

Ecology and Energy Flow DBQ

Name: _____

Data and information

The resident orcas of Southern Puget Sound are the top predators of the Puget Sound food chain. Their preferred food is salmon, whose numbers have been seriously declining over the last decade. The salmon feed mostly on zooplankton, in particular euphausiid krill, which in turn feed on phytoplankton, the primary producers of the marine ecosystem.

Roughly 1,700,000 kcal/m²/yr of sunlight is used by 809 g/ m² of primary producers, roughly 17,597 individuals per square meter. The primary producers are able to convert 8,863 kcal/m²/yr of the solar energy into chemical energy. The 912 primary consumers per square meter (37 g/ m² of biomass) are able to utilize 1,478 kcal/m²/yr of that energy. However, only 67 kcal/m²/yr is passed on to the 11 g/ m² of secondary consumers. The 0.5 secondary consumers per square meter are eaten by the 0.03 third level consumers per square meter. These tertiary consumers are able to acquire 4.9 kcal/m²/yr by eating the second level consumers, which provided energy for them to maintain their 2 g/ m² of biomass.

Your Task

Consider the trophic transfer efficiency for the Puget Sound orca food chain described above. Each of the species described above is the dominant species in their trophic level so understanding energy transfers among these four species goes along way toward understanding energy transfers in the whole ecosystem. Based on the information provided below, your job is to:

- Draw the food chain described.
- Create a data table that includes each organism in the food chain, its trophic level, the energy it is able to acquire, its biomass and the number of individuals per square meters (use the 10% rule to calculate, as necessary).
- Draw the pyramid of numbers
- Draw the pyramid of biomass.
- Draw the pyramid of energy (with a calculation of the percent of energy transferred from each trophic level to the next)

For each pyramid, please:

- Include a title
- Be neat. Drawings should be clear with straight lines (use a ruler)
- Include the actual numbers (with units) inside or next to the box on the ecological pyramid.
- Write a brief evaluation of why the pyramids do or do not make sense given the patterns of trophic efficiencies described in your notes and textbook.