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Aquatic insects in rice fields from the East of Uruguay

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Introduction

Uruguayan rice crop is mainly produced under irrigation, which generates a temporary semi-aquatic environment from tillering to pre-harvest. This condition may be favorable for the development of aquatic insects and other macroinvertebrates. This situation, and its location in wetland regions, presents the crop as a potential reservoir of biodiversity. Works on aquatic macroinvertebrates in Uruguay refer mainly to natural environments, but the studies in agroecosystems are scarce, without works on aquatic macroinvertebrates in rice crop in our country.

Objective

This work is a first approach to the knowledge of insects and other aquatic macroinvertebrates from rice agroecosystem in Uruguay.

Materials and Methods

-Sampling of aquatic macroinvertebrates with surber net.
-Uruguay, Treinta y Tres department.
-Localities: Julio María Sanz, El Tigre and General Enrique Martínez (Charqueada), february 2015 (Figure 1).
-Water sources: entrance, outlet and a neighboring control area (Figure 2). Three samples per water source per locality following (Rizo-Patrón et al., 2011).

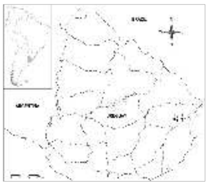

Figure 1. Sampling locations. 1: JM Sanz, 2: El Tigre, 3: Charqueada.

Figure 2. Water sources sampled A: entrance, B: outlet and C: control.

-Individuals counted and organized into functional groups following (Ramírez y Gutiérrez-Fonseca, 2014).
-Cumulative species curve was constructed (EstimateS 9.1.0, Collwell, 2013). Principal component analysis was done according water source (PAST 3.14, Hammer et al., 2001). Richness and Shannon diversity indices were calculated for each locality and water source (ANOVA and Tukey test).

Results

For the three localities sampled were registered 2851 individuals. Insect represented 43% of total individuals, while the rest of macroinvertebrates represented 57% (Table 1).

Table 1. Relative abundances of macroinvertebrates (no insects) collected with surber net in rice crop and its surroundings in Treinta y Tres, Uruguay (february 2015).

Class	Order	Family	Genus/morpho specie	Relative abundance (%)
Maxillopoda	Cyclopoida	Cyclopidae	*Copépodos*	22,50
Branchiopoda	Anomopoda	Daphniidae	*Daphnia*	18,12
Arachnida	Araneae	*Allocosinae, Lyniphiidae, Anyphaenidae*	unidentified juveniles	0,32
	Trombidiformes (subclass Acarina)	Hydrachnidae	*Hydrachna* y otros	8,00
Gastropoda (snails)	Caenogastropoda	Ampullariidae	*Pomacea* y otros	4,88
Oligochaeta	Tubificida	undetermined	unidentified earthworm	1,77
Malacostraca	Amphipoda	posibly Hyalellidae	posible *Hyalella* sp	1,35
Clitellata	Hirudinea	undetermined	unidentified leech	0,28

Within insects Ephemeroptera were more abundant in water entrance while Syrphidae larvae (Diptera) were more abundant in water outlet (Figure 2).
Cumulative species curve shows that are still species pending sampling. Richness estimators values were Chao 1=59.8%, Jacknife1= 66.4% and Bootstrap=74.4% estimating a total number of 48, 44 and 39 insect species, respectively.

Results

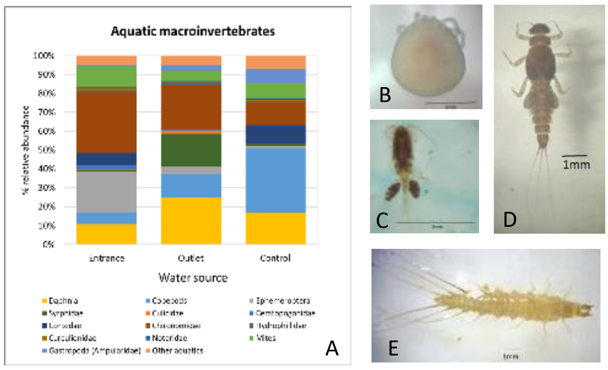

Figure 2. A: Relative abundances of aquatic macroinvertebrates collected with surber net according to water source (entrance, outlet, control), Treinta y Tres, Uruguay (entrance, outlet, control). B: mites (*Hydrachna*), C: copepods, D: Ephemeroptera larva (*Caenis*), E: Hydrophilidae larva (*Berosus*).

Principal Components Analysis comparing community composition showed that samples grouped according water source (Figure 3). *Caenis* individuals (Ephemeroptera) were associated to the water entrance, while Syrphidae and Chironomidae morphospecie 2 larvae (Diptera), where more abundant in water outlets.

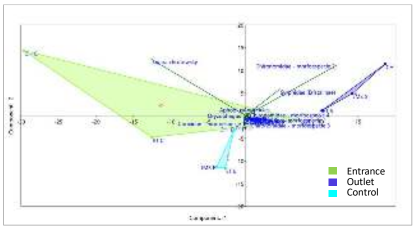

Figure 3. Principal component analysis (PCA) through Bray Curtis distances for each locality (ET: El Tigre, JMS: Julio María Sanz, CH: Charqueada) and water source (E: entrance, S: putlet, C: control), autovalues Axis 1: 57,74%, Axis 2: 21,51%.

The highest richness and Shannon diversity indices were recorded in the location of El Tigre at the water outlet (Table 2).

Table 2. Richness and Shannon diversity indices for insects in wáter samples according to water source and locality (Treinta y Tres, Uruguay, february 2015).

Diversity	Control		
	El Tigre	J.M. Sanz	Charqueada
Richness (S)	11,00±1,31a**B**	7,00±1,31a**AB**	7,33±1,31aA
Shannon_H	1,40±0,15a**A**	1,19±0,15aA	1,05±0,15aA
	Entrance		
Richness (S)	6,33±0,92a**A**	9,00±0,92a**B**	7,67±0,92aA
Shannon_H	1,55±0,12a**A**	1,54±0,12aA	1,64±0,12aA
	Outlet		
Richness (S)	13,33±0,67**bB**	4,67±0,67**aA**	5,33±0,67**a**A
Shannon_H	2,02±0,07**bB**	1,14±0,07**a**A	1,14±0,07**a**A

Different small letters within lines and big letters within column indicates significant differences through Tukey test (p<0.05).

Conclusions

Different taxonomic groups were associated to diferent water souces. Some groups like *Caenis* could be associated to good water quality, while others like Syrphidae are more associated to high levels of organic matter.

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