

Reproductive Isolation in Salamanders

Allopatric speciation begins when populations become geographically isolated, preventing mating between individuals in different populations and thus stopping gene flow. It is logical that as distance between populations increases, so will their degree of reproductive isolation. To test this hypothesis, researchers studied populations of the dusky salamander (*Desmognathus ochrophaeus*) living on different mountain ranges in the southern Appalachians.

The researchers tested the reproductive isolation of pairs of salamander populations by leaving one male and one female together and later checking the females for the presence of sperm. Four mating combinations were tested for each pair of populations (A and B) - two *within* the same population (female A with male A and female B with male B) and two *between* populations (female A with male B and female B with male A).

The researchers used an index of reproductive isolation that ranged from a value of 0 (no isolation) to a value of 2 (full isolation). The proportion of successful matings for each mating combination was measured, with 100% success=1 and no success=0. The reproductive isolation value for two populations is the sum of the proportion of successful matings of each type within populations (AA+BB) minus the sum of the proportion of successful matings of each type between populations (AB+BA). The results are summarized in Table 1

Table 1 Distance and reproductive isolation data for 27 pairs of dusky salamander populations

Geographic Distance (km)	15	32	40	47	42	62	63	81	86	107	107	115	137	147
Reproductive Isolation Value	0.32	0.54	0.50	0.50	0.82	0.37	0.67	0.53	1.15	0.73	0.82	0.81	0.87	0.87
Distance (continued)	137	150	165	189	219	239	247	53	55	62	105	179	169	
Isolation (continued)	0.50	0.57	0.91	0.93	1.5	1.22	0.82	0.99	0.21	0.56	0.41	0.72	1.15	

1. a) State the researchers' hypothesis, and identify the independent and dependent variables in this study.
b) Explain why the researchers used four mating combinations for each pair of populations.
2. Calculate the value of the reproductive isolation index if (a) *all* of the matings within a population were successful, but *none* of the matings between populations were successful; (b) salamanders are equally successful in mating with members of their own population and members of another population.
3. Make a scatter plot of the data.
4. a) Explain any pattern indicating a possible relationship between the variables.
b) Propose a hypothesis about the possible cause of such a relationship.