**Ecology of Animal Communities**

***Section 1:***

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| In the 1920’s an ecologist named Charles Elton went on scientific expeditions to the Artic Island of Spitsbergen. Elton was interested in the dynamics of communities of organisms – how they interacted with one another. He looked at which organisms ate which other ones. During the expeditions to Spitsbergen he made thousands of measurements and collected vast amounts of data.  While looking at which organisms ate which other ones, Elton collect data on the numbers of individuals of each species in the ecosystem. His data looked something like this for the mass of organisms in a given area in his study:  Grass = 1489 kg/km2 (Grass are “producers” – they convert sunlight into usable energy).  Snowshoe Hare = 153 kg/km2 (Snowshoe Hares eat grass, ecologists label them “primary consumers”).  Red Fox = 15 kg/km2 (Red Fox eat Snowshoe Hares and ecologists label them as “secondary consumers”.)  ***On your doodle sheet describe what type of pattern you observe? Come up with a way to represent this pattern using a drawing/diagram. Record that on your doodle sheet.*** |

***Section 2:***

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| No matter which ecosystems he studied Elton found the same kind of pattern. If the ecosystem had grasses (plants) as the producers, which were eaten by grasshoppers and other insects, which in turn were eaten by frogs, and frogs were eaten by snakes, and finally snakes were eaten by hawks – you still found a pattern similar to the one with grass, Snowshoe Hares, and Red Fox.  If you looked at an oak tree, it might have 100,000 leaves. The leaves from 2 trees (200,000 leaves) provide food for 1,000 caterpillars. The caterpillars provide food for 20 small birds and the small birds provide enough food for 1 hawk.  When scientists examine the biomass of producers (plants), they find it is about 10 times that of the biomass of the things that eat the producers – the primary consumers. In other words, the biomass of primary consumers was only about one tenth (1/10th) of the biomass of the producers. They found that the biomass of secondary consumers was only about one tenth (1/10th) of the biomass of the primary consumers. And the tertiary consumers were only about one tenth (1/10th) of the biomass of the organisms they ate.  ***We’ve been discussing energy, not mass so far. What is the relationship between biomass and energy? Record your ideas on your doodle sheet.*** |

*Section 3:*

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| It doesn’t matter if you are talking about an ecosystem in which deer eat plants and mountain lions eat deer, or if it is an ecosystem in which it is insects eating grasses and shrews eating the insects and coyotes eating the shrews – the pattern is always similar.  In his book, Animal Ecology (1927), Elton quoted two Chinese proverbs:  “The large fish eat the small fish; the small fish eat the water insects; the water insects eat plants.”  “One hill cannot shelter two tigers.”  ***On your doodle sheet, describe in what ways these proverbs communicate the patterns that ecologists have found in ecosystems?*** |

**References:**

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Lindeman, R. L. (1941). Seasonal food-cycle dynamics in a senescent lake. *American Midland Naturalist*, 636-673.

Lindeman, R. L. (1942). The trophic‐dynamic aspect of ecology. *Ecology*, *23*(4), 399-417.