Genetic study of silkworm helps unravel its long history of domestication

July 3 2018, by Bob Yirka

Credit: CC0 Public Domain

A team of researchers affiliated with several institutions in China has

conducted a genetic study of the silkworm in hopes of better understanding its long historical ties to humans. In their paper published in the journal *Nature Ecology & Evolution*, the group describes their study and what they found.

There are many varieties of silkworms, but only one makes silk that is mass-producible: Bombyx mori. Because of that unique characteristic, B. mori has a very long history of domestication by humans. Most scientists in the field suggest that the relationship began approximately 5000 years ago, and that it likely started in China. In this new effort, the researchers sought to trace the origins of the silkworm to its first domestication to learn more about its history over the past several thousand years.

The genetic study consisted of collecting silkworm samples representing 137 strains. Those samples included strains that were locally bred and even some representing recently improved strains. The team also collected samples of strains that have not been domesticated. They then sequenced the DNA of all the samples and compared them to one another. The group was able to use the DNA data to construct geographic maps that showed the history of the silkworm as it spread between geographic areas.

The researchers were able to see patterns over time of silkworms being carried eastward, mostly from China to other places along the ancient Silk Road. And while their data strongly points to China as the site of first domestication, the researchers acknowledge that their data still does not provide definitive proof of it. The researchers were also able to trace changes to the silkworms as they became domesticated. They have lost their ability to survive in the wild, the team notes, due to such changes as wings that no longer support flight. They have also lost color, and of course, produce silk fibers that are much larger than needed for protection in their cocoons. The team notes that they were also unable to

pinpoint just how long ago first domestication of silkworms occurred, but suggest it was likely in agreement with prior estimates.

More information: Hui Xiang et al. The evolutionary road from wild moth to domestic silkworm, *Nature Ecology & Evolution* (2018). DOI: 10.1038/s41559-018-0593-4

Abstract

The Silk Road, which derives its name from the trade of silk produced by the domestic silkworm Bombyx mori, was an important episode in the development and interaction of human civilizations. However, the detailed history behind silkworm domestication remains ambiguous, and little is known about the underlying genetics with respect to important aspects of its domestication. Here, we reconstruct the domestication processes and identify selective sweeps by sequencing 137 representative silkworm strains. The results present an evolutionary scenario in which silkworms may have been initially domesticated in China as trimoulting lines, then subjected to independent spreads along the Silk Road that gave rise to the development of most local strains, and further improved for modern silk production in Japan and China, having descended from diverse ancestral sources. We find that genes with key roles in nitrogen and amino acid metabolism may have contributed to the promotion of silk production, and that circadian-related genes are generally selected for their adaptation. We additionally identify associations between several candidate genes and important breeding traits, thereby advancing the applicable value of our resources.