Conclusion

Although previous systematic work on the Arctiidae was largely intuitive and based on overall similarity, a number of the phylogenetic affinities suggested by previous authors are corroborated by our study. The monophyly of Arctiidae is supported, although not all features that are characteristic of the Arctiidae are synapomorphies for the family (e.g., heteroideous crochets, prothoracic glands). The presence of female dorsal pheromone glands with openings placed horizontally was the only uniquely derived synapomorphy for the family found in this study. There is strong support for the division of the Arctiidae into three monophyletic subfamilies: Syntominae, Lithosiinae, and Arctiinae (after Kitching and Rawlins 1998). The sister-group relationship between the Syntominae and Lithosiinae is likewise strongly supported and resolves the long-standing debate as to the affinities of the syntomines. There also has been uncertainty as to the affinities of the Pericopini. Characters of the larval mandibles provide strong support for their relationship with the Phaegopterini, Ctenuchini, and Euchromiini. This study also identifies some problematic taxa (e.g., Euchaetes group, Melese) that will benefit from more detailed studies with additional taxa and character systems. For example, genitalic homologies can be established within the Euchaetes group and the Phaegopterini s.l. (J. B. Simmons and S.J.W., unpublished data), which will allow for an additional, rich source of character information.

Debates about cladistic methodology include the relative advantages of additive versus nonadditive coding of multistate characters. Similarities among character states can lead to homology statements that are captured in additive coding of transformation series (Lipscomb 1992). However, problems arise when there is homoplasy. If convergent character states are derived from more than one precursor in different parts of the tree, then additive coding can distort the tree topology or, at the very least, reduce the consistency index unnecessarily (Hauser and Presch 1991). There were numerous times that convergent character states were derived from different precursors in this study (e.g., sclerotized or melanized parapatagia in Arctiini s.s. were derived from unmodified prothorax, whereas sclerotized or melanized parapatagia in Euchromiini were derived from unmelanized parapatagia), supporting our choice to treat multistate characters in a nonadditive fashion.