

Bluegill Metazoan Parasite Community Structure in 2 Non-Point Source Polluted Streams in San Antonio, Texas

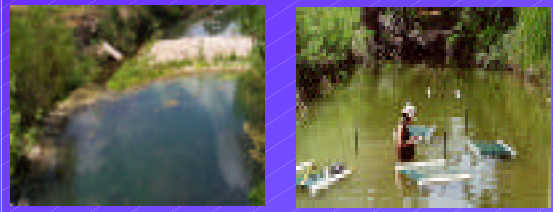
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Background

Non-point source (NPS) pollution from agricultural and urban runoff adversely affects aquatic ecosystems. These effects are evident in changes of species diversity and composition of biota in streams as the system adapts to disturbance (Koskivaara 1992). Because fish parasites are sensitive to changes in water quality, they have been used as cost-effective bio-indicators of watershed degradation (Bagge 1996, D'Amelio and Gerasi 1997, Gelner et al. 1997). Our study examined the fish metazoan parasite communities (Copepoda, Monogenea, Nematoda, Trematoda) of 2 NPS polluted streams in San Antonio, Texas, using the bluegill (*Lepomis macrochirus*), a sunfish, as a model host at middle and lower watershed sites.



Materials and Methods

Leon and Salado creeks are 2 fourth order, perennial streams in the upper San Antonio River Basin which flow through sections of the city of San Antonio. These streams are considered unsafe for human and wildlife use due to NPS pollution (SARA 1996). Bluegill were obtained from a local aquaculturist and placed in submerged, stationary wire-mesh cages at middle and lower watershed sites in each stream for approximately 20 days in August 1999 and again in August 2000. This treatment exposed fish to stream conditions and allowed parasite communities to become established. Water samples were collected on 2 separate days at each site during each year. Nitrate levels were determined from these samples at the Texas A&M Environmental Water Quality Research Lab.



Images from *Parasites and Parasitological Resources* (<http://www.bioed.net/parasites/parasites.html>)

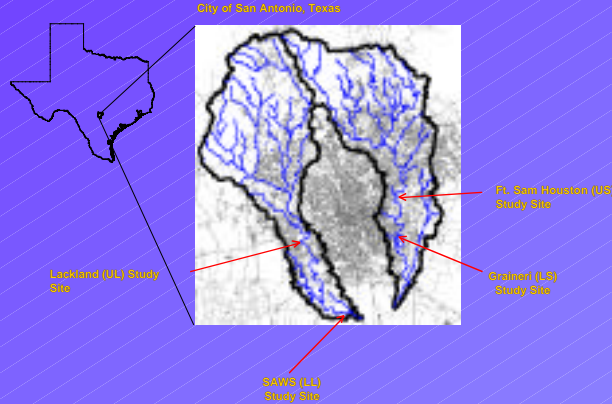


Figure 1. Map of study sites in the Leon Creek and Salado Creek watersheds. LL= upper Leon Creek, LL= lower Leon Creek, LS= upper Salado Creek, LS= lower Salado Creek.

Aug 1999 Diversity Indices

Site	# Fish Examined	Shannon Diversity Index (H)	Equitability (E _c)
SAWS (LL)	12	0.48	0.27
Lackland (UL)	7	1.1422	0.64
Grainer (LS)	11	0.75	0.42
S. Hous (US)	12	1.144	0.64

Aug 2000 Diversity Indices

Site	# Fish Examined	Shannon Diversity Index (H)	Equitability (E _c)
SAWS (LL)	12	0.514	0.319
Lackland (UL)	12	0.630	0.392
Grainer (LS)	5	0.706	0.438
S. Hous (US)	11	0.560	0.348

Results

During the 1999 field season, values of Shannon's diversity index indicated a greater diversity of bluegill parasites at the upper watershed sites for both Leon and Salado creeks (1.142, 1.144), compared with the lower sites (0.48, 0.75). Equitability tended also to decrease downstream, with the upper Leon and Salado watershed sites having higher values (0.64, 0.64) than the lower sites (0.27, 0.42).

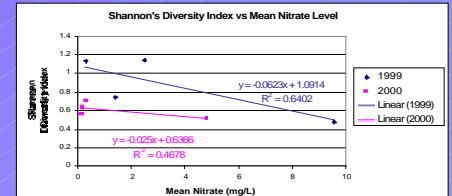
The August 2000 data reflected similar patterns, with the upper Leon diversity index being 0.630 and that for the lower Leon site being 0.514. The Salado Creek indices in 2000 did not follow the trend, but this may have been due to a high-flow event that killed 50% of the bluegill caged at the lower site.

Dissolved nitrate values ranged from 0.20 to 8.1 mg/L in 1999, and from 0.03 to 4.8 mg/L in 2000. Both parasite diversity and equitability decreased with increasing nitrate level.

Date	Site	Nitrate (mg/L)	Date	Site	Nitrate (mg/L)
1999/09/17	LL	8.82	2000/08/10	LL	1.57
1999/09/19	LL	10.2	2000/08/18	LL	8.04
1999/09/17	UL	0.28	2000/08/10	UL	0.15
1999/09/19	UL	0.28	2000/08/18	UL	0.22
1999/09/18	LS	1.37	2000/08/10	LS	0.33
1999/09/18	LS	1.37	2000/08/18	LS	0.29
1999/09/18	US	2.48	2000/08/10	US	0.15
			2000/08/18	US	0.17

Adapted from *Microbiol*, unpublished data

There were apparent differences in parasite diversity and evenness not only between years, but also in relation to nitrate level. Linear regression indicated that nitrate level accounted for 64% and 67% of the variation in parasite diversity, in 1999 and 2000, respectively.



Conclusions

- Parasite communities that developed on bluegill during summer in Leon and Salado creeks tended to have both less diversity and less equitability at lower versus middle watershed sites.
- Complementing the upstream-downstream pattern was a tendency for parasite diversity to decrease with increasing levels of dissolved nitrate.
- Reduced complexity of metazoan parasite community structure may be characteristic of urbanizing aquatic systems.

Literature Cited

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