The following supplement accompanies the article

Fiddler crab control of cordgrass primary production in sandy sediments

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Marine Ecology Progress Series 399: 253–259 (2010)

Supplement 1

NITROGEN ANALYSIS

The % N, % C and ratio of C:N were calculated for stem, root and rhizome samples collected from each plot in the field. The C: N ratio provides a proxy for nitrogen limitation in which C:N values remain stable when N concentrations are low and limit plant growth and begin to decrease when N concentrations are high enough to meet plant demand and N begins to accumulate in plant tissue.

RESULTS

The ratio of C:N was similar across treatments in both above- ($F_{2,18}$ = 0.1243, p = 0.8927) and belowground samples (roots: $F_{2,18}$ = 0.1298, p = 0.8790 and rhizomes: $F_{2,18}$ = 0.2100, p = 0.8125, Table 1).

DISCUSSION

Our results suggest that even in the presence of natural densities of fiddler crabs cordgrass is strongly nitrogen-limited in sandy sediments. When soils are characterized by a paucity of N, and N-availability increases, the concentration of N or C in plant tissues will not change measurably because additional N uptake is diffused by new growth (see Fig. S1, adapted from Noggle & Fritz 1976, Tyler et al. 2003). Similarly, when N-availability decreases under severely nitrogen-deficient conditions, plant biomass can drop precipitously, as observed in our crab removal treatments, and % N, % C and C:N ratio values will remain stable

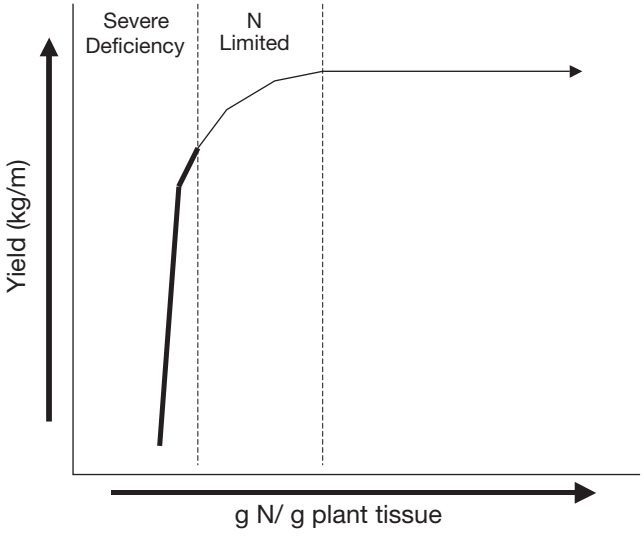

Fig. S1. Relationship between nitrogen uptake by plants measured in g N per g plant tissue and crop yield under conditions of severe N deficiency, moderate N limitation and sufficient N availability to meet plant demand. Plants accumulate N only when N limitation ceases and plant demand for N is met. Adapted from Noggle & Fritz (1976, p. 236)

Table S1. Cordgrass tissue analysis testing the effect of crab removal treatments on the percent nitrogen and carbon in leaf, root and rhizome structures. Data are shown as mean ± SE and results from Tukey's post-hoc comparisons test are reported

Treatments	Stems			Roots			Rhizomes		
	% N	% C	C:N	% N	% C	C:N	% N	% C	C:N
Removal cage	2.2 ± 0.2[a]	43.5 ± 0.4[a]	20.8 ±1.9[a]	1.3 ± 0.2[a]	37.5 ± 1.9[a]	32.5 ± 4.4[a]	1.2 ± 0.3[a]	39.8 ± 4.3	42.0 ± 7.3[a]
Crab access	2.1 ± 0.1[a]	44.3 ± 0.6[a]	21.2 ± 0.7[a]	1.4 ± 0.2[a]	39.6 ± 1.6[a]	30.5 ± 3.5[a]	1.1 ± 0.2[a]	39.4 ± 0.7	44.5 ± 9.6[a]
Removal control	2.1 ± 0.1[a]	43.9 ± 0.2[a]	21.7 ±1.3[a]	1.2 ± 0.04[a]	38.6 ± 0.8[a]	32.7 ± 1.7[a]	0.9 ± 0.1[a]	38.2 ± 1.2	49.6 ± 8.2[a]

because the lower uptake of N limits plant growth. These data suggest that although nitrogen fertilization by fiddler crabs strongly regulates cordgrass primary production in sandy soils, it does not release cordgrass from N-limitation. Further studies that add fiddler crab excretions or increase crab densities to experimental plot would certainly supplement our findings.

LITERATURE CITED

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Tyler AC, Mastronicola TA, McGlathery KJ (2003) Nitrogen fixation and nitrogen limitation of primary production along a natural marsh chronosequence. Oecologia 136: 431–438