Dominant Plant Type Affects Arthropod Diversity

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Background

- Arthropod diversity can be affected by dominant vegetation type
- Arthropods may rely on plants as a food source; most rely on plants as a shelter
- Plants benefit from arthropod abundance by using arthropods as pollinators
- In a study done by Siemann (1998), they found that the dominant vegetation type not only controlled the abundance of arthropods but also effected the arthropod diversity
- In the Colusa National Wildlife Refuge ponds may be dominated three different vegetation types: Tule (*Schoenoplectus acutus*), Swamp Timothy (*Crypsis schoenoides*), and Smart Weed (*Persicaria punctate*).
- In this study we used pitfall trapping to determine if there were differences in arthropod diversity associated these dominant vegetation types.

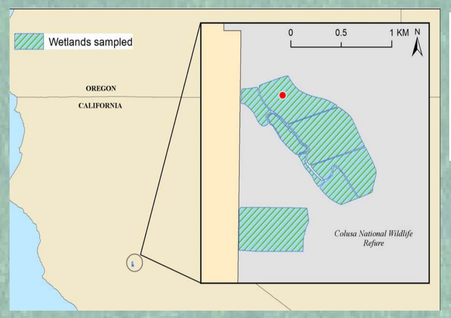

Figure 1. Location of Colusa National Wildlife Refuge in California and sampling site within the refuge.

Figure 2. Wetland site with dominant vegetation types studied.

Research Question

Is arthropod diversity different in habitats associated with three different dominant vegetation types: Tule, Swamp Timothy, and Smart Weed.

Methods

- The study took place in association with the Colusa National Wildlife Refuge in Colusa, California
- Pitfall trapping was used to collect arthropod samples
- Traps were urine sample cups (7.6 cm diameter and 10 cm deep) filled halfway with ethylene glycol
- Three dominant plant taxa occurring in a wetland site (~20 Ha) were selected, Schoenoplectus acutes (tule), *Persicaria punctate* (Smartweed), and Crypsis schoenoides (Swamp Timothy)
- Nine traps were placed among each of the three dominant plant taxa for twenty-seven traps total
- Traps were left open during the 7 week sampling period and checked once a week for seven weeks
- Weekly pitfall samples were examined in the lab using a dissecting microscope to key arthropod taxa to family level using standard keys
- We used Shannon's index for each plant taxa, taking into consideration both abundance and evenness

$$H = -\sum_{i=1}^{S} p_i \ln p_i$$

- The proportion of taxon *i* relative to the total number of taxa (p_i) is calculated, and then multiplied by the natural logarithm of this proportion ($\ln p_i$). In this case, each taxon was identifiable as distinct, but were not keyed to species level.

Figure 3. Dominant species studied a) Tule (*Schoenoplectus acutus*), Swamp Timothy (*Crypsis schoenoides*), and Smart Weed (*Persicaria punctate*).

Figure 4. Examples of arthropods collected from pitfall traps and keyed to family level

Results

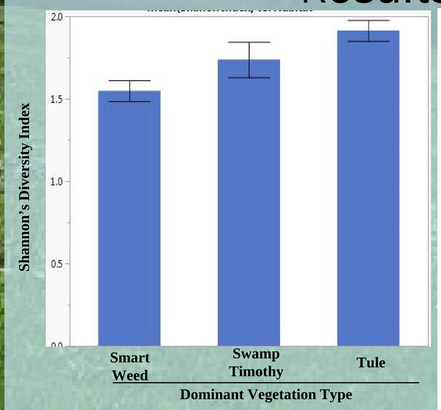

Figure 4. Evaluation Shannon Index of Diversity shows results of a general linear model with a significant effect of dominant vegetation type on arthropod diversity ($F_{1,2}$=5.0628, p=0.0180). Post hoc analysis of Least Squared Means Differences among habitats showed that the Tule habitat was associated with significantly higher arthropod diversity than the Smart Weed habitat but the Swamp Timothy habitat was not different from either Tule or Smart Weed.

Discussion

- The greatest arthropod diversity was found in Tule habitat over the seven week period and was significantly higher than the Smart Weed habitat
- Tule is a large plant that has more ground coverage that Smart Weed at this site which could provide more biomass for food, more complex habitat, or greater protection from predation
- Because this study had a smaller sample size, additional sites could be studied to increase the sample size and potentially better detect differences in biodiversity of arthropods and other taxa in these habitats

References

Siemann, Evan. "Experimental Tests of Effects of Plant Productivity and Diversity on Grassland Arthropod Diversity." Ecology, vol 79, no. 6, 1998.

Acknowledgements

We would like to thank the SSU SOURCE program for support of this research. We would also like to thank Sharon Kahara for access to the field site.