

Analysis of Shoot and Root Systems of *Spartina alterniflora* from Dead Marsh Sites in Coastal Georgia

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Study Site Location(s): Glynn, Chatham, Liberty, and McIntosh counties in Georgia

Keywords: Herbivory, Plant tissue analysis, Restoration, *Spartina*

Project Type: Descriptive

Project Outline:

Specific Aims

The overall objective is to determine the cause(s) of vegetation loss in dead marsh sites.

Specific objectives are:

1. To identify any unusual structural details or functional activities at the organ, tissue and cellular levels through morphological, anatomical and cytological analyses of plant samples from affected areas.
2. To perform vital stain tests to determine if plant parts (e.g. rhizomes, apical meristems, etc.) from affected areas are viable.
3. To identify a pattern, if present, in the progression of death of plants.
4. To predict the natural recovery of the salt marsh, or to determine if there is a potential for recovery.

Methodology

- Plant samples for this study were collected by Marsh Monitoring Groups following a standardized protocol.
- At each site, five samples from the healthy zone, the dead zone, and the transition zone (moderately impacted marsh) were collected.
- Each sample consisted of a 15cm cube of sediment containing underground plant parts as well as the aerial portions of those plants, if present.
- Samples were thoroughly rinsed with tap water to remove the sediment.
- Initial vegetative assessments involved morphological inspection at the organ level. Each set of samples was evaluated for general health, measure of extent of decay, presence of mechanical damage, occurrence of necrotic patches, and accumulation of secondary

compounds such as anthocyanins. Samples collected from the healthy marsh served as a control.

- For histological studies, various plant parts from each zone were sectioned and examined microscopically.
- Tissue samples from aboveground and belowground plant parts were assayed for viability using the vital stain 2,3,5-triphenyl tetrazolium chloride.

Results to Date

- A total of 105 *S. alterniflora* samples from 6 sites (from Glynn, Chatham, Liberty, and McIntosh counties) have been analyzed thus far.
- Underground plant parts from dead marsh sites (where aboveground vegetation is destroyed) were dead as well (i.e. failed the vital stain test). Samples from different dead marsh sites showed varying degrees of decay. Samples from the Talahi Island site showed early stages of decay, whereas those from the South Newport site were completely decomposed with very little or no root mass. The rate of decay can provide an indication of the time it will take for the onset of erosion to occur.
- Insect damage to aboveground plant parts was noticeably high - of the 60 samples examined with intact aerial parts (i.e., those from healthy and transition zones), 29 showed a similar type of insect damage. Insect damage observed in plants from healthy zone suggests that insects are not the causal agent(s) of marsh die back. On the other hand, it may be an indication of early stages of marsh die-off in areas that look healthy.
- Xylem vessels in the rhizomes of samples from dead marshes (and in some cases transition zones as well) were clogged with a yellowish-brown colored substance. Whether this is the cause or effect of plant death is yet to be determined. Also, what (pathogen attack, toxins, herbicides, etc.) triggers the clogging of xylem vessels is unknown.
- Plasmolysis at the cell, tissue or organ levels; as well as unusual accumulation of secondary compounds (e.g. anthocyanin) or any other damage at the cellular level were not observed.

Lessons Learned

- The extent of damage observed in the underground plant parts suggests that natural recovery from the underground plant material may not take place in affected sites studied thus far.
- Whether insects are the causal agents of marsh die back needs to be further investigated.

Publications, reports, or web-accessible materials

- A mid-year report was submitted to the MKP-Ecology Fund on 11-14-2003.
- Additional information is available at the GCRC website
http://www.marsci.uga.edu/coastalcouncil/marsh_dieback.htm

Suggested citation: Georgia Coastal Research Council, 2004. Proceedings of the Marsh Dieback Workshop, held February 3-4, 2004, Savannah Georgia.