Salamanders spell out evolution in action

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Lungless salamanders (*Ensatina eschscholtzii*) live in a horseshoe-shape region in California (a 'ring') which circles around the central valley. The species is an example of evolution in action because, while neighboring populations may be able to breed, the two populations at the ends of the arms of the horseshoe are effectively unable to reproduce. New research published in BioMed Central's open access journal *BMC Evolutionary Biology* showed that this reproductive isolation was driven by genetic divergence rather than adaption to different ecological habitats.

Researchers used genetic variation to determine 20 distinct populations of salamanders and focused in detail at 13 zones where the populations were able to cross breed. Results showed that the diversification of salamander populations was associated with significant genetic divergence, both nuclear and mitochondrial, and also with strong ecological divergence, in the plants and climate within their habitats.

However the ability to cross-breed was only associated with nuclear divergence. At contact zones around the ring up to 75% of the salamanders were hybrids, including second generation and back crosses to the parental populations but at the ends of the ring only 5.7% were hybrids and all of these were first generation F1 hybrids which rarely reproduced.

Dr Pereira said, "Evidence from *E. eschscholtzii* shows that the ecological environment, which may drive species formation, does not necessarily drive reproductive isolation. Instead, reproductive isolation of this 'ring' species of salamanders appears to be due to processes such as length of

time in geographic isolation which are related to overall genetic divergence."

More information: Predictors for reproductive isolation in a ring species complex following genetic and ecological divergence, Ricardo J Pereira, William B Monahan and David B Wake, *BMC Evolutionary Biology* (in press)

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