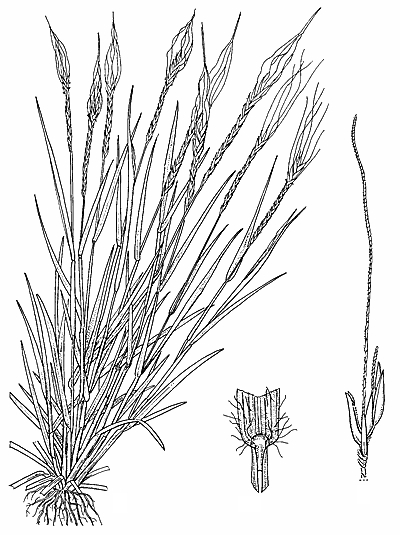
Biology from Hawaii Name

2014

**Ecological Pyramids**

**Introduction**



*Pili* grass (*Heteropogon contortis*)

*Manana* Island is suitable habitat for many species: grasses, bushes, rabbits, mice, *iwa* birds, ants, etc. But which species are common and which ones are rare? For example, if you wanted to collect *pili* grass to thatch a roof, would you be able to get a lot on *Manana* Island?

To answer such questions, scientists estimated the **biomass** of different species on *Manana* Island. They randomly chose 12 **sample** areas that could represent the rest of the island. Every living thing in the 10m x 10m areas was collected, species sorted, dried, then weighed. Multiplying to the full area of *Manana* Island, scientists could estimate the total biomass of each species on the entire island. The data (below) are in pounds for greatest reification.

**Procedure**

1. Group the *Manana* Island species by **trophic level**:

• producers (can obtain energy and raw materials from non-living things)

• primary (1°) consumers (only eat producers)

• secondary (2°) consumers (eat 1° consumers and below)

• tertiary (3°) consumers (eat 2° consumers and below)

• quaternary consumers (you get the idea)

2. Graph the total mass of each trophic level on the axes provided.

**Producers**

**Results**

1. Group these **modern** species by trophic level.

|  |  |  |
| --- | --- | --- |
| **Scientific name** | **Common name** | **Mass (lbs)** |
| *Argemone glauca* | *pua kala*/Hawaiian poppy | 2071  **1° consumers** |
| *Boerhavia coccinea* | red spiderling | 302 |
| *Cenchrus echinatus* | sandspur grass | 10722 |
| *Ctenocephalides felis* | cat flea (can live on rabbits) | 7 |
| *Fregata minor* | *‘iwa*/frigate bird | 121 |
| *Gryllodes sigillatus* | cricket | 464 |
| *Heteropogon contortus* | *pili* grass | 4190  **2° consumers** |
| *Mus musculus* | mouse | 451 |
| *Oryctolagus cuniculus* | European rabbit | 909 |
| *Prosopis pallida* | *keawe*/Mesquite | 1631 |
| *Solenopsis geminata* | red fire ant | 49 |
| *Xenopsylla cheopis* | rat flea (can live on mice) | 4 |

**Results (continued)**

2. Graph the biomass of each modern trophic level on the axes provided.

Title:

2° consumers

1° consumers

producers

0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000

Biomass (lbs)

**Producers**

3. Group these **ancient** species by trophic level.

**1° consumers**

|  |  |  |
| --- | --- | --- |
| **Scientific name** | **Common name** | **Mass (lbs)** |
| *Argemone glauca* | *pua kala*/Hawaiian poppy | 1937 |
| *Asio flammeus sandwicensis* | *pueo*/Hawaiian owl | 156 |
| *Buteo solitaris* | *‘io*/Hawaiian hawk | 377 |
| *Ciridops anna* | *‘ula‘aihawane* | 2170 |
| *Eupithecia orichloris* | *carniverous caterpillar* | 39  **2° consumers** |
| *Heteropogon contortus* | *pili* grass | 16290 |
| *Jacquemontia sandwicensis* | *pa‘uohi‘iaka* | 10901 |
| *Pritchardia martii* | *loulu* palm | 27851 |
| *Sida fallax* | *‘ilima* | 1104 |
| *Thambetochen xanion* | *moa nalo* | 3609 |

4. Graph the biomass of each ancient trophic level on the axes provided.

Title:

2° consumers

1° consumers

producers

0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000

Biomass (lbs)

**Discussion**

1. Compare the modern and ancient trophic level graphs. Why are the same shape?

2. Compare the modern and ancient trophic level graphs. Why is the ancient graph bigger?

3. As animals eat, they take mass from a lower trophic level and add it to their own. On average, how many pounds of producers are needed to support 1 pound of primary consumer? Calculate using both modern and ancient data. Please show your work.

4. How many pounds of primary consumer are needed to support 1 pound of secondary consumer? Again, use both modern and ancient data. Please show your work.

5. During the modern era, rabbits were introduced to *Manana* Island for food. The hope was that humans may one day inhabit the island, but there were never enough rabbits to feed a family. Why?

6. If the family from question #5 ate plants instead of rabbits, how many pounds of humans could *Manana* Island support?

7. Why is being a vegetarian better for the environment than being a carnivore?

|  |  |  |
| --- | --- | --- |
| **Grading** | points worth | points earned |
| **Results**  *group species by trophic level*  *clearly graph the mass in each trophic level, title the graphs* | **4** |  |
| **Discussion**  *thorough answers use vocabulary from class*  *show work where appropriate* | **6** |  |
| **Total** | **10** |  |