IS UNIMPORTANT THE BIOMASS OF EICHHORNIA CRASSIPES (MART.) SOLMS (PONTEDERIACEAE) LOST THROUGH HERBIVORY IN THE PARANÁ RIVER FLOODPLAIN?

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INTRODUCTION

Consumption by invertebrates of living macrophytes has been considered unimportant until recently, whereas plant die contribute substantially to food webs of aquatic habitat (Wetzel 1981). Quantification of the amount of herbivore damage on living aquatic macrophytes has been understudied (Newman 1991) and few studies have provide the effect of herbivory on the aboveground primary production (Medeiros dos Santos & Estevez 2002). *Eichhornia crassipes* (MART) SOLMS, which is invasive in other subtropical waters (Julien et al., 2001), is the most abundant macrophytes of the Paraná River floodplain. Its biomass increases from August to March and decline to about 50% of the annual maximum during winter (Neiff & Poi de Neiff 1984). The main purpose of this study is to measure the biomass of *E crassipes* leaves lost through invertebrates herbivory during the peak of biomass (December), at the end of the growth period and the beginning of the annual decline (March) and at the annual minimum (July) in two floodplain lakes with pure stands of water hyacinth.

MATERIAL AND METHODS

The study area is located within the RAMSAR Site CHACO (Argentina) on the west bank of the Paraná River, 30 km downstream from its confluence with the Paraguay River. We selected two sites where *E. crassipes* was found in monospecific stands that covered up to 70% of the water surface. Three replicate samples were taken in two lakes (site A and B), at distance of 5 m from the edge with a ring of 0.30 m^2, in different growth period of *E. crassipes* population: (December 2002, March 2003 and July 2003). All green leaves were cut off, separated and counted to estimated leaf density (number per m^2) and leaf lamina biomass (dry weight at 105ºC). In each sample, 10 leaves were taken in order to measure the damage and leaf area. Two categories of damage to the leaves were identified and separately measured: holes and surface abrasion. We used a plastic transparency with a millimetre grid to estimate the leaf area removed. Removed biomass by surface abrasion was assessed by mean of an indirect method, knowing obtaining the weight average of 30 square of 10 mm^2 with this type of damage and the weigh average of 30 not damage square of equal size. The average value of not damaged square was using to calculate biomass removed by hole, because all tissues are removed completely in the affected area. Differences between biomass without herbivorous and biomass including loss by herbivorous were tested using the Chi-Square Test.

RESULTS AND DISCUSSION

Total damaged area per lamina (surface abrasion + holes) varied between 5.98 % (July-03) and 11.41 % (March-03) in both lakes. Like the damaged area, total removed biomass per lamina was high at both sites and the percentage of biomass removed considering surface abrasion and holes together was more than 21 % per lamina in all sampling date except July at Site B. Our results indicated that total *E. crassipes* biomass removed by invertebrates is higher than the mean percentage reduction of standing crop by snails and insects estimated by Lodge et al. (1998) for different taxa of macrophytes. In temperate herbaceous community herbivorous insect can reduce, in average, 13 % of plant biomass (Couple & Cahill, 2003). We have measured in this study the cumulative damage produced by herbivores during the development time of one leaf. Underestimation of amount of damage may be caused when herbivorous eat completely the leaves because they are not found in field sampling (Coley & Barone, 1996). However, in different studies carried out since 1977 we were not observed leaves of *E. crassipes* completely eaten in the Paraná River floodplain. Significant differences were found between lamina biomass observed in the field and lamina biomass estimated after adding the biomass lost by herbivory (Chi-square Test, $p < 0.05$; N=

180). Our results show that herbivores consume an important amount of *E. crassipes* standing crop. We suggest the use of the indirect method to calculate the biomass removed in sites with aquatic floating plant, which experimental exclusion of insect may be difficult to carry out.

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