

## **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.