



Phylogeny and higher classification of the scale insects (Hemiptera: Sternorrhyncha: Coccoidea)*

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Abstract

The superfamily Coccoidea contains nearly 8000 species of plant-feeding hemipterans comprising up to 32 families divided traditionally into two informal groups, the archaeococcoids and the neococcoids. The neococcoids form a monophyletic group supported by both morphological and genetic data. In contrast, the monophyly of the archaeococcoids is uncertain and the higher level ranks within it have been controversial, particularly since the late Professor Jan Koteja introduced his multi-family classification for scale insects in 1974. Recent phylogenetic studies using molecular and morphological data support the recognition of up to 15 extant families of archaeococcoids, including 11 families for the former Margarodidae *sensu lato*, vindicating Koteja's views. Archaeococcoids are represented better in the fossil record than neococcoids, and have an adequate record through the Tertiary and Cretaceous but almost no putative coccoid fossils are known from earlier. In contrast, the sister group of the scale insects (Aphidoidea) has a more informative Jurassic and Triassic record. Relationships among most scale insect families are unresolved in phylogenetic trees based on nuclear DNA sequences, and most nodes in trees based on morphological data, including those from adult males, are poorly supported. Within the neococcoids, the Eriococcidae is not monophyletic and the monophyly of the Coccidae and Diaspididae may be compromised by the current family-level recognition of a few species-poor autapomorphic groups.

Key words: archaeococcoids, neococcoids, systematics

Introduction

Scale insects or coccoids (Coccoidea) are sap-sucking hemipterans with paedomorphic adult females (resembling nymphs), perhaps due to neoteny, and males that display complete metamorphosis (Gullan & Kosztarab,