

Assessment of time-dependent evolutionary rates of rodent mitochondrial DNA based on paleoclimatic calibrations of the Japanese Islands

*Hitoshi Suzuki¹

1.Faculty of Environmental Earth Science, Hokkaido University

Use of the reliable time-dependent evolutionary rates of mitochondrial DNA might allow us to built realistic evolutionary scenario with phylogenetic inferences, covering a broad time scale based on the phylogenetic inferences. Other than using fossil evidence, it is possible to estimate evolutionary rates by relying on the well-established temporal framework of the Quaternary glacial cycles that would likely have promoted both rapid expansion events and interisland dispersal events. We are now focusing on the mitochondrial cytochrome *b* (*Cytb*; 1140 bp) sequences of a temperate species of wood mice (*Apodemus argenteus* and *A. speciosus*) from the Japanese Islands to assess evolutionary rates (site/million years) and obtained ca. 11% and 3% under assumption of rapid expansion and a priori information of the Quaternary climate fluctuation around 10 and 130 k years ago (ka), respectively (Suzuki et al., 2015). In addition, assuming that land-bridge like structures were created intermittently at glacial maxima of 100 k year intervals and shaped divergence patterns of the *Cytb* sequences of the larger Japanese wood mice *A. speciosus*, we obtained estimated evolutionary rates of 3.3 to 2.7% with presumed calibrations of 140, 250, 350 and 440 ka, through comparison of sequences from peripheral remote islands. In survey of rapid expansion signals in the lesser Japanese wood mouse *Apodemus argenteus* and three continental congeneric species from Asia and Europe, three levels of *t* values can be categorized into three levels, 3.9, 5.0-5.7 and 7.8-8.1. Adopting the idea in which the climate turned to be warm after preceded time of rapid cooling at 15, 53, 82 and 119 ka based on available pollen fossil evidence of trees including *Quercus* species, the evolutionary rates were estimated to be 11.4, 4.4-5.0, 3.1%, respectively. Here we propose the use of the time-dependent evolutionary rates (11~2.7%/site/million years) for the time span of 10 to 450 ka, hoping that it can be applicable to other species of murine rodents including mice and rats.

Reference: Suzuki Y, Tomozawa M, Koizumi Y, Tsuchiya K, Suzuki H (2015) Estimating the molecular evolutionary rates of mitochondrial genes referring to Quaternary Ice Age events with inferred population expansions and dispersals in Japanese *Apodemus*. *BMC Evolutionary Biology*, 15,187.

Keywords: mitochondrial DNA, evolutionary rate, Japanese Islands, *Apodemus* species, Quaternary glaciation