ISLAND COLONIZATION

Introduction:

Biodiversity is a measure of amount of variety in organisms, generally the variety in an ecological community. Biodiversity takes into account both the total number of different species (species richness) and the relative abundance of different species. Biodiversity tends to increase with habitat size, environmental variation (for example, topographic relief or climatic microclimates), and latitude (for example, there are more species in the tropics than at cooler climates).

Some of the most interesting research on biodiversity has examined species richness on island habitats (e.g., Simberloff and Wilson's 1970). The first thing to consider is that islands are colonized by migration of certain species from mainland source populations, and thus the biodiversity found on an island is a function of how close the island is to the mainland. This is due to the fact that dispersal, the movement of species to new islands, is more frequent and successful the closer these habitats are to potential source populations. Secondly, larger islands tend to have more species than smaller islands. This is because there is more habitat diversity and therefore there are more resources available.

Biodiversity on these island habitats is thought by many researchers to reach equilibrium, maintained by the new arrival of some species (immigration) and the extinction of populations of some species presently on the islands.

Though extinction of local populations may occur, dispersing individuals from other habitat sources, can reintroduce the same species. This is referred to as the **rescue effect**. The rescue effect can be important in maintaining higher levels of biodiversity in smaller habitats than expected when nearby source populations of species can disperse to these habitats. The rescue effect is thought to be closely linked with proximity and dispersal abilities of source populations. This has implications for conservation biology, since the closer two to more populations are to each other the less likely that any of them will suffer an extinction, since population A may be rescued via migration from individuals in population B.

Though studies such as Simberloff and Wilson's original model were for islands, ecologists have found the same trends on mainland habitats. Mainland habitats often have large environmental variations within a single ecosystem, creating mosaics of ecological island-like habitat patches. Also, further alterations of habitats by humans, now estimated to have greatly altered at least 50% of all terrestrial ecosystems, has fragmented many formerly large and continuous habitats. These anthropomorphic (human induced) alterations increase island-like separations of mainland populations, which pose dispersal problems and reductions and extinctions for many species. Dispersal abilities vary widely from species to species. A formidable barrier to dispersal for one species (ex. snails crossings roads), may be negligible to other species that can dross mountains or oceans without much difficulty (ex. many birds).

Materials Needed:

Masking tape
Meter sticks
Containers 3 of each: small, medium, & large (~ 250, 600, & 1000 ml in size)
A variety of materials to represent 10 different species: nuts, beans, paper wads, paper clips, rubber or wood stoppers, Styrofoam packing peanuts, etc.

Procedure & Discussion:

Each group will arrange simulated island groups consisting of a small, a medium, and a large container. Placement of groups is as follows: One group at 1.0 meter, one group at 1.5 meters, and one group at 2.0 meters.

Place a small piece of tape to measure the distances for each island group. The three containers (islands) will be placed so that they just touch each other.

State your predictions:
In one or two sentences, state your predictions (hypotheses) as to what your expected results will be concerning the number of species colonizing each habitat type based on the size and distance of the islands.

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Collect 20 individuals of each species designated by materials chosen by your instructor. Ten of each species will be considered female organisms and the other 10 male organisms.

Stand at the 1 meter distance and then toss the 10 females toward the island group. Record your results. Repeat for the 1.5 and 2 meter distances. Repeat this process for the males. You are considered the mainland from which the pioneer species are dispersed.

Record your results in the two tables:

1) number of species by island size and distance
2) number of individuals per species by island size and distance.

Name___________________________

Island Colonization Report Sheets

Table 1:

	Near Islands			Middle Islands			Far Islands		
Species	Small	Med	Large	Small	Med	Large	Small	Med	Large

Table 2:

Island size, distance	Total number of successfully dispersed species (both genders represented)
small, near	
small, middle	
small, far	
medium, near	
medium, middle	
medium, far	
large, near	
large, middle	
large, far	

1. Were more species found to colonize near islands over far?

2. Did size of the island habitats make any difference in the rate of species colonizations?

3. What would you alter in this experiment to test these predictions in the future?

4. What actual habitats and what types of organisms would you consider testing for these questions?

5. How might the **<u>rescue effect</u>** be incorporated into this simulation?