sigmoides, Encentrum mustela, Habrotrocha collaris*
	TARDIGRADA
	EPHEMEROPTERA: 2species
	CHIRONOMIDAE: 5 species
	OSTRACODA
Zavrelimyia signatipennis (KIEFFER)	FPOM & sand grains
	BACILLARIOPHYCEAE
	PROTOZOA
	OLIGOCHAETA
	TARDIGRADA
	ROTIFERA: *Notholca foliacea, Proales fallaciosa, Cephalodella gibba, C. tenuior, Trichocerca porcellus, Embata laticeps*
	OSTRACODA
DIPTERA-LIMONIIDAE	
Dicranota sp.	ROTIFERA: *Proales similis*
COPEPODA-CYCLOPOIDA	
Megacyclops viridis (JURINE)	ROTIFERA: *Proales sp.*

Tab. 2: Classification based on feeding type mechanisms observed with video-techniques of diverse meiofaunal taxa inhabiting a gravel stream. Predators: organisms that capture whole or parts of live animal prey. Suspension feeders/ filter feeders: organisms that feed on suspended particles. Deposit feeders: organisms that burrow through the substratum, and ingest particulate material as they do so. Browsers (or scrappers): organisms that actively remove biofilm from mineral/plant/ substrates (i.e. particles). Grazers: organisms that feed on algae.

Feeding type	High taxomonical group	Group/Genus/species
Predators	PROTOZOA	*Lacrymaria sp.*
		Litonotus sp.
		Trachelius ovum
		Dileptus sp.
	CNIDARIA	*Hydra viridis*
		Hydra sp
	TURBELLARIA	*Geocentrophora sp.*
	ROTIFERA	*Cephalodella gibba* (EHRB.)
		C. gibba macrodactyla KOCH-ALTHAUS
		Dicranophorus forcipatus (O.F.M.)
		D. liepolti DONNER
		D. lütkeni-sigmoides (BERGENDAL)
		D. uncinatus MILNE
		Aspelta sp.
		E. incisum WULF.
		E. mustela (MILNE)
	NEMATODA	*Prionchulus punctatus* COBB
		Anatonchus tridentatus DE MAN
	OLIGOCHAETA	*Chaetogaster cristallinus* VEJDOVSKY
		C. langui BRETSCHER
	DIPTERA-CHIRONOMIDAE	*Conchapelopia pallidula* (MEIGEN)
		Macropelopia notata (MEIGEN)
		Nilotanypus dubius (MEIGEN)
		Paramerina divisa (WALKER)
		Thienemannimyia geijskesi (GOET.)
		T. laeta (MEIGEN)
		Trissopelopia longimana (STAEGER)
		Zavrelimyia signatipennis (KIEFFER)
	DIPTERA-LIMONIIDAE	*Dicranota sp.*
	COPEPODA-CYCLOPOIDA	*Megacyclops viridis* (JURINE)
Suspension feeders	CILIATES	Most species
Filter feeders	ROTIFERA	*Synchaeta tremula* (O.F.M.)
		Fam. Habrotrochidae (all species)
		Fam. Philodinidae (most species)
Deposit feeders	NEMATODA	most species
	OLIGOCHAETA	Fam. Aelosomatidae
		Fam. Naididae

Browsers Biofilm	ROTIFERA	*Notholca foliacea* (EHRB.)
		N. squamula (O.F.M)
		Lophocharis salpina (EHRB.)
		Colurella colurus (EHRB.)
		Colurella sp.
		Lepadella acuminata (EHRB.)
		L. ovalis (O.F.M.)
		L. triptera EHRB.
		Lecane (s.str.) *flexilis* (GOSSE)
		L. luna (O.F.M.)
		L. (*Monostyla*) *lunaris* (EHRB.)
		L. (Monostyla) sp.
		Proalinopsis caudatus (COLLINS)
		Proales fallaciosa WULF.
		P. similis DE BEAUCHAMP
		Lindia torulosa DUJARDIN
		Drilophaga bucephalus VEJDOVSKY
		Itura aurita f. *intermedia* (WULF.)
		Monommata sp.
		Resticula nyssa H.& M.
		R. vermisculus WULF.
		Resticula sp.
		Pleurotrocha petromycon EHRB.
		Notommata thopica H.& M.
		Cephalodella catellina (O.F.M.)
		C. forceps DONNER
		C. forficula (EHRB.)
		C. gibba (EHRB.)
		C. cf. gobio WULF.
		C. cf. gracilis DONNER
		C. cf. incila WULF.
		C. megalocephala (GLASCOTT)
		C. oxydactyla WULF.
		C. reimanni DONNER
		C. cf rigida DONNER
		C. tenuior (GOSSE)
		FAM. ADINETIDAE
		FAM. PHILODINAVIDAE
	GASTROTRICHA	all species
	CLADOCERA-CHYDORIDAE	all species
	COPEPODA-HARPACTICOIDA	all species
Grazers Algae	ROTIFERA	*Proales theodora* (GOSSE)
		Trichocerca (Diurella) porcellus (GOSSE)
		T. (Diurella) taurocephala (HAUER)
		T. (Diurella) tigris (O.F.M.)
		Ascomorpha eucadis (PERTY)