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Abundant Benthic Macroinvertebrates in the Lower St. Johns River, Florida, Pose Nuisances and Wildlife Benefits

The St. Johns River, Florida, the second longest river of the Atlantic drainage, flows from south to north and is parallel to the coast for 455 km. The lower 173 km reach is an area of high competing water uses including municipal, industrial, agricultural, military, and recreational. The lower St. Johns River is listed in Florida's 1987 Surface Water Improvement and Management program as a "priority body of water"; that is in special need of attention for cleanup and control of point and nonpoint source discharges. Some areas of the lower reach and its tributaries do not meet the state Class III water standards for general uses and balanced aquatic life communities.

Depending on tidal cycles and winds, a salinity wedge of 5 ppt sometimes extends upriver past Jacksonville at km 42 (Table). Tidal influences are present to km 173, and water quality there is influenced by freshwater discharge from Lake George just upriver.

The St. Johns River Water Management District, in cooperation with the Florida Department of Environmental Protection, Tallahassee, routinely monitors the quality of surface waters in the lower river. They have, however, little information on macroinvertebrate communities. In 1993 the District invited the Southeastern Biological Science Center and phytologists at the University of Florida's Department of Fisheries and Aquatic Sciences, Gainesville, to participate in joint 3-year biomonitoring. We provide some preliminary findings about the benthic macroinvertebrate communities.

Diversity and Abundance of Benthic Communities

During 1993–94, bottom-dwelling communities were sampled quarterly with a "petite" Ponar grab (nine replicates per site). Hyperbenthos (organisms residing just above the bottom) in the nearshore submerged aquatic vegetation *Vallisneria zone* and midchannel were collected with a sled trawl (10-m hauls). Colonizing drift organisms were collected on EPA standard (modified Hester-Dendy) hardboard multiplate samplers (two replicates per site; 1-month incubation period).

From October 1993 to July 1994, collections from the lower reach yielded 137 total taxa, or about 66% of the total diversity collected in various surveys (unpublished data) in the same reach during the past two decades by the Florida Department of Environmental Protection (Table). The apparent reduction of taxa, occurring principally at km 79 and km 45, may have been influenced by seasonal cycles of the organisms, site-specific conditions, or sampling gear bias. Collections in 1995–96 may corroborate any real decline that might have occurred at these sites during the past two decades.

An abundance of macroinvertebrates places the lower river among the top for any Southeastern brown water (tannin-stained) river. In the freshwater km 173 in July, the trawls averaged 15 taxa and 35,000 individuals. The Shannon-Weaver community diversity index (d), an indicator of biological balance, averaged 2.51, which is a midrange value for the index. Mayflies, caddisflies, sludgeworms, and chironomids accounted for two-thirds of the densities at km 173.

At km 127 near the western shore, the average Empirical Biotic Index (Hilsenhoff Biotic Index) exceeded 7.0 from samples with Ponar grabs (8.39) and trawls (8.27) in October, which is considered indicative of organic pollution and stressful conditions for benthic organisms. However, the multiplate sampler EBI (6.72) on the site was the maximum of any multiplate collections on the mainstem, indicating that although the bottom sediments may have an accumulation of putrescent matter and toxins in certain areas that restrict substrate-dwelling animals, constituents in the water column may not be immediately harmful to drift and migratory animals.

In the brackish water section of the lower river at km 89 in July 1994, benthic diversity indices (trawl $\bar{d}_x = 2.90$; multiplate $\bar{d}_x = 3.38$) from grab samples of sand and old shell bottoms reflected good bottom substrate quality. Indices from grabs were somewhat lower at km 42 (Jacksonville) than at km 89. The macrofauna was predominantly gammarid amphipods and gastropod and bivalve mollusks (*Rangia cuneata* and Sphaeriidae). Chironomids, tubificid oligochaetes (*Limnodrilus hoffmeisteri* and *Quistadrilus multisetosus*), and polychaetes were also common throughout the section except in midchannel, which is periodically dredged for barging.

NUISANCE ORGANISMS

The abundance of larval aquatic insects in the eutrophic segments of the river is a problem for residents and tourists after the insects emerge as flying adults (imagoes). Encrusting organisms, most abundant in the highly enriched waters between km 42 and km 72, can also damage equipment and detract from recreational enjoyment.

WILDLIFE BENEFIT FROM ABUNDANT MACROFAUNA

The abundance of macroinvertebrates in the river, although a nuisance in some respects, provides fish, waterfowl, and other aquatic life with an abundant food supply. The steady inflow of nutrients and high retention time (3 months) for waters in the lower reach stimulate the growth of plankton and submerged aquatic vegetation in the littoral zone, creating more food and spawning habitat for fish. Excessive growth of biofilm and silt on the grass blades, however, reduces photosynthesis and apparently has damaged some nearshore grass beds. Commercially important species, such as pink shrimp *Penaeus duorarum*, white shrimp *P. setiferus*, blue crab *Callinectes sapidus*, oysters and other shellfish at the mouth of the estuary benefit from the abundant shredder and gatherer benthic macroinvertebrates in the lower St. Johns River that begin the nutrient recycling process.

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Table. Location of benthic invertebrate monitoring sites, major substrate types, and taxonomic diversity in the lower St. Johns River, Florida, 1993-1994 (km = kilometer; RM = river mile; D = organic detritus, L = silt, M = muck, O = old shells, and S = sand over clay).

Sites	Distance from river's mouth		Major substrate types	Taxonomic diversity	
	km	RM		1973-92	1993-94
1	173	108	L, S	37	76
2	143	89	D, M, S	23	50
3	127	79	D, L, M, S	126	60
4	108	67	D, L, S	16	45
5	89	55	L, O, S	19	56
6	72	45	L, O, S	110	42
7	58	36	D, L, O, S	28	48
8	42	26	D, L, O, M, S	1	38