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Maine belowground marsh destruction from the European green crab documented by computer-aided tomography

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Abstract:

Invasive European green crab (*Carcinus maenus*) populations have exploded with devastating losses to Maine's intertidal resources including soft-shell clams, eelgrass beds, and salt marshes. This project quantified the green crab abundance in three different marsh locations using fyke nets and baited, modified eel traps. The number of crabs caught per m² per hour were recorded and later expressed as the number of crabs/hr. The direct erosional impacts on Maine salt marshes from crab activities were measured using conventional methods (shear vane strength measurements) and the novel application of computed tomography (CT). At each site, paired cores were collected, one inside (impacted) and one outside the green crab high impact zone (reference). Cores were prepared at the Wells Reserve, CT scanned at Southern Maine Health Care in Biddeford, ME., and then the CT images were processed and analyzed using the software programs Osirix and ImageJ. This CT study demonstrated the presence of belowground crab burrows in the highly impacted crab sites. Also the total core volume of inter connected coarse roots and rhizomes (R&R volume) of the primary marsh species, *Spartina alterniflora* was calculated from the CT images. All the marsh reference cores had a total R&R volume average of 91.7+/-19.9 cm³; whereas, the impacted areas of marshes with the greatest abundance of the green crabs, Wells (26.3-46.2 crabs/hr) and Damariscotta (24.4-30.9 crabs/hr), had total R&R volumes of 0.1 cm³ and 0.3 cm³ respectively. However, the marsh with the least abundance of green crabs, Yarmouth (0.2-12.4 crabs/hr), had a total R&R volume of 170.0 cm³. This investigation was the first time CT scans have been used to measure and image geologic cores from Maine salt marshes and these results demonstrate that CT technology can be applied to quantitatively assess belowground impacts of green crab activities.