

Western Painted Turtle genome decoded: Scientist uncover evolutionary history behind common turtle's novel traits

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Western Painted Turtle. Credit: 2006 Don VandeBergh, Oregon Department of Fish & Wildlife

Scientists have recently decoded the genome of the Western Painted Turtle, *Chrysemys picta bellii*, one of the most widespread, abundant and well-studied turtles in North America. This freshwater turtle is only the second reptile species for which complete genome sequences have been assembled and analyzed, behind the green anole lizard.

"Turtles are an exceptionally old group of organisms, and they're also evolving very slowly," said University of Hawai'i at Mānoa Assistant Professor of Biology Robert C. Thomson, who has worked on the Western Painted Turtle project since 2008. Turtle genomes evolve at about one-third the rate seen in humans, and roughly one-fifth the rate of other reptiles such as the python.

Thomson led the analysis of the turtle's rate of evolution and [phylogenetic relationships](#)—the pattern of evolutionary divergence between turtles and other groups of organisms. These analyses indicate that turtles' closest living relatives are crocodiles and birds, not snakes and lizards as some previous studies have suggested.



Western Painted Turtle Hatchlings. Credit: 2006 Don VandeBergh, Oregon Department of Fish & Wildlife

The research team announced the Western Painted Turtle sequencing in a March 28 paper in the scientific journal *Genome Biology*.

"In many respects, turtles are a very strange group of animals," Thomson

said. "They have a number of novel traits that we can learn from." For the Western Painted Turtle, these novel traits include the ability to hibernate through long winters by burying themselves in near-freezing mud beneath streams and ponds, surviving with almost no oxygen for up to four months—longer than any other known tetrapod.

Comparative genomic information about animal species is often valuable for scientists working on certain human health-related problems. Understanding how turtles protect their [vital organs](#) during periods of [oxygen deprivation](#) may one day improve treatment for human victims of heart attack or strokes, researchers say. This majority of the turtle gene sequencing effort was completed at Washington University's Genome Institute, which is one of three National Institutes of Health (NIH)-funded sequencing centers in the United States.

No freshwater turtles are native to Hawai'i, although three species have been introduced, from the pet trade and for food. Five types of sea turtles occur in the Pacific waters off Hawai'i's coasts.

More information: Shaffer, H. et al. 2013. The western painted turtle genome, a model for the evolution of extreme physiological adaptations in a slowly evolving lineage. *Genome Biology* 14:R28
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