What can 'ring species' teach us about evolution?

March 12 2013, by Yaneer Bar-Yam

Ten thousand years ago, at the end of the last ice age, a species of greenish warblers lived in a forest south of the Tibetan Plateau. As the ice receded, the forest grew to form a ring around the plateau—and so did the songbird's habitat. Two thousand years later, birds living on the eastern edge of the expanding ring once again met those living in the western edge, only now they couldn't mate. Although still members of the same species, something had changed. What led to their genetic incompatibility?

In a new article, researchers of the New England Complex Systems Institute (NECSI) and two Brazilian universities—the Universidade de São Paulo and the Universidade Estadual de Campinas—offer important clues to the warblers' divergent fates, demonstrating how they successfully modeled the bird range-expansion that eventually led to their genetic split.

In biology, a ring species is a connected series of neighboring populations. While each can breed with those nearby, in the end at least two populations are no longer able to interbreed as both time and their environment has left them too distantly related, even though they are technically the same species.

"Ring species provide a unique opportunity to test our understanding of the way species form," said Yaneer Bar-Yam, President of NECSI and a co-author of the paper. "Geography and barriers like the Tibetan plateau can play an important role in biodiversity and speciation. As scientists,

being able to simulate what happened provides confidence that we understand how it works."

The NECSI-São Paulo-Campinas collaboration found that the persistence of the ring species depended on a particularly large habitat at the point at which the eastern and western branches met north of the plateau. The authors predict the ring will ultimately split into distinct species between ten thousand to fifty thousand years from now.

Their work builds on a study demonstrating how the same model can account for the formation of multiple species and the geographical structure of biodiversity around the world.

More information: A. B. Martins, M. A. M. de Aguiar, and Yaneer Bar-Yam, Evolution and Stability of Ring Species. *PNAS* 201217034 (March 11, 2013).

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