Spartina alterniflora ontogenetic effects on associated micro-metazoan assemblages

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Abstract

The relative age composition of *Spartina alterniflora* (smooth cordgrass) and effects on the abundance and richness of epifaunal micro-metazoans were studied in a South Carolina salt marsh. Stem age and resultant changes in structural characteristics may affect stem suitability as a habitat for micro-metazoans. Greater abundance and richness were hypothesized to occur on stems of intermediate age because of the presence of leaf sheaths attached to the core stem. *Spartina alterniflora* stems were collected from a Waites Island midmarsh elevation where a range of different aged culms occurred. Stems from three age categories (early, intermediate, and late) were collected approximately every thirty days. The early (~10-30 cm) and intermediate (~30-140 cm) categories were live stems with the late category being dead standing stems ranging from ~10-80 cm. Nematodes were the most abundant taxa representing ~58% of all stem epifauna. Harpacticoid copepods and mites each represented ~10% of epifauna sampled. Additional taxa (10) inhabited the stems in fewer numbers. Stems in the intermediate and late age categories generally had more epifauna than stems in the early category. Results suggest that *S. alterniflora* stems represent important, temporally-variable habitats for micro-metazoans and that the age of a given stem influences the associated faunal assemblage.

Introduction & Methods

Spartina alterniflora Loisel., (smooth cordgrass), was studied to examine how abundance and diversity of epiphytic micro-metazoans (>63 µm) varied with stem age during March-August 2007. OBJECTIVES: (1) describe the relative age composition of mid-marsh stems; (2) determine epifaunal abundance relative to stem age; (3) enumerate micro-metazoans in the structural microhabitats of the stems, meaning the spaces between the leaf sheaths and the core stem. PREDICTIONS: (1) newly emerging stems (tillers) have comparatively few epifaunal organisms; (2) dead standing stems may have slightly greater numbers of epifauna than tillers. Intermediate stems may represent a superior habitat due to the structural integrity of leaf sheaths attached to the core stem. HYPOTHESIS: Stems of intermediate age will have more abundant micro-metazoans than tillers and dead standing stems.

STUDY AREA: located on the southern portion of Waites Island, an undeveloped barrier island in northeastern Horry County, SC.
STEM AGE CATEGORIES: Early = (~10-30 cm), green shoots or tillers
Intermediate = (~30-100 cm), live green stems or culms
Late = (~10-100 cm) dead standing, dry, brown stems, with senescent leaves sometimes still attached.
STEM DATA: recorded from five randomly placed 0.25 m^2 quadrats per month.
-number of stems per age category
-height (cm) of each stem
-ratio of live to dead stems per quadrat

Fig. 1: *Spartina* tiller with tag.

STATIC STUDY: Ten stems were collected monthly from each of the 3 age categories (n = 180 stems) from areas outside the quadrats.
COHORT STUDY: In February 200 tillers were marked with numbered aluminum tags. The tillers were all ~10 cm tall and presumably about the same age. Each month 10 marked tillers were haphazardly chosen for collection (n = 60 stems). Before each stem was cut, a string was tied about 10 cm up the stem and another around the base of the stem (*sensu* Walters et al. 1996).
LABORATORY PROCEDURES: Samples were placed in a solution of 10% buffered formalin with rose bengal stain (Walters et al. 1996). Organisms were sieved (63-µm mesh) and rinsed into a counting dish. For cohort stems, strings were removed after epifauna on the exterior were counted from the first sieving, allowing interior fauna to be counted separately.

Results

SPARTINA DATA: Stems in all 3 age categories co-occurred throughout the mid-marsh (Fig. 2).

STATIC STUDY: Mean numbers of epifauna were blocked by date (Fig. 3). [Date: $F_{5, 171} = 11.93$, $p<0.001$] [Age: F2, 171 = 24.99, $p<0.001$]. The Ryan-Einot-Gabriel-Welsch F, $p<0.05$ demonstrated that the intermediate and early age categories were not significantly different; however the late category was significantly different from the others.

COHORT STUDY: Epifauna were compared on the exterior and interior of stems (Fig. 4). A chi-squared test confirmed that the numbers of micro-metazoans on stems are dependent on the interaction between dates and stem microhabitats (exterior/interior) [$X^2_5 = 267.1$, $p<0.001$].

EPIFAUNA: Nematodes were the most abundant stem fauna, representing about 58% of all specimens. Adult mites and harpacticoid copepods each represented about 10% of stem fauna. Several other taxa were found in fewer numbers (Table 1).

Table 1: Percent of major taxa on *S. alterniflora* stems.
Nematodes: (57.7%)
Mites & juvenile mites: (18.3%)
Harpacticoid copepods: (10.8%)
Crustacean nauplii: (5.5%)
Foraminifera: (3.0%)
Other: (4.7%) = Oligochaetes, Mussel larvae (*Geukensia*), Snails (*Littoraria*), Amphipods, Tanaids, Polychaetes Insects, insect larvae

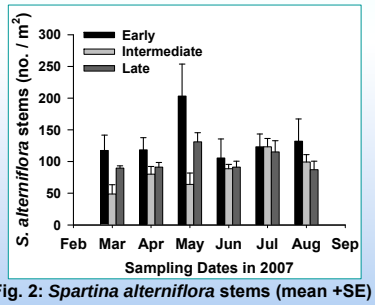

Fig. 2: *Spartina alterniflora* stems (mean +SE) in 3 age categories were enumerated within quadrats.

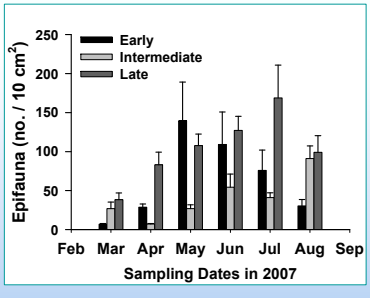

Fig. 3: In the static study, epifauna (mean +SE) were enumerated on *S. alterniflora* stems in 3 age categories.

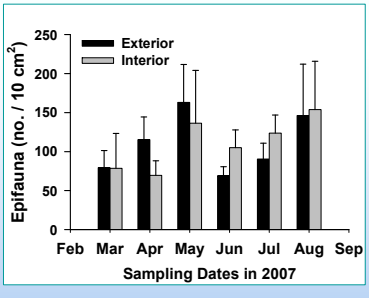

Fig. 4: In the cohort study, numbers of epifauna (mean + SE) per *S. alterniflora* stem area (10 cm^2) were calculated for exterior & interior microhabitats.

Conclusions

STATIC STUDY: *Spartina alterniflora* stems in the late age category had the most abundant epifauna per 10 cm^2 for 5 out of the 6 months. In May the early age category had the most epifauna. In 4 out of 6 months the intermediate age category had the least epifauna per 10 cm^2. *Spartina alterniflora* stems in the early age category had the greatest overall abundance per m^2.

COHORT STUDY: Epifauna on tagged stems were most abundant in May and August, but least abundant in March. In March-May the exterior microhabitat had a greater percentage of epifauna, while in June-August the interior microhabitat had a greater percentage.

Lit. Cited

Walters, K., Jones, E., Etherington, L., 1996. Experimental studies of predation on metazoans inhabiting *Spartina alterniflora* stems. Journal of Experimental Marine Biology and Ecology 195: 251-265.

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