

12. Comparisons of Fish Communities in Ledbetter Creek and Ledbetter Embayment of Kentucky Lake, Kentucky, USA

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ABSTRACT

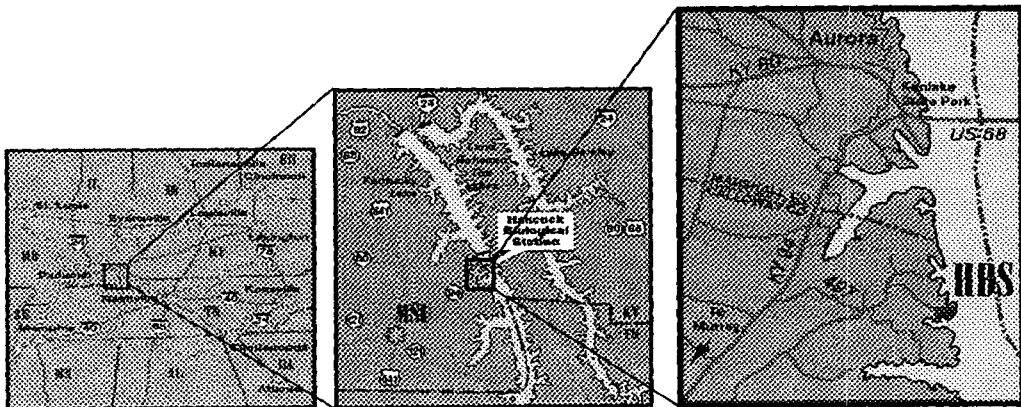
To determine if fish density, biomass, species richness, and species diversity were greater in ecotone than the stream and littoral zones, I sampled fish monthly in the Ledbetter Creek through Ledbetter Creek Embayment in Kentucky Lake, Kentucky, from April to October 1996 by using throw traps. During the first four months (daytime only) fish density did not vary significantly among zones or among months. However, there were significant differences among zones during the last three months and the stream zone had significantly higher mean fish density than both the littoral zone and the ecotone. Fish biomass also differed significantly among zones during the last three months. The stream zone had the highest mean fish biomass among zones, significantly higher than the ecotone, but not different than the littoral zone. There were no statistically significant differences among zones during the first four months, but mean fish biomass in the stream zone was about eight times higher than the ecotone. The stream zone had the highest fish species richness among zones. Differences were significant among zones during the last three months, and the stream zone (0.98 ± 0.04) had significantly greater mean fish species richness than the ecotone (0.45 ± 0.01), but not significantly than the littoral zone (0.56 ± 0.17). Fish species richness differed significantly among months during the first four months. Monthly species diversities ranged from 0.62 to 1.96 in the stream zone, 0 to 2.57 in the ecotone, and 0 to 2.60 in the littoral zone. Combined species diversities in the stream, the ecotone, and the littoral zones were 2.72, 3.58, and 3.10, respectively. There were five families of fishes captured frequently enough for their individual numbers to comprise at least 8 % of the total. Family rankings in the stream zone were opposite of the littoral zone. Percidae was the most abundant family and Clupeidae was absent in the stream zone, whereas Percidae was uncommon and Clupeidae was the most abundant family in the littoral zone. Atherinidae was dominant in the ecotone. Five of the most abundant species comprised 65 % of the total number. The guardian darter occurred only in the stream zone, and it was consistently found in riffles. Longear sunfish and central

stoneroller also had significant differences of mean fish densities among zones, and they were found mostly in the stream zone. Threadfin shad and bullhead minnow were almost exclusively caught in the littoral zone. I finally concluded that the ecotone between the stream and the littoral zone in this small-scale freshwater aquatic ecosystem was not as productive as the ones in other ecosystems.

INTRODUCTION

1. Role of fish habitat investigation
2. Classification of freshwater aquatic ecosystem
3. Ecotone as transitional zone
4. Restricted studies either in streams or in littoral zone
5. Numerical resolution to analyze fish communities
6. Selection of appropriate gear for quantitative sampling of fish

STUDY AREA



Zone	Mean channel width(m)	Zone description	Shading effect	Nutrients (TN, TP)
Stream	4	Well-developed pools and riffles	High	Low
Ecotone	7	Non-measurable water flow	Medium	Medium
Littoral	Wide-open area	Lentic water, bottom gently sloping region	Low	Nigh

MATERIALS AND METHODS

1. Fish collection

Sampling period and frequency: April to October, 1996, once per month

Sampler: circular 0.785 m² (1-m diameter X 1-m height) throw trap

Measurements: secchi depth, water temperature, dissolved oxygen, and current

Fish: less than 100 mm standard length, preserved in 40% isopropanol

2. Data analysis

Mean fish density, biomass, and species richness

⇒ Randomized block ANOVA, followed by Tukey's procedure

Species diversity

⇒ $D = (S - 1) / \ln N$, (Margalef 1958)

D: species diversity, S: number of species, and N: total number of individual

RESULTS

815 fish representing 27 species and 9 families

Zone	Stream	Ecotone	Littoral
Families	6	6	7
Species	17	18	19

Mean number/biomass of fish per trap

Zone	Stream	Ecotone	Littoral
Number	2.2	0.9	1.9
Biomass	6.3g	1.3g	2.1g

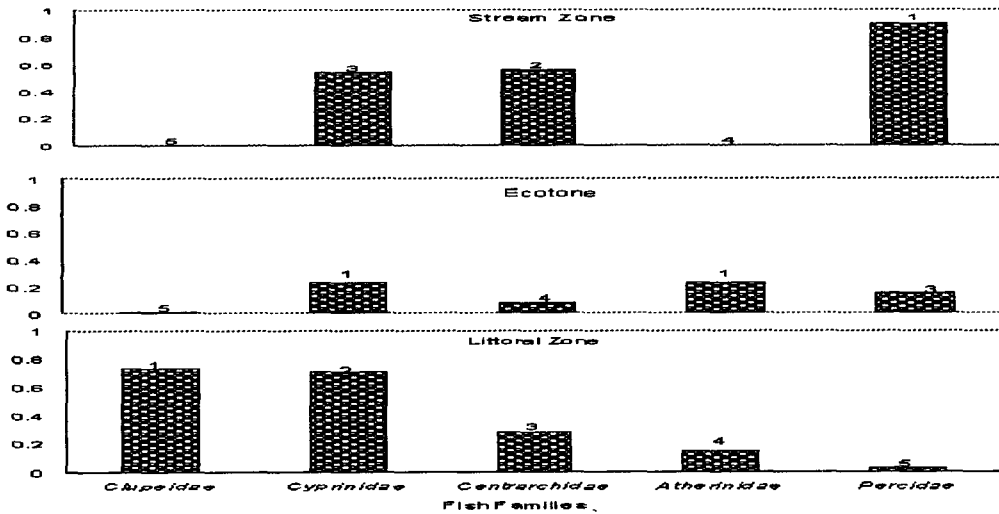
Five dominant families

	Clupeidae	Cyprinidae	Atherinidae	Centrarchidae	Percidae
Number	17.3%	29.1%	8.00%	20.5%	22.5%
Biomass	11.2%	22.7%	1.8%	51.8%	7.5%

Comparison of fish communities

	Stream	Ecotone	Littoral
Fish density	2.20 ± 0.14 ^a	0.58 ± 0.11 ^b	1.11 ± 0.29 ^b
Fish biomass	6.21 ± 0.29 ^a	1.14 ± 0.48 ^b	2.15 ± 0.37 ^a
Species richness	0.98 ± 0.04 ^a	0.45 ± 0.01 ^b	0.56 ± 0.17 ^a
Species diversity	2.72	3.58	3.10

Spatial distribution of abundant families of fish



Individual species and habitat guilds (five of the most abundant species)

CONCLUSION

Species	Median of mean fish density over months / trap			P value
	Stream	Ecotone	Littoral	
Guardian darter	0.72	0	0	< 0.001
Longear sunfish	0.285	0	0	< 0.001
Central stoneroller	0.13	0	0	< 0.001
Threadfin shad	0	0	0.25	= 0.001
Bullhead minnow	0	0	0.165	< 0.001

1. The species (sunfishes) in the stream were relatively larger in size and biomass than fishes in the littoral zone.
2. Family rankings in the stream appeared to be the opposite of the littoral zone.
3. Substantial temporal variation occurred in the five most abundant families of fish among zones.
4. The five most abundant species seemed to have habitat selection.
5. Many variables can be recognized and affect the fish community.
6. The ecotone in this small-scale freshwater aquatic ecosystem was not as productive as the one in other ecosystem.