TRENDS IN CONSUMER STANDING STOCKS AT THE FLORIDA COASTAL EVERGLADES LTER: EXISTING DATA AND FUTURE PLANS

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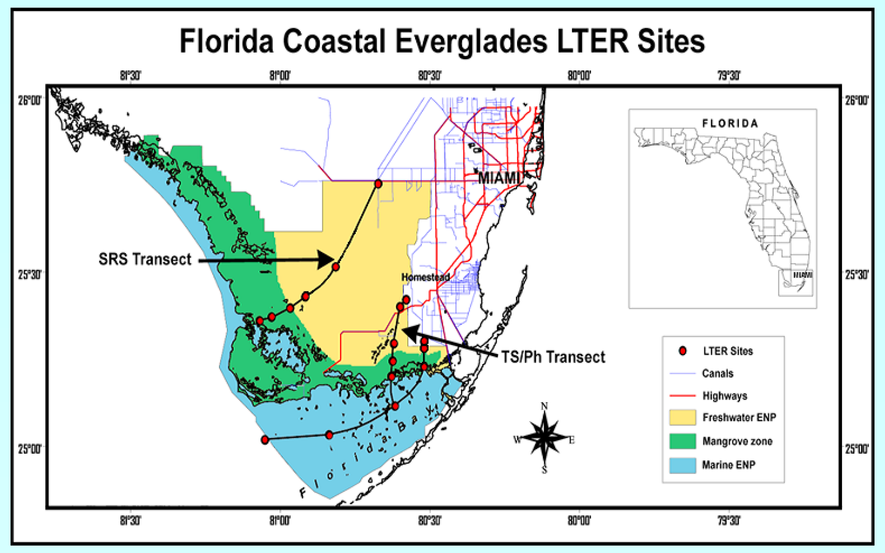


ABSTRACT

We hypothesize that standing crops of consumers reflect patterns of allochthonous nutrient transport along the estuarine interface at the Florida Coastal Everglades (FCE) LTER. Our goal is to investigate how variation in hydrology, water quality, and disturbance influence secondary production in this oligotrophic ecosystem. Study sites are situated along freshwater to marine transects in two drainages, Shark River (SRS) and Taylor (TS) Sloughs. SRS supports a freshwater marsh and mangrove estuary that drains into the Gulf of Mexico. This basin exhibits a peak in animal standing stocks where water from the P-limited freshwater marsh meets P-rich coastal water. In TS, water flows through a freshwater marsh into a low productivity mangrove estuary that is hydrologically isolated from the Gulf. This drainage does not exhibit the productivity maximum, and has low consumer standing stocks. Changes in hydrology resulting from proposed modification of Everglades management will provide an experimental test of our hypotheses of the origins of these spatial patterns.

I. Introduction

We have studied aquatic communities at over 20 locations in the Everglades since 1996 (Fig. 1). This work has included quantification of density and standing stocks of fishes, aquatic macroinvertebrates, vascular plants, and periphyton.

Six of these study sites correspond to areas of research emphasis for FCE-LTER research (Fig. 1: 7, 8, P37, MD, TS, and CP). The FCE project will permit expansion of this study into the mangrove estuarine zone and provide opportunities to test hypotheses generated by the existing data regarding patterns of productivity at the freshwater-saltwater interface.

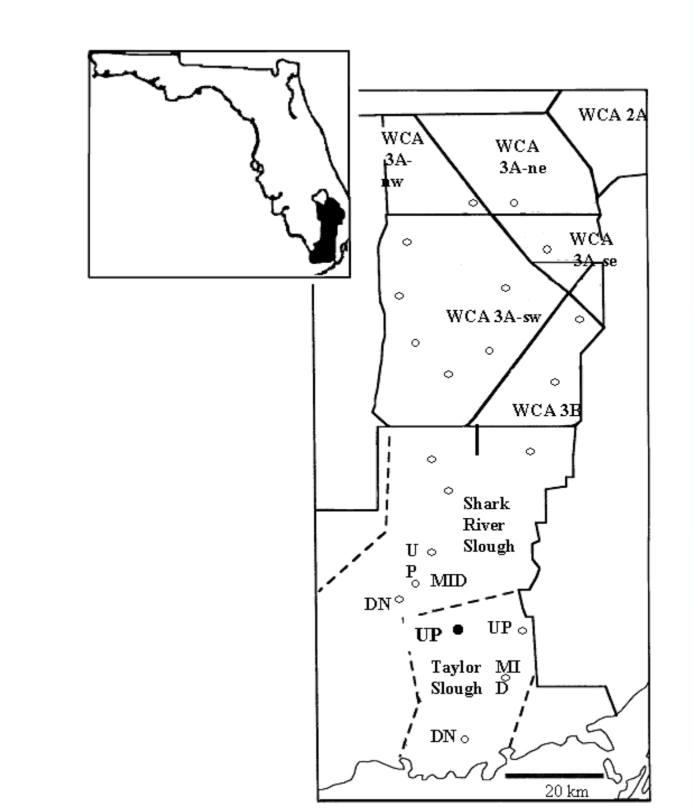
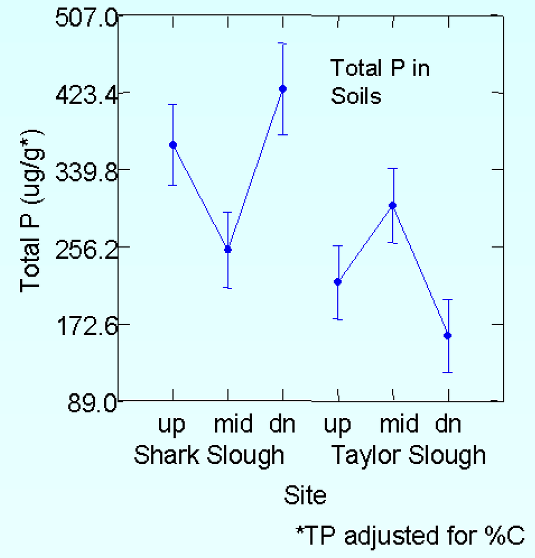
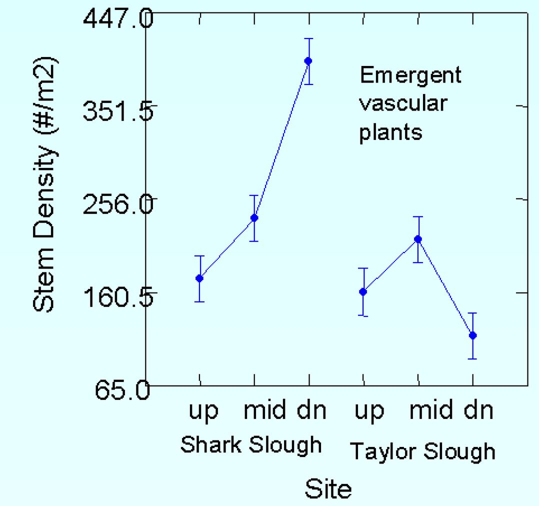


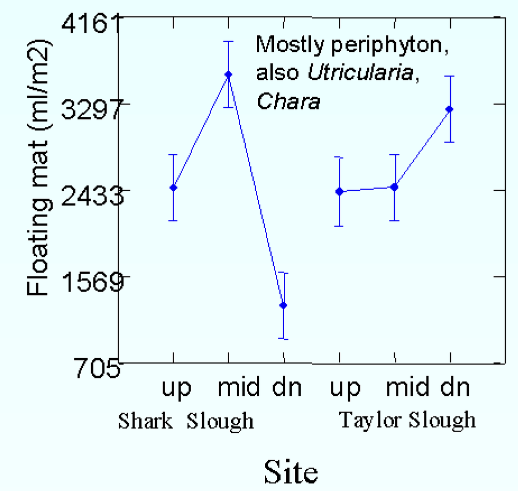
Fig. 1. Long-term aquatic animal study sites in the Everglades. Sites corresponding to FCE research in Shark River Slough and Taylor Slough are identified. UP, MID, and DN are used to indicate upstream, midstream, and downstream locations relative to freshwater flow in each drainage.

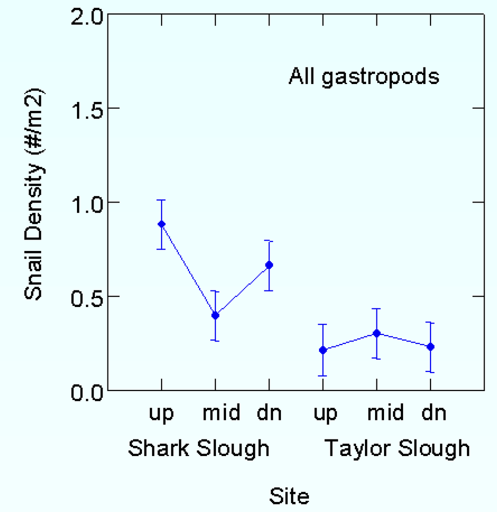
II. Spatial Patterns

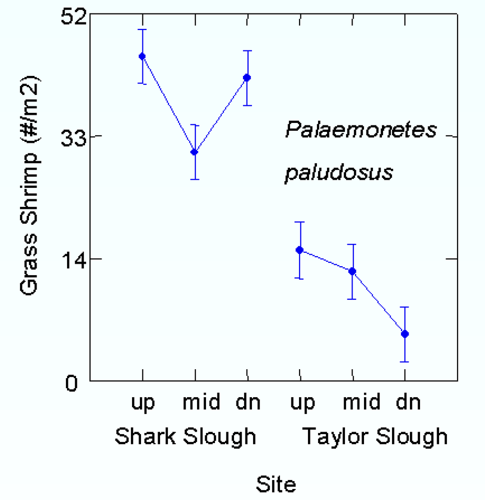
Average density or biomass between 1997 and 1999 are plotted for Shark and Taylor Slough study sites. Data were obtained from 105 1-m^2 throw trap samples per year collected in Feb, Apr, July, Oct, and Dec. TP is estimated from 9 sediment samples per site. Large fishes were sampled by airboat electrofisher with 216 5-min transects per year. Note the contrast in downstream sites (dn), located at northern edge of the mangrove estuarine interface. The dn site at Shark River Slough has the highest soil TP, vascular plant stem density, and animal biomass, but lowest floating mat volume. The reverse pattern is observed at the dn site in Taylor Slough.

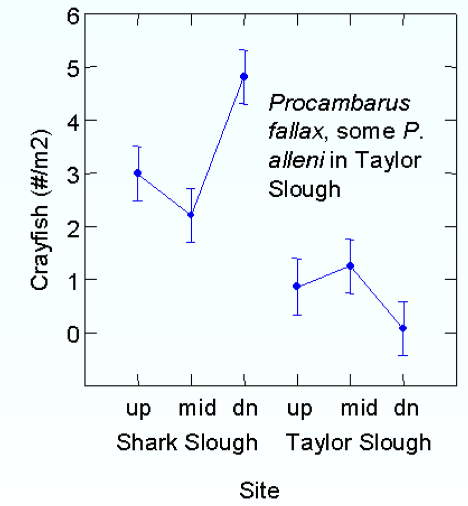


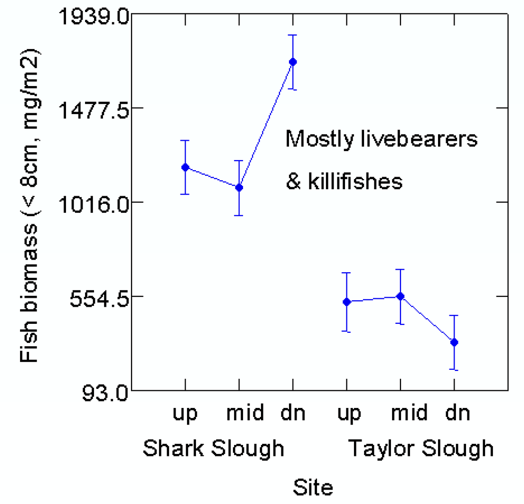


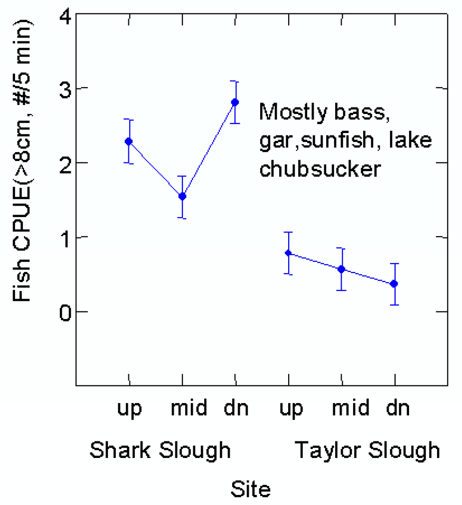






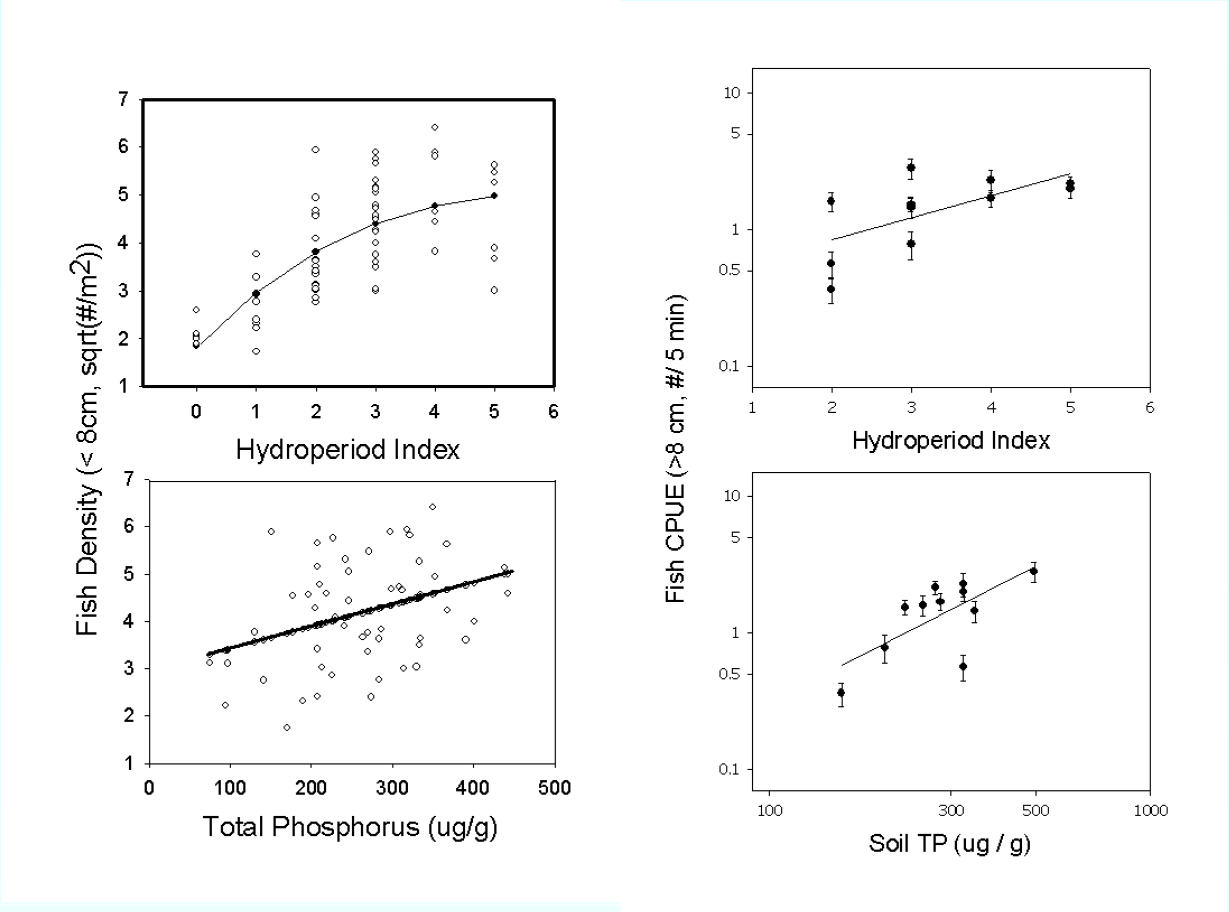






III. Sources of Spatial Variation

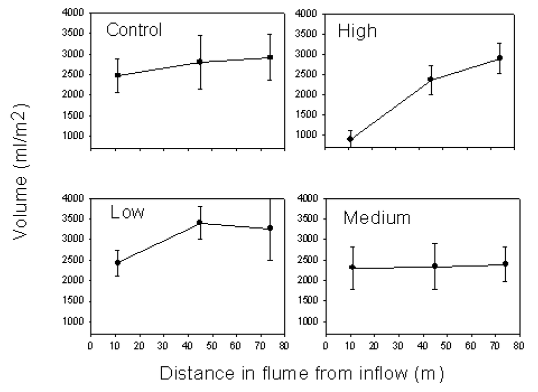
We are exploring various explanations for these spatial patterns. Nutrient availability and hydroperiod are likely (and confounded) sources of variation in biologic activity in that these sites. This is illustrated by plots of small and large fish density. Small fish were collected by throw traps, and large fish by airboat electrofisher.



Experimental data from nutrient-dosing studies support a nutrient hypothesis in explaining some aspects of these patterns. We have added P to flow-through flumes (4 channels 100m x 3m, 4 replicates) to test for dose-response patterns in ecosystem parameters. The experimental treatments are: control = ambient (approx 12 ug/L), low = +5 ug/L, medium = +15 ug/L, and high = +30 ug/L) Preliminary data support effects of nutrients up the food web to small fish. No treatment effects have been recorded yet for aquatic invertebrate prey of these fish (cladocerans, copepods, midge larvae, amphipods). Exclusion experiments are planned to control for fish consumption effects on these animals.

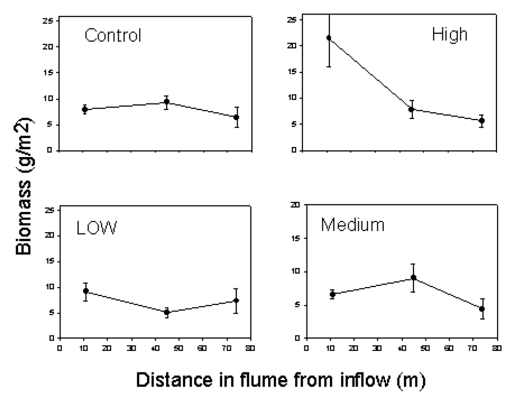
FLOATING MAT

Floating mat volume (including periphyton) declined at the upstream end of the high dose after 6 months of dosing. More subtle effects were observed all levels of dose.

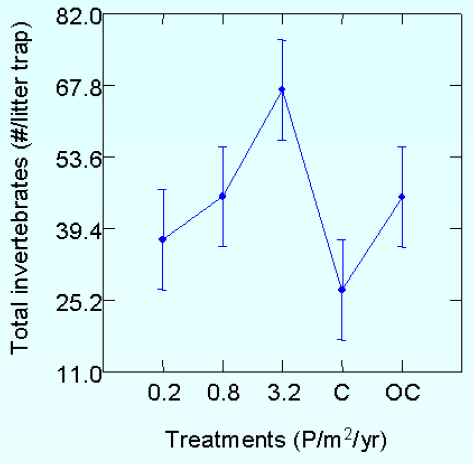


FISH

Small fish density increased at the upstream end of the high dose channel after 6 months of dosing. All species of fish increased in density, or were unchanged.



Preliminary results from a mesocosm P loading experiment indicate that small invertebrates (cladocerans, copepods, midge larvae) increase with P loading when fishes are excluded. P was dosed weekly to 2.7 m^2 mesocosms for 6 months at levels indicated below; C are controls receiving no dose and OC are open-control areas. Invertebrates were sampled by placing 100 g wet weight of plant stems in mesh cages that excluded fish.



IV. Research Plans

We have recently established study plots in the mangrove zone to extend this work further down the salinity gradient. Future plans include:

1. Continue routine sampling to document trends as freshwater flow into the mangrove zone is altered by Everglades restoration.

2. Conduct experimental studies of food webs along the salinity gradient to better delineate the role of abiotic and biotic factors in the patterns of abundance.

3. Establish use of stable-isotopic markers to examine food-web length across the salinity/productivity gradient in the southern Everglades. We will monitor how Everglades restoration changes food-web length as it progresses.

V. Acknowledgements.

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