Diet Composition of two minnow species in Tenderfoot Creek

Practicum in Aquatic Ecology

Amy Altesleben

1634 West Turtle Creek Dr.

South Bend, In. 46637

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Diet Composition of two minnows

Abstract. This experiment evaluated cyprinid diets of two species: *Notropis cornutus and Notemigonus crysoleucas*. The study addressed four areas: diet composition between minnows, habitat variation, availability vs. selectivity and diel variation. Diel pattern could not be assessed for golden shiners. However, common shiner diet remained constant throughout the day. Benthic community structure among habitats was diverse and remained different throughout the summer averaging a SIMI index of .846 in riffles and .734 in pools. Diet among these two species correlated with benthic composition. Therefore, data show cyprinids eat what is available. The effect of fish predation on invertebrates in the benthos suggests that fish feeding does not have an impact on benthic composition but invertebrate composition remains relatively constant over time. Midge distribution was calculated for the three dominant midge genera using a Mann-Whitney U test. Data suggests that *Tribelos sp.* was generally found in riffles while *Cricotopus sp. and Polypedilum sp.* were distributed throughout both habitats.

INTRODUCTION

Fundamental to understanding stream ecology is the examination of food webs and the importance of trophic interactions. Trophic levels comprise food chains in ecosystems and are based on the idea of primary producers, primary consumers, secondary consumers, and tertiary consumers. The various interactions of this system determine the types of organisms found in streams. According to Angermeir and Karr (1986), a valid approach to studying the ecological state of aquatic habitats is to examine properties of the biotic communities that live there. Studying benthos in relation to diet composition of small piscivorous fish can reflect diet composition and changes in a stream. Thus, diets of aquatic organisms are of considerable importance in assessing energy flow in streams.

Of particular importance in energy flow in streams are Chironomidae. Allen (1951) evaluated ecotrophic coefficients based on the percent of benthic organisms in fish diets. He showed the significance of invertebrate abundance in the diet and showed midge (chironomidae) abundance to be of little importance in diet composition. However, Berg (1989) found over 80 percent of the fish diet in the benthos, consisted of chironomids. Thus, chironomidae are particularly worth evaluating when assessing diet composition because they may be of energetic importance in stream ecosystems.

Minnows (Cyprinidae), are the predominant component of the fish fauna in small streams throughout most of the eastern United States (Schlosser and Ebel 1989). Fish diets are strongly influenced by habitat selection and food availability (Fraser et al. 1989). Together, riffles and pools comprise habitats where fish forage on benthic invertebrates, a major component of their diet. A variety of studies (Cooper et al. 1990, Reice 1991, and Schlosser and Ebel 1989) have found predation on macroinvertebrates by minnows to be the controlling factor in community structure of aquatic habitats. Furthermore, those streams with higher fish densities should be expected to have stronger effects on benthic prey (Reice 1991). Thus, cyprinid studies are of importance because they can effect trophic levels which can alter stream dynamics.

In the past, importance of vertebrate predation of stream organisms has been questioned. In contrast to the denial by Allan et al.(1982), that vertebrate predation exerts strong effects on invertebrate densities, Cooper et al. (1990) and Schlosser and Ebel (1989) have provided data supporting the importance of vertebrate predation. These studies point out various factors that influence predator-prey interactions.

Therefore, a study was conducted to address four questions relating to minnow predation. Do minnow diets vary throughout the day? Does habitat (riffle vs. pool) have an effect on diet? Are there differences in the diets of two cyprinid species? Finally, what invertebrates are available in the benthos in comparison to what is actually found in cyprinid diets.

STUDY SITE

The study was conducted in Tenderfoot Creek, a lake outlet stream of Tenderfoot Lake in Gogebic County Michigan at the University of Notre Dame Environmental Research Center (UNDERC). The research was conducted in two areas of the stream, shallow riffles (commonly 8 m wide, 50 m long, 10-35 cm deep) and deep pools (commonly 12 m wide, 17-20 m long, .5 m deep). The stream was bordered with overhanging bushes and trees (commonly sugar maple, sweet gale, and speckled alder). Beaver dams occupied areas of the stream as well. The riffles were underlain by a coarse bedrock substrata whereas the pools had a fine, silty substrata. Two species of minnows dominate the stream fauna: the common shiner *(Notropis cornutus)* and the golden shiner *(Notemigonus crysoleucas)*. The former are primarily found in the riffles while the latter are more abundant in the pools. These two species were used in the study.

METHODS

Sampling periods were spaced out periodically over two months of the summer with two samples taken in June and two in July. On each sampling date, minnows were collected in the morning (5 am), at noon, and in the evening (7 pm). Fish were sampled from two riffles and two pools of comparable size. The second riffle and pool were used as replicates and the data was pooled for statistical purposes. Minnows were collected by electroshocking in riffles and seining in pools. After being collected, total body length (mm) was taken. Species identification, time of day, and location were also recorded. To analyze diets, gut contents were extracted using a lavage technique involving pressurized water (Light et al. 1983). After content removal, fish were returned to the stream unharmed. The contents were collected in enamel pans and then preserved in vials with 70 percent ethanol for later identification and analysis. In the lab, prey was then counted and identified under a dissecting microscope to lowest possible taxonomic level.

In conjunction with sampling fish, a survey of the benthos was taken in both riffles and pools in order to analyze what organisms were available to both shiners and what these cyprinids actually ingested. Benthic samples were taken for every sampling period. Based on substrata, two different sampling techniques were used. In riffles, ten samples were taken using the single rock sampling technique on a transect of the width of the riffle. For pools, five ekman grabs were taken over a transect of the width of the pool. Samples were preserved in 70 percent ethanol for later analysis as well. Invertebrates were separated from substrates by sugar flotation (Lind 1974) and hand sorting. Samples were then counted and identified under a dissecting microscope to lowest taxonomic level primarily family or genus for later comparisons with diets.

Because of their small size, chironomids require special handling. They were mounted on slides using euparol mounting medium and then identified to genus under a compound microscope. Chironomids were also included since they are of relative importance to minnows.

Dissolved oxygen, and temperature were recorded for each sampling period in both riffles and pools for every sampling time (morning, noon, and evening). Dissolved oxygen measurements were taken using a dissolved oxygen meter with an oxygen probe and temperature gage. Qualitative weather conditions were also recorded for each sampling period and time.

DATA ANALYSES

To test similarity relationships, a SIMI analysis was used to calculate similarity indexes to detect similarities between experiments (Charleboios, 1994). SIMI analysis compares two samples where P is the proportion of the entire sample on a date. H equals the first sample, K equals the second sample and N is the taxonomic level (family for our purposes).

$$\mathrm{SIMI} = \sum_{i=1}^{n} P_{ih} P_{ik} \Big/ \sqrt{\sum_{i=1}^{n} P_{ih}^2} \sqrt{\sum_{i=1}^{n} P_{ik}^2}$$

SIMI values are based on a 0-1 scale where 0 means no taxa are in common and 1 means samples are identical. This test measures taxonomic comparison and abundance. SIMI analyses were conducted for the following comparisons: diet composition between minnows, habitat variation, availability vs. selectivity and diel variation.

Since golden shiners primarily dominate pool habitats and common shiners riffle habitats, only those minnows found in the respective habitat were used to help simplify the analyses. The analysis for diel variation of diet could only be calculated for golden shiners on date 2 and 3. This is due to lack of data. Fish were not captured for all times during a sampling period. All times and dates, however, provided sufficient data for analyses with common shiners.

Midge (chironomidae) distribution was assessed using a Mann-Whitney U statistical test and the three dominant groups of midges were contrasted by habitat. This is a non-parametric analysis to test the hypothesis that two samples are identical. This test was selected because the data were clearly non-normal.

RESULTS

Time of feeding throughout the day on benthos did not have an effect on the diet. Diel patterns of the diet do not appear to change among common shiners. SIMI values show repeatable similarity. All possible comparisons were calculated throughout the day for each sampling period and are depicted in Table 1. For golden shiners not enough data was collected to make logicalcomparisons. The data that was collected, is presented in Table 2.

Table 3 represents the results of the SIMI analyses comparing all pool and riffle samples. The SIMI calculations represent the similarity index among riffles and pools for all dates possible (1-4). Values between riffles averaged .846 while those for pools .734.

However, when riffle to pool SIMI comparisons were calculated the index was low, averaging .095. This indicates large differences among invertebrates living in these two habitats. These values remained different throughout time as represented in the bottom left and top right corners in Table 1. Invertebrate communities occupying riffles over time remained similar throughout the summer. However, invertebrate community structure was different in riffle vs. pool and remained different throughout the summer.

Variation of invertebrates among habitats indirectly represents the differences in diets between golden and common shiners. Golden shiners primarily live in pools because this is an ideal habitat with deep, slow moving, cool water. Common shiners prefer shallow, fast moving, rocky-bottom habitats, known as riffles (Becker, 1983). This has proven to be true in this experiment as well. During sampling periods, the majority of fish captured in riffle habitats were common shiners and those captured in pools golden shiners.

Therefore, SIMI indexes were calculated only for those golden shiners found in pools and common shiners in riffles. Based on habitat preference, foraging patterns for these two minnows are different. Since these two minnow species were found primarily in these various habitats the diet composition reflected benthic composition. Table 3 shows the similarity index of invertebrates among these habitats. This table reflects strong differences in invertebrate communities between habitat

TABLE 1 --- SIMI VALUES FOR COMMON SHINER DIET IN RIFFLES THROUGHOUT THE DAY.

		DATE 1	
TIME	5AM	12PM	7PM
5AM	-		
12PM	.906	-	
7PM	.952	.890	-
		DATE 2	
TIME	5AM	12PM	7PM
5AM	-		
12PM	.796	-	
7PM	.044	.930	-
		DATE 3	
TIME	5AM	12PM	7PM
5AM	-		
12PM	.719	-	
7PM	.877	.673	-
		DATE 4	
TIME	5AM	12PM	7PM
5AM	-		
12PM	.605	-	
7PM	.861	.982	-

TABLE 2 --- SIMI VALUES FOR GOLDEN SHINER DIET IN POOLS THROUGHOUT THE DAY.

		DATE 2	
TIME	5AM	12PM	7PM
5AM	-		
12PM		-	
7PM		.247	-
		DATE 3	
TIME	5AM	12PM	7PM
5AM	-		
12PM		-	
7PM	.864		-

TABLE 3 --- RESULTS OF SIMI ANALYSES COMPARING INVERTEBERATES IN RIFFLE AND POOL HABITATS.

	R1*	R2	R3	R4	P1*	P2	P3	P4
R1	-							
R2	.960	-						
R3	.909	.953	-					
R4	.709	.752	.793	-				
P1	.162	.170	.150	.317	-			
P2	.001	.001	.001	.004	.373	-		
P3	.109	.108	.097	.000	.588	.937	-	
P4	.000	.000	.000	.021	.562	.957	.986	-

CODE

* R=RIFFLE AND P=POOL FOR EACH SAMPLING PERIOD (1-4).

(riffle/pool) but similar values within habitat (riffle/riffle &pool/pool) throughout the summer. Therefore, the SIMI values indirectly show differences between diets of golden shiners and common shiners.

Table 4 depicts the dissolved oxygen measurements, water temperature, and weather conditions for each sampling time and period. Weather conditions were sunny for all sampling periods except for period three where heavy rain persisted throughout most of the day. Weather conditions appeared to have an effect on diet composition and stream flow.

Table 5-7 list the abundance and distribution of macroinvertebrates in the benthos for each sampling period of the summer. Both riffles and pools display the same number of families found but the community structure for each varies.

As noted in table two, the number of hydropsychids found in the benthos was low in comparison with the other sampling dates. Yet in the diet, hydropsychid consumption is extremely high. The benthic composition to consumption ratio of hydropsychids is the highest for the summer in sample period three, the same period of poor weather conditions (heavy rain).

Although midge composition in diet could not be evaluated to genus in the diet, midges in benthic samples were identified to genus and a Mann-Whitney U test was used to compute the median number for the three dominate genera to contrast distribution between riffles and pools throughout the summer. Two of the dominant midges, *Cricotopus sp.* and *Polypedilum sp.,* appear to be more abundant in both (fig. 1,2) while *Tribelos sp.* appeared to be more abundant in riffles (fig. 3). However, none of the differences are statistically significant at =.005. The probability values for the three genera are 0.72, 0.70, and 0.056, respectively.

DISCUSSION

Diel patterns in diets could not be assessed for golden shiners due to lack of fish capture based on the sampling technique used in pools. Electroshocking was used in riffles but not in pools because of the water depth. Therefore, seining was used and was not as effective, as shown in Table 1. Thus, it made diet comparisons throughout the day difficult for golden shiners. Only two comparisons could be made and these are not sufficient for drawing conclusions. The data shows no differences for common shiners in the diet over a 24 hr. period. Rather, the diets show a consistently similar pattern throughout the day for each sampling period (table 2).

Since diet did not vary throughout the day with golden shiners or common shiners, it is interesting to see if diet changed throughout the summer. It is worth noting, while benthic

TABLE 4 --- DISSOLVED OXYGEN AND WEATHER CONDITIONS ON THE FOUR SAMPLING PERIODS.

	DATE*	LOCATION**	TEMP C	DO MG/L	WEATHER
TIME 1					
	1	R1	16.9	5.3	COLD/SUNNY
	1	P1	14.8	4.8	--
	1	R2	17.0	4.6	--
	1	P2	16.8	4.8	--
	2	R1	20.0	5.2	WARM/SUNNY
	2	P1	21.0	4.2	--
	2	R2	19.0	4.8	--
	2	P2	19.0	4.9	--
	3	R1	23.0	5.4	--
	3	P1	23.0	5.1	--
	3	R2	22.5	4.4	--
	3	P2	22.5	4.7	--
	4	R1	20.0	7.9	--
	4	P1	20.5	7.9	--
	4	R2	19.0	5.7	--
	4	P2	19.0	5.5	--

TABLE 4 (CONT.)

	DATE*	LOCATION**	TEMP C	DO MG/L	WEATHER
TIME 2					
	1	R1	18.0	9.2	SUNNY
	1	P1	18.0	9.2	--
	1	R2	20.5	10.0	HOT/SUNNY
	1	P2	21.5	10.4	--
	2	R1	23.5	7.9	--
	2	P1	24.0	7.8	--
	2	R2	25.5	11.5	--
	2	P2	25.5	10.5	--
	3	R1	24.0	9.1	RAIN
	3	P1	24.0	9.3	--
	3	R2	24.0	8.5	--
	3	P2	23.0	8.1	--
	4	R1	20.2	11.2	SUNNY
	4	P1	22.0	10.6	--
	4	R2	21.0	11.0	--
	4	P2	21.0	10.2	--

TABLE 4 (CONT.)

	DATE*	LOCATION**	TEMP C	DO MG/L	WEATHER
TIME 3	1	R1	18.0	9.2	SUNNY
	1	P1	18.5	9.4	--
	1	R2	18.0	9.2	--
	1	P2	19.0	9.4	--
	2	R1	25.0	9.4	--
	2	P1	21.0	8.7	--
	2	R2	27.0	11.2	--
	2	P2	27.0	10.4	--
	3	R1	22.0	7.5	RAIN
	3	P1	22.0	7.4	--
	3	R2	21.5	7.2	--
	3	P2	21.5	7.1	--
	4	R1	24.0	12.0	SUNNY
	4	P1	22.0	10.6	--
	4	R2	24.0	10.4	--
	4	P2	24.0	9.2	--

CODE

* =indicates the four sampling periods

** =indicates the site where measurements were taken either riffle 1 or 2 and pool 1 or 2

TABLE 5 --- ABUNDANCE OF INVERTEBRATES IN RIFFLE THROUGH TIME

	DATE 1	2	3	4
FAMILY				
BAETIDAE	3	2	11	35
CAENIS	0	0	0	2
CEATOPOGONIDAE	0	0	1	0
CORYDALIDAE	3	0	0	0
ELMIDAE	3	3	1	0
HEPTAGENIIDAE	42	25	9	25
HYDROPSYCHIDAE	90	147	80	125
LIMNEPHILIDAE	12	8	0	0
PERLIDAE	8	4	1	3
PHILOPOTAMIDAE	6	3	23	47
POTAMANTHIDAE	1	0	3	0
PSYCHOMYIIDAE	0	0	4	21
SIMULIIDAE	0	0	2	4
SIPHLONURIDAE	4	10	2	44

TABLE 6 --- ABUNDANCE OF INVERTEBRATES IN POOL THROUGH TIME

	DATE 1	2	3	4
FAMILY				
BAETIDAE	0	0	9	0
CAENIS	0	0	0	1
CEATOPOGONIDAE	0	0	2	0
CORYDALIDAE	1	0	1	1
ELMIDAE	2	11	0	0
EPHEMERIDAE	0	0	2	2
GOMPHIDAE	4	1	3	1
HYDROPSYCHIDAE	3	0	9	0
LIMNEPHILIDAE	3	0	0	0
PERLIDAE	0	0	1	0
POLYCENTROPODIDAE	0	0	1	2
POTAMANTHIDAE	0	3	3	0
PSYCHOMYIIDAE	0	0	11	0
SIPHLONURIDAE	0	0	4	1
SIALIDAE	0	0	0	1

TABLE 7 --- CHIRONOMIDAE ABUNDANCE IN BENTHOS THROUGHOUT TIME

	DATE 1	2	3	4
CHIRONOMIDAE				
RIFFLE	187	259	52	74
POOL	45	93	27	42

FIGURE 1

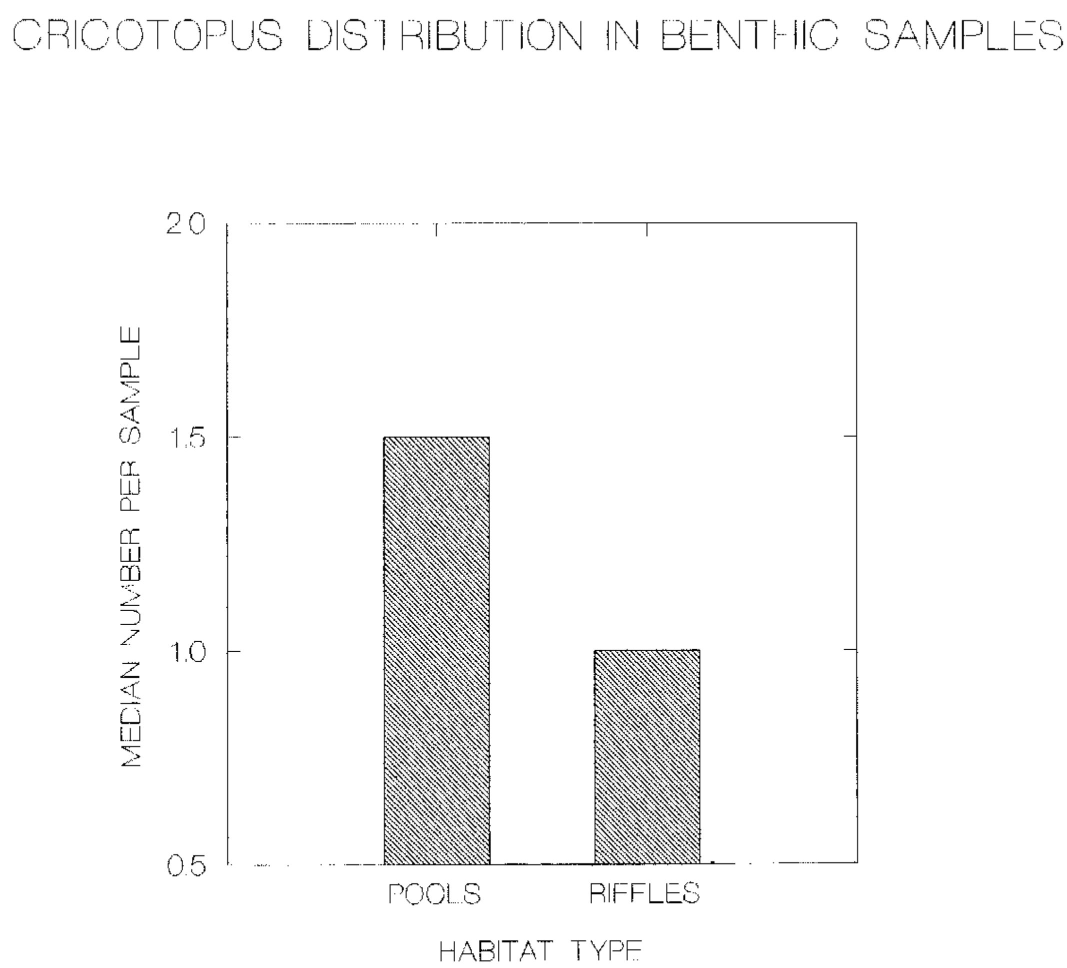

CRICOTOPUS DISTRIBUTION IN BENTHIC SAMPLES
2.0
1.5
1.0
0.5
MEDIAN NUMBER PER SAMPLE
POOLS
RIFFLES
HABITAT TYPE

FIGURE 2

POLYPEDILUM DISTRIBUTION IN BENTHIC SAMPLES

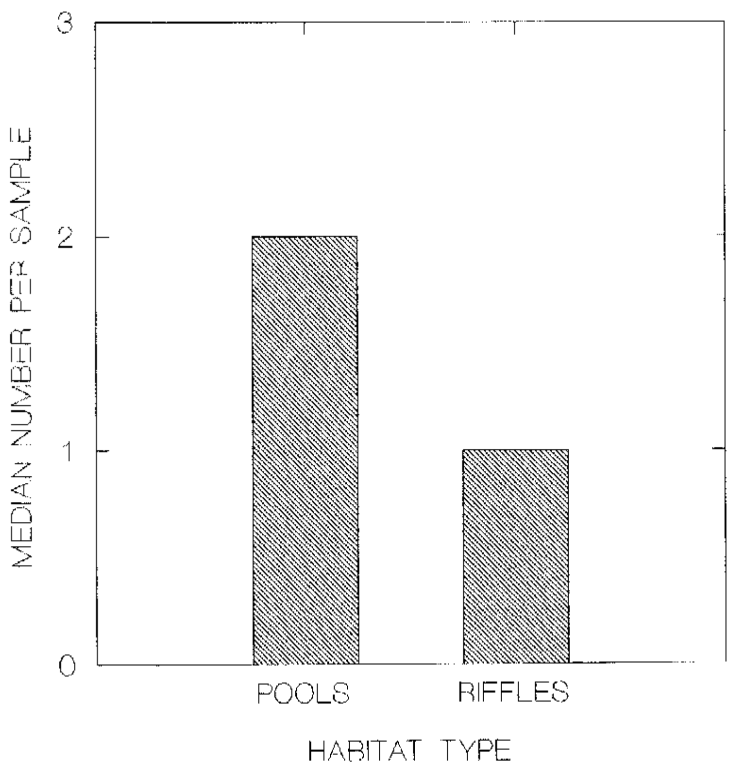
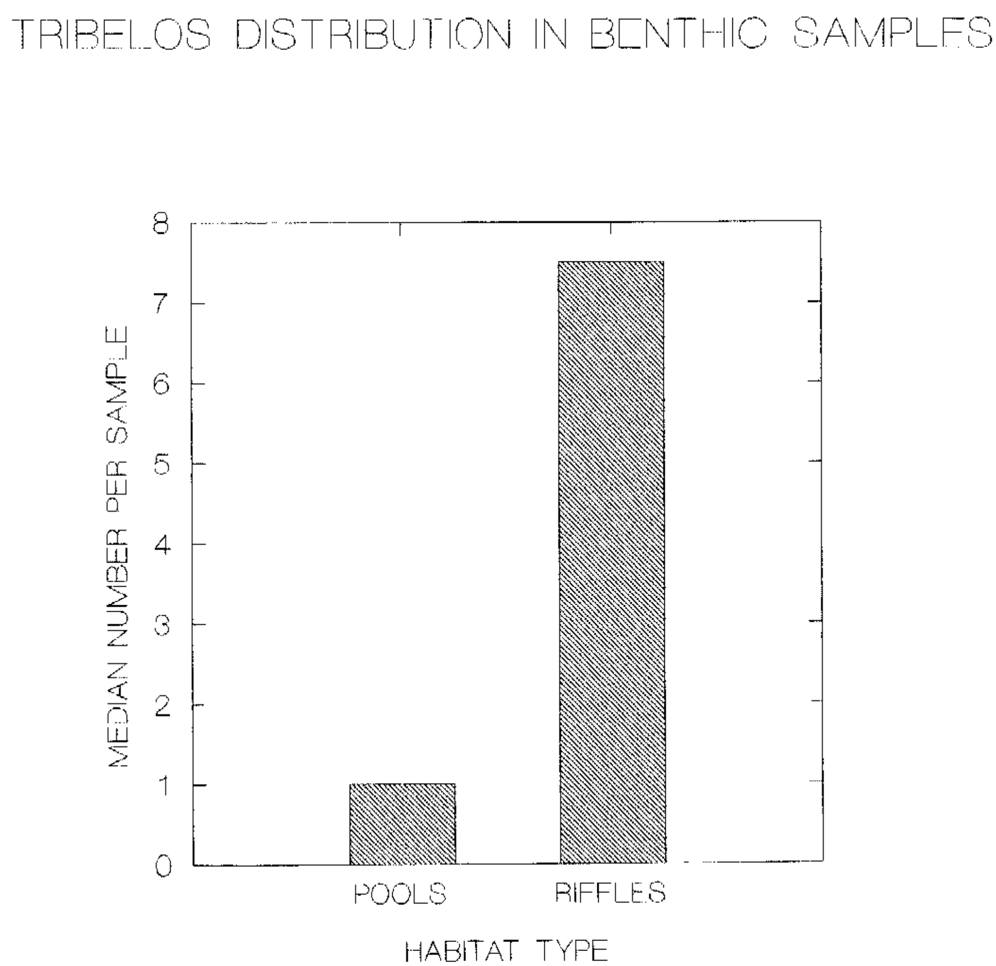


FIGURE 3


TRIBELOS DISTRIBUTION IN BENTHIC SAMPLES
MEDIAN NUMBER PER SAMPLE
0
1
2
3
4
5
6
7
8
POOLS
RIFFLES
HABITAT TYPE

community structure was diverse among riffle and pool, benthic fauna were often similar and remained similar throughout the summer as evident in table 3. Since cyprinid diet composition is based on available macroinvertebrates in benthos, the individual species in the diet also remained similar throughout the summer.

When comparing species' diet (common shiner to golden shiner) diets are different because the individual habitat is comprised of a different benthic community, so similarities can not be assessed. The experimental design of this study should have focused on two fish species that shared the same habitat in order to compare diets of two minnow species. Unfortunately, these two minnow species were the dominate species in the stream. Working with any other species would not have been feasible because of the low numbers of other taxa found.

I hypothesized that as various invertebrates emerged throughout the summer, the diet would change in correlation with the most abundant invertebrates in the benthos. But, data suggests that diets did not change over the summer. Since, cyprinids are consuming what is found in the benthos and benthic composition is not changing throughout the summer, the summer data would suggest that cyprinids are eating what is available. However, because there is no fluxuation in the benthic community throughout the summer no comparisons can be made to address cyprinid selectivity choosing the diet. Common shiner diet is of a wider variety even though benthic composition in both families consist of the same number of families.

Golden shiners appear to be somewhat variable in choosing the diet because four families were preyed upon consistently throughout the summer. Furthermore, these families were not necessarily found in the benthos (simuliidae). Golden shiners show repeatable choice in invertebrate taxa throughout the summer, even when a wide variety of invertebrates are available. Moreover, there is an smaller number of invertebrates in pool and diet of golden shiners. The sampling technique used to sample pools (ekman grabs), did present some problems. Rocks occasionally prevented the jaws on the apparatus from closing in which case some samples had to be retaken. This could have stirred the benthos and biased sampling. But, the experimental design was such that five replicate samples were taken per site to avoid this problem. But, it is noteworthy that benthic composition remained relatively constant throughout time. This could lead to further investigations on benthic community structure and predator-prey interactions within the invertebrate community.

Proportions of invertebrates in the diet remain relatively constant despite the various invertebrate emergence throughout the summer and is shown in table 8 & 9. Diet composition indicates that cyprinids feed on the most abundant invertebrates in the benthos regardless of different invertebrate patterns of emergence. The same families were evident in the diet and the benthos throughout time.

The three dominant genera found in the diet throughout the sampling dates are shown in Figure 1. Minnow diets did not vary throughout the summer and some comparisons can be made among the three dominate families found particularly hydropsychidae. On date three and an overwhelming number of hydropsychids appear in the diet of common shiners. This has a correlation with the weather conditions during the sampling period.

Throughout most of the summer weather conditions were sunny. However, on sampling period 3 the conditions were poor due to heavy rain. This had an effect on stream flow, particularly in riffles. Strong weather conditions caused insects in the sediments especially on rocks to become dislodged thus, releasing invertebrates into the water column to be transported down stream. This increases the risk of fish predation because these invertebrates are no longer clinging to the bottom of rocks. Since hydropsychids cling on the bedrock substrata in riffles, poor weather conditions, show a positive correlation with fish consumption. This is evident with common shiner diets because these fishes are found in riffle habitats where hydropsychids live.

This further supports the idea that cyprinids eat what is available. This is ecologically sound because fish would exert less energy foraging and reduce predation risk. They can use this energy in more beneficial areas (i.e. mating or seeking shelter). Data suggest cyprinids consume macroinvertebrates that are available in the benthos and show no support of selectivity.

Therefore, emergence did not have and effect on diet or benthic composition as I originally thought it would. The data supports Fraser's et al. (1989) study that habitat selection strongly influences availability. The habitat type (riffles/pool) dictates the type of macroinvertebrates that are present for consumption in the diet. The data clearly represents the diversity of fauna in riffle and pool and furthermore, the habitat preference of the common and golden shiner. The data also shows each habitat's similarity among fauna between sampling periods.

What cyprinids choose in there diet is directly related to what is found in the benthos. In this study I hypothesized that as vertebrate predation increased in a particular habitat, abundance of those invertebrates common in the benthos and diet would decrease. However, variation among invertebrates found in the benthic samples corresponded to what was found in the diet. Both macroinvertebrates in the benthos and invertebrates in diets remained relatively similar throughout the summer. This supports Reice's (1983) findings that vertebrate predators have little influence on the abundance of invertebrates in shallow

TABLE 8 --- ABUNDANCE OF INVERTEBRATES IN COMMON SHINER DIET THROUGHOUT TIME

	DATE			
	1	2	3	4
FAMILY				
BAETIDAE	0	13	0	0
CEATOPOGONIDAE	5	2	33	8
CHIRONOMIDAE	34	46	27	24
HEPTAGENIIDAE	2	4	0	0
HYDROPSYCHIDAE	6	48	22	39
LIMNEPHILIDAE	0	0	1	0
MESOVELIIDAE	0	3	1	0
PHILOPOTAMIDAE	1	4	0	0
POTAMANTHIDAE	0	1	0	0
SIMULIDAE	23	13	7	19
SIPHLONURIDAE	0	1	1	0

TABLE 9 --- ABUNDANCE OF INVERTEBRATES IN GOLDEN SHINER DIET THROUGHOUT TIME

	DATE			
	1	2	3	4
FAMILY				
CEATOPOGONIDAE	8	0	7	5
CHIRONOMIDAE	12	1	31	28
HYDROPSYCHIDAE	0	1	3	4
SIMULIDAE	18	0	7	0

rocky habits.

Data in this experiment supports little variation throughout samples in the diet. Schlosser and Ebel (1989) also found little effect of predation on invertebrates in shallow habitats. However, they found great influences of cyprinids on benthic invertebrates in pools. From the lack of data in this experiment few comments can be made about benthic invertebrates in pools in relation to diet. From those golden shiners collected in pools there appears to be little predator influence on abundance or variety of invertebrates in the benthos throughout time.

Midge distribution was taken into consideration because of the important role they play in diet composition. Looking at distribution of chironomids can predict what types of midges were most likely to be found in diets. This can be useful when the midge head capsule is partially decomposed and unidentifiable. Predictions can at least be made based on possible chironomids in the benthos available for consumption. Unfortunately, no comparisons could be made between midges in the benthos and those found in the diet.

However, the three most abundant midge genera throughout the summer are depicted in Figures 1-3. *Tribelos sp.* is particularly interesting to examine. The abundance of midges in riffles is extremely higher than those in pools. This figure particularly shows *Tribelos sp.* to be generally found in greater abundance in riffles as opposed to pools. This is evident on the bar graph, although, the difference is not statistically significant. However, the data does suggests that there is a difference. In opposition, *Polypedilum sp.* and *Cricotopus sp.* were found to be widely distributed in both habitats. Due to the greater abundance of *Tribelos sp.* found in riffles and the data presented, it would be logical to predict that *Tribelos sp.* would be found in common shiner diets. However, due to decomposition of head capsules of chironomids in the diet, no comparisons can be made.

Berg (1989) found chironomids to be an energetically important part of lotic ecosystems, effecting energy flow in streams. This study would support Berg's finding. Chironomids are a consistent component of cyprinid diet throughout the summer.

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