Mid-Missouri Trout Unlimited
http://www.midmotu.org/

Cross Currents

August 2007

An Assessment of the Insect Community above and below Gravel Mine Operations on Little Piney Creek, Phelps Co., Missouri

Excerpted from a report by
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The objective of this study was to determine if the gravel mine operation at T36N, R9W, S13 on Little Piney Creek has an effect on the richness and abundance of the benthic insect community.

Introduction

Little Piney Creek in Phelps County, Missouri is a spring-fed stream and is listed as an Outstanding State Resource Water for 30 miles from its mouth to S21, T35N, R8W. In 2001, a Wild Trout Management Area was formed on Little Piney Creek. (mdc.mo.gov/fish/watershed/gascon/contents) Although the trout are introduced, the creek harbors a diverse natural fauna, including the grotto salamander, which is on the state watch list, at Little Piney Spring, and a great blue heron rookery (www.nps.gov/rtca/nri/states/MO.html). Although Little Piney Creek is noted for limited development in its watershed and high quality stream, some gravel mining is found on the creek, which represents a threat to the distribution and abundance of introduced rainbow trout.

Upcoming meetings

August 7: Dr. Bob Sites, Professor of Entomology, University of Missouri. Results of the Little Piney insect sampling project.

Dr. Bob Sites

September: To be announced.

October: Dan Bollow, Fishing New Zealand.

Fieldwork

To determine if the gravel mining operation on Little Piney Creek has an effect on the insect community, three riffles above and three below the mine (Fig. 1) were sampled on 9 September 2006. Ten quantified samples of one square meter of substrate were taken in each riffle. Samples were taken by kicking

the gravel immediately upstream from a D-net for a distance necessary to equal one square meter of substrate. The contents of the net were emptied into a white pan, and all insects were picked by hand with the help of Trout Unlimited membership. Insects from each sample were placed into one or two labeled, plastic containers with 80% ethyl alcohol. One container was for most insects, while the other was intended for larger specimens, such as Megaloptera, that would potentially damage smaller fragile insects, such as mayflies.

Figure 1. Google Earth image of the sampling site

In the laboratory, all insect specimens were sorted and identified to the lowest taxon possible with the current state of taxonomic knowledge.

Results

Descriptive Data. A total of 5,621 specimens representing 8 orders, 25 families, 33 genera, and 36 species were collected. Of the entire list of taxa, all were present in both upstream and downstream sites with the following exceptions: *Rhithrogena pellucida* and *Tipula* were not present in the upstream riffles. *Polycentropus*, *Stenelmis*, *Dubiraphia*, and *Protoplasa fitchii* were not present in the downstream riffles.


Trout Unlimited bug pickers

Perspectives

Why should we expect differences below the gravel mine? Gravel operations can affect the water column in several ways. Probably the greatest impact is by increased siltation resulting from disturbance of settled gravel. In our project, subtle effects of siltation were found, including a higher density of insects with concealed gills below the mine. Insects with concealed gills, such as the mayfly genus *Caenis*, are thought to have evolved to take advantage of habitats in which siltation is prevalent. In this case, *Caenis* has the first pair of gills enlarged, acting as an operculum to cover the subsequent pairs. Other than this lone significant contrast, little biological impact of siltation was evident. Disturbance to gravel bars can also result in detritus and other food particles stirred up into water column. In areas in which this is a regular occurrence, typically there is a prevalence of insects that employ filter-feeding mechanisms downstream to take advantage of the suspended food resource. However, singling out filter-feeding insect taxa for a specialized ANOVA did not reveal a significantly higher density or increased richness of these taxa downstream. The mayfly *Isonychia bicolor* is the most prevalent of the filter feeding insects in Little Piney Creek. Although not statistically significant, much higher numbers of *Isonychia* were collected in downstream riffles, although their densities were highly variable among samples. Moreover, five of

the downstream samples contained more than 100 *Isonychia* individuals per square meter, and one had 312 specimens.

Current research being conducted by scientists at the University of Kentucky have revealed an interesting phenomenon that might explain our higher numbers of individuals of particular taxa downstream of the gravel mine. Their unpublished data suggest that during times of the year when water levels are high and precipitation washes nutrients into the stream from the watershed, the nutrients are absorbed into porous gravel bars. Very slow horizontal movement of water through the gravel bar results in an extended time-release of these nutrients downstream from the gravel, including during the summer when water levels are low. In the case of the gravel mine, disruption of the gravel bar by the mine might result in more massive release of nutrients than previously considered, thereby providing an elevated level of food resource for insects that are able to take advantage of it.

Finally, the objective of this project was to determine if there is an effect on the benthic insect community by the gravel mine that might have a secondary effect on the trout population. There is no basis from which to infer a negative effect of mining on the insect community. The diversity of the insect community is clearly different above and below the mine based on species-specific densities combined with taxonomic identities. How this affects the trout population would depend on trout preferences for particular insect species as food items. Statistical significance was difficult to obtain in our project because of high variability among riffles. Thus, future studies should include more riffles to increase statistical power, and repeat this sampling in multiple streams of similar hydraulic characteristics to obtain true replicates. In this way, inference could be made about the effect of gravel mines on aquatic insects in Ozark streams, rather than only the effect of this gravel mine on the aquatic insects in Little Piney Creek.

Taxa associated with three categories of insects important in consideration of impact of the gravel mine.

Filterers

Isonychia bicolor (Walker)
Cheumatopsyche sp A
Cheumatopsyche sp B
Cheumatopsyche sp C
Hydropsyche sp.
Ceratopsyche bronta/morosa

Exposed Gills

Acentrella turbida (McDunnough)
Baetis prob *tricaudatus* Dodds
Stenonema modestum (Banks)
Stenonema mediopunctata (McDunnough)
Stenacron interpunctatum (Walker)
Rhithrogena pellucida Daggy
Serratella deficiens (Morgan)
Pteronarcys pictetii Hagen
Cheumatopsyche sp A
Cheumatopsyche sp B
Cheumatopsyche sp C
Hydropsyche sp.
Ceratopsyche bronta/morosa
Helicopsyche borealis (Hagen)
Chimarra prob *obscura* (Walker)
Polycentropus sp.
Corydalus cornutus (Linnaeus)
Nigronia serricornis (Say)

Concealed Gills

Tricorythodes prob *cobbi* (A-T & Flannagan)
Caenis latipennis Banks
Leuctra tenuis (Pictet)
Optioservus sandersoni Collier
Stenelmis sp.
Dubiraphia prob *vittata* (Melsheimer)
Helichus suturalis LeConte
Psephenus herricki Dekay
Stylogomphus sigmastylus Cook & Laudermilk
Atherix lanta Webb
Protoplasa fitchii Osten-Sacken
Cricotopus nr *fasciatus*
Chrysops sp.
Simulium sp.
Tipula sp.

The complete report will be available on the Chapter Web site: **http://www.midmotu.org/**

Excerpting by Bill Lamberson

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***Cross Currents**, the Mid-Missouri Chapter of Trout Unlimited newsletter, has a circulation of approximately 300. Regular chapter meetings are held on the first Tuesday of each month, except for July. The meeting place is the Missouri Department of Conservation, Resource Science Center at Stadium Blvd. and College Ave. in Columbia, Missouri. Meeting time is 7:00 p.m.*

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