ENERGY IN A SALT MARSH

Today we’re going to be looking at how energy transfers from one organism to another. Each person will be assigned a certain plant/animal found in a Salt Marsh. The person who is the marsh grass, or autotroph, in the food chain will be given *$1,000 to represent that it is making use of 100% of the sun’s energy*. The “animals” that are higher up on the food chain (as a higher trophic level), will start without any money because they rely on the autotroph for their energy. It is a cruel world out there and those lower on the food chain will ultimately meet their match!

**Prelab Questions:**

*Define:*

Autotroph/producer:

Heterotroph/consumer:

1. *Secondary consumer:*
2. *Tertiary consumer:*

Predator:

Prey:

1. What does the money represent?
2. Why do the animals that are high on the food chain rely on the autotrophs?

**Procedure:**

PREDATOR-PREY SENARIOS

**Encounter 1:** The marsh grass has no real defense against the grasshopper so it is no surprise the grasshopper eats the marsh grass easily. The Marsh grass will only give 10% of its “energy” to the grasshopper; the other 90% is lost as heat.

* Marsh grass gives 10% of his money to the grasshopper

**Encounter 2:** The grasshopper wore out his luck and found himself the prey of none other than the mouse. The mouse took the grasshopper by surprise and ate him. The grasshopper had already lost 90% of its energy to heat, but he did give 10% of the “energy” he had gotten from the marsh grass to the mouse.

* Grasshopper gives 10% of his money to the mouse

**Encounter 3:** The mouse was pretty sly in his attack on the grasshopper; however, even the mouse was not safe in the presense of the marsh hawk. Once the mouse realized the hawk had eyed it; the mouse tried to get away, but he was no match for the marsh hawk. The mouse had used lots of its energy too, 90%, but it was able to give 10% of the “energy” it had gotten from the grasshopper to the marsh hawk.

* Mouse gives 10% of his money to the marsh hawk

**Results:**

|  |  |  |
| --- | --- | --- |
| **Animal** | **Total amount of “energy” transferred to the predator (10%)** | **Amount of” energy” prey had to start (100%)** |
| **Marsh Grass** |  | 1,000 |
| **Grasshopper** |  |  |
| **Mouse** |  |  |
| **Marsh Hawk** | ----------------------- |  |

Draw an *energy pyramid* to show how energy moved during the “predator-prey” encounters.

**Conclusion/Discussion:**

1. Did the prey keep most of its energy, or did it give most of its energy to its predator?
2. Where does the “lost energy” go?
3. Predict. Would there be more or less marsh hawks than grasshoppers? Why?
4. Consider the following food chain: CORN 🡪 MICE 🡪 SNAKES 🡪 HAWKS

If the total amount of energy captured by the corn is 1,000,000 calories per day, and only 10% of the energy is passed on at each higher trophic level, calculate:

1. How much energy (in calories) would be available per day at each higher trophic level for: mice, snakes, and hawks.
2. How many hawks this ecosystem could support if the each hawk needs 500 calories per day to survive.
3. Which diet, plant based diets, or animal based diets make best use of the energy in our environment. Explain.