

Invasives and Macroinvertebrates

Based on what you know about macroinvertebrates as well as the vegetation along the Hudson, you might be wondering what kinds of organisms live in the different areas. During this activity, you will find out by graphing the different invertebrates found in water chestnut (*Trapa natans*) and water celery (*Vallisneria americana*).

Before you begin, make a prediction about which habitat you would expect to see more invertebrates: _____

Why? Justify your answer. _____

Using Excel, open the data set titled “Invasives and Macroinvertebrates”. Your teacher will decide whether you will use the data from Cruger Island or Esopus Meadows. Create a graph that shows the difference in macroinvertebrate numbers between the two vegetation types. Then, using the information you found and the information below on the plant biomass in the study site, answer the questions below. If you don’t have access to Excel, your teacher will give you a copy of the graphs.

The data that you are using was collected by Dr. Strayer and his colleagues during the summer of 2000 in Cruger Island and Esopus Meadows. Both of these study sites are freshwater tidal sites in the Hudson River. Macroinvertebrate samples were collected at twelve sites within each pair of plant beds. Animals were collected from the plants and the sediment at each sampling site. Sampling was done in July before the vegetation was fully developed and repeated in August when the plants had reached their peak.

Table: Plant Biomass in the study sites

Plant biomass is the average weight of several samples of vegetation growing in one square meter of an aquatic habitat. In this study, the researchers collected samples at the different sites by clearing a square meter of area, taking the vegetation back to the lab, and drying it in a special oven to remove the weight of the water. That way, when the plants are weighed, you only get the total dry mass (DM) in grams (g), which makes it easier to compare the two types of plants. A biomass of 1g/m² means that it’s kind of hard even to find plants, while a plant bed with 500 g/m² is too thick to walk through.

Site	Plant Species	Edge/Interior	Plant biomass: July (g DM m ⁻²)	Plant biomass: August (g DM m ⁻²)
Cruger Island	<i>Trapa</i>	Edge	113	516
		Interior	178	979
	<i>Vallisneria</i>	Edge	20	21
		Interior	14	111
Esopus Meadows	<i>Trapa</i>	Edge	13	49
		Interior	195	514
	<i>Vallisneria</i>	Edge	4.3	2.1
		Interior	1.4	6.4

Questions:

1. Was there more water chestnut or water celery at the two sites?
2. Which type of plant (water chestnut or water celery) had higher levels of plant biomass? Thinking about the physical structure of this plant, why does it have higher biomass?
3. When did the highest level of biomass occur? Where did the highest levels of biomass occur (edge or interior)?
4. In which habitat were more invertebrates found?
5. Which invertebrate family was most common? Which habitat did it prefer?
6. Which invertebrate family was least common? Which habitat did it prefer?
7. How do these results compare with the invertebrate samples that you collected outdoors? Are they similar or different? Which groups do you have in common with the researchers?
8. What effect do you think the plant biomass could have on the macroinvertebrate numbers?
9. What other factors might play a role in the differences in invertebrate numbers?
10. A study by Feldman (2001) in the journal *Hydrobiologia* found some very different results. Feldman studied a site in the upper, non-tidal portion of the Hudson River, and found that the water celery beds supported two- to sixfold more invertebrates than the water chestnut beds. What do you think could be the reason that the results are so different from the study you examined?
11. Compare your results with another group that graphed the data from the other study site. How are your findings similar and how are they different?
12. What relationship do you think exists between plant biomass and macroinvertebrate density? Why?
13. Water chestnut is an invasive plant that is bad for recreation and bad for the native plants that it crowds out, but good for at least some kinds of invertebrates. Can you think of other examples of invasive plants or animals that have some good effects and some bad effects?

Reference: Strayer, D.L., Lutz C., Malcom H.M., Munger K. and W.H. Shaw. 2003. Invertebrate communities associated with a native (*Vallisneria americana*) and an alien (*Trapa natans*) macrophyte in a large river. *Freshwater Biology*, 48, 1938-1949.

Feldman, R.S. 2001. Taxonomic and size structures of phytophilous macroinvertebrate communities in Vallisneria and Trapa beds of the Hudson River, New York. *Hydrobiologia*, 452, 233-245.