



Zootaxa 3729 (1): 001–062
www.mapress.com/zootaxa/

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Monograph

ISSN 1175-5326 (print edition)

ZOOTAXA

ISSN 1175-5334 (online edition)

<http://dx.doi.org/10.11646/zootaxa.3729.1.1>

<http://zoobank.org/urn:lsid:zoobank.org:pub:CA0C1355-FF3E-4C67-8F48-544B2166AF2A>

ZOOTAXA

3729

Phylogeny of the tribe Archipini (Lepidoptera: Tortricidae: Tortricinae) and evolutionary correlates of novel secondary sexual structures

JASON J. DOMBROSKIE^{1,2,3} & FELIX A. H. SPERLING²

¹*Cornell University, Comstock Hall, Department of Entomology, Ithaca, NY, USA, 14853-2601. E-mail: jjd278@cornell.edu*

²*Department of Biological Sciences, University of Alberta, Edmonton, Canada, T6G 2E9*

³*Corresponding author*



Magnolia Press
Auckland, New Zealand

Accepted by J. Brown: 2 Sept. 2013; published: 25 Oct. 2013

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(*Zootaxa* 3729)

62 pp.; 30 cm.

25 Oct. 2013

ISBN 978-1-77557-288-6 (paperback)

ISBN 978-1-77557-289-3 (Online edition)

FIRST PUBLISHED IN 2013 BY

Magnolia Press

P.O. Box 41-383

Auckland 1346

New Zealand

e-mail: zootaxa@mapress.com

<http://www.mapress.com/zootaxa/>

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Abstract

We reconstructed a preliminary phylogeny for the economically important tribe Archipini (Lepidoptera: Tortricidae: Tortricinae) based on 135 exemplar species (including four outgroups) and a combined analyses of 28S rDNA and COI DNA using maximum parsimony, maximum likelihood, and Bayesian analyses. A summary tree was produced as the majority rule consensus tree by first assembling all clades that were present in more than 50% of analyses. Based on the results of the analyses, several taxonomic changes are suggested. After mapping secondary sexual characters (SSCs), host plant breadth, and geographic distribution onto the phylogeny, we examined correspondences among these traits using two-by-two χ^2 tests and ancestral character state reconstructions. Absence of SSCs was associated with decreased host plant breadth and colonization of the New World, but was not significantly associated with the presence of other SSCs. There is a strong likelihood of an Australasian origin for Archipini. We propose the synonymy of *Archebandemis* Mutuura with *Pandemis* Hübner (**new synonymy**); the synonymy of *Cudonigera* Obraztsov & Powell with *Choristoneura* Lederer (**new synonymy**); and elevation of *Anaphelia* Razowski, *Sacaphelia* Razowski, and *Zelotheres* Lederer to genera from subgenera of *Aphelia* Hübner (**revised status**). *Epiphyas* Turner, may be subordinate within *Clepsis* Guenée, but further study is needed to confirm this.

Key words: *Aphelia*, *Archebandemis*, *Choristoneura*, *Clepsis*, *Cudonigera*, *Epiphyas*, *Pandemis*

Introduction

The tortricid tribe Archipini includes many economically important species worldwide such as the smaller tea tortrix, *Adoxophyes honmai* Yasuda, 1998; the summer fruit tortrix, *Adoxophyes orana* (Fischer von Röslerstamm, 1834); the fruit tree leafroller, *Archips argyrospila* (Walker, 1863); the orange tortrix, *Argyrotaenia franciscana* (Walsingham, 1879); the spruce budworm, *Choristoneura fumiferana* (Clemens, 1865) species complex; the obliquebanded leafroller, *C. rosaceana* (Harris, 1841); the carnation worm, *Epichoristodes acerbella* (Walker, 1864); the light brown apple moth, *Epiphyas postvittana* (Walker, 1863); the greater tea tortrix, *Homona coffearia* (Nietner, 1861); the tea tortrix, *H. magnanima* Diakonoff, 1948; the green-headed leafrollers, *Planotortrix* spp.; and many others (Timm *et al.* 2010, Lee *et al.* 2005, Liu & Li 2002, Razowski 2002a, Freeman 1958). The tribe is found worldwide, although it has lower diversity in the Neotropics (Horak 1999). There are 187 genera and 1,709 species currently recognized (Baixeras *et al.* 2010), although this number is undoubtedly low since many undescribed species are known in collections and there has been limited collecting in large parts of the tropics (Razowski 2004). In Canada and the United States, there are 18 genera and 123 species (Pohl 2006).

Archipini were initially recognized by Pierce & Metcalfe (1922) based on the presence of an elongate signum and a bulbous capitulum in the female genitalia. However, several of the taxa placed in the tribe by Pierce and