Phylogenetic relationships between isolated populations of the limestone-dwelling microsnail Gyliotrachela hungerfordiana (Gastropoda: Vertiginidae)

Abstract

The vertiginid species Gyliotrachela hungerfordiana, an obligate limestone-dwelling microsnail, is relatively widespread and is found on a large number of isolated limestone hills in Peninsular Malaysia. To elucidate the pattern of colonization of these hills, we conducted a molecular phylogenetic analysis on G. hungerfordiana subpopulations from 15 separate limestone outcrops. As outgroups, we also included five related Peninsular Malaysian Vertiginidae (Gyliotrachela frequens, Gyliotrachela transitans, Gyliotrachela salpinx, Gyliotrachela depressispira and Paraboysidia tarutao), one population each. A combined analysis of nuclear (internal transcribed spacer 1) and mitochondrial (cytochrome c oxidase 1) sequences showed that (1) G. hungerfordiana is monophyletic; (2) there is a clear geographical pattern in the phylogenetic relationships between G. hungerfordiana populations, with genetic distances increasing with geographic distance; (3) this pattern is disturbed by a few long-distance (north-west to south-east and north to south) colonizations.