

## **Phylogenetic position of Phthiraptera (Insecta: Paraneoptera) and elevated rate of evolution in mitochondrial 12S and 16S rDNA**

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### **Abstract**

Phthiraptera (chewing and sucking lice) and Psocoptera (booklice and barklice) are closely related to each other and compose the monophyletic taxon Psocodea. However, there are two hypotheses regarding their phylogenetic relationship: (1) monophyletic Psocoptera is the sister group of Phthiraptera or (2) Psocoptera is paraphyletic, and Liposcelididae of Psocoptera is the sister group of Phthiraptera. Each hypothesis is supported morphologically and/or embryologically, and this problem has not yet been resolved. In the present study, the phylogenetic position of Phthiraptera was examined using mitochondrial 12S and 16S rDNA sequences, with three methods of phylogenetic analysis. Results of all analyses strongly supported the close relationship between Phthiraptera and Liposcelididae. Results of the present analyses also provided some insight into the elevated rate of evolution in mitochondrial DNA (mtDNA) in Phthiraptera. An elevated substitution rate of mtDNA appears to originate in the common ancestor of Phthiraptera and Liposcelididae, and directly corresponds to an increased G + C content. Therefore, the elevated substitution rate of mtDNA in Phthiraptera and Liposcelididae appears to be directional. A high diversity of 12S rDNA secondary structure was also observed in wide range of Phthiraptera and Liposcelididae, but these structures seem to have evolved independently in different clades.