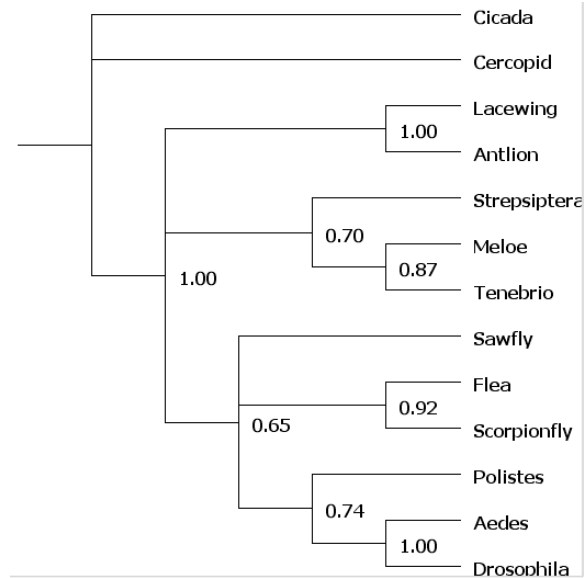


Assignment V – 16 Nov 2004

Use PAUP\* for the following problems. PAUP is installed on iNquiry (<http://inquiry.egg.isu.edu>). Data required for the following problem may be obtained from the course website. The problem requires the generation of some data – you will also provide an interpretation (2-3 paragraphs) of the final results. **The assignment is due on Tuesday, November 30.**



### ***The Bride of Strepsiptera***

In Assignment III, you found that the 18S gene in Strepsiptera has experienced many more substitutions than the same molecule in most other insects. It seems that the flies have also experienced an exceptional number of substitutions in the 18S genes. Because of these long branches, the Strepsiptera and the flies tend to form a clade when a phylogeny is inferred using NJ with a biased distanced estimate or when using MP. When an unbiased estimate is used with NJ, the Strepsiptera tend to cluster with the beetles. In Assignment IV, using ML analyses, you found that likelihood was able to recover a tree resembling the NJ tree with the Strepsiptera + beetles clade. In the Bayesian exercise, we also recovered a **Bayesian tree (shown above)** with the Strepsiptera + beetles clade, albeit with less than confidence-inspiring support: only 70% of sampled trees support this node. Can the bootstrap test help us find the true tree?

1. Given the 18S genes of insects, consisting of 13 taxa and 770bp, using the parameters identified by ModelTest to estimate of substitution rates for the given data set, construct the following trees:
  - a. MP bootstrap consensus (50%) tree with 10,000 replicates.
  - b. NJ tree; get branch length estimates for this tree.
  - c. NJ bootstrap consensus (50%) tree with 10,000 replicates; get branch length estimates for this tree.
  - d. ML bootstrap consensus (50%) tree with 100 replicates; get branch length estimates for this tree.
2. Discussion (2-3 paragraphs); use these questions to guide your thinking: You found that the long branches of flies and Strepsiptera are problematic for MP – are there other branches (hint: consider  $n$ ) that may indicate problems for another method? If there are differences between the NJ tree and the NJ bootstrap consensus tree, describe a method or test that can compare these trees (hint: consider interior branch lengths). Given all the trees you've constructed for these insects, what recommendation would you make for someone wanting to study this group to determine the placement of the Strepsiptera?