



Revision of the North American Genera *Tetracis* Guenée and Synonymization of *Synaxis* Hulst with Descriptions of Three New Species (Lepidoptera: Geometridae: Ennominae)

CLIFFORD D. FERRIS^{1,2,3} & B. CHRISTIAN SCHMIDT^{4,5}

¹5405 Bill Nye Ave., R.R. 3, Laramie, WY 82070, USA. E-mail: cdferris@uwyo.edu

²Research Associate: McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, FL; C. P. Gillette Museum of Arthropod Diversity, Colorado State University, Ft. Collins, CO; Florida State Collection of Arthropods, Gainesville, FL

³To whom correspondence should be directed concerning all aspects of this paper other than the genus concepts and molecular analyses

⁴Canadian National Collection of Insects, Arachnids, and Nematodes, Agriculture and Agri-Food Canada, KW Neatby Bldg., C.E.F., Ottawa, Ontario, Canada K1A 0C6. E-mail: Chris.Schmidt@inspection.gc.ca

⁵To whom correspondence should be directed concerning the genus concepts and molecular analyses

Table of contents

Abstract	2
Introduction	2
Materials and methods	2
Genus <i>Tetracis</i> Guenée	4
Species-group definitions based on morphology	7
Key to species	7
Group I: <i>crocallata</i> , <i>cachexiata</i>	8
<i>Tetracis crocallata</i> Guenée	8
<i>Tetracis cachexiata</i> Guenée	9
Group II: <i>cervinaria</i> , <i>australis</i>	11
<i>Tetracis cervinaria</i> (Packard)	12
<i>Tetracis australis</i> Ferris, New Species.....	13
Group III: <i>fuscata</i> , <i>pallulata</i> , <i>mosesiani</i> , <i>jubararia</i> , <i>montanaria</i>	15
<i>Tetracis fuscata</i> (Hulst)	16
<i>Tetracis pallulata</i> Hulst	16
<i>Tetracis mosesiani</i> (Sala)	17
<i>Tetracis jubararia sericeata</i> (Barnes & McDunnough)	19
<i>Tetracis montanaria</i> Ferris, New Species	19
Group IV: <i>barnesii</i> , <i>formosa</i> , <i>hirsutaria</i> , <i>pallidata</i>	21
<i>Tetracis barnesii</i> (Hulst)	21
<i>Tetracis formosa</i> (Hulst)	22
<i>Tetracis hirsutaria</i> (Barnes & McDunnough)	23
<i>Tetracis pallidata</i> Ferris, New Species	25
Check List of North American <i>Tetracis</i>	35
Acknowledgments	35
References	36

Abstract

The genus *Synaxis* is synonymized with *Tetracis*. The thirteen North American species in genus *Tetracis* (some formerly in *Synaxis*) are discussed, including descriptions of three new species from western North America: *Tetracis australis*, *T. montanaria*, *T. pallidata*. Two additional species, “*Synaxis*” *triangulata* and “*S.*” *brunneilinearis* are excluded. A key to species, descriptions, check list, illustrations of adults and genitalia, and distribution maps are included. The formerly presumed lost types of the taxa *aurantiacaria*, *cervinaria*, and *jubararia* were located and are illustrated.

Key words: Arizona, British Columbia, California, DNA barcoding, Ennominae, Geometridae, Mexico, *Synaxis*, *Tetracis*, *Tetracis australis*, *Tetracis barnesii*, *Tetracis cachexiata*, *Tetracis cervinaria*, *Tetracis crocallata*, *Tetracis formosa*, *Tetracis fuscata*, *Tetracis hirsutaria*, *Tetracis jubararia*, *Tetracis montanaria*, *Tetracis moresiani*, *Tetracis pallidata*, *Tetracis pallulata*, Washington

Introduction

Parsons *et al.* (1999) listed ten species in *Tetracis* Guenée, all from the New World with two from North America, the type species *T. crocallata* Guenée, [1858], and *T. cachexiata* Guenée, [1858]. Pitkin (2002) subsequently transferred three neotropical species to a new genus (*Costalobata* Pitkin), and stated that another five neotropical species are likely or possibly misplaced in *Tetracis*, leaving only *crocallata* and *cachexiata* Guenée within *Tetracis* (*sensu stricto*). Within *Synaxis* Hulst, Parsons *et al.* (1999) placed eleven species, ten from North America and a Chilean species originally described as *Erosina strigata* Bartlett-Calvert, 1893. Based on male genitalia, Pitkin (2002: 325) stated that the affinity of *strigata* is unknown, and that it is misplaced in *Synaxis* [type species: *Tetracis pallulata* Hulst, 1886]. Based on male genitalia, Ferris (2009a, b) removed two additional taxa from *Synaxis*, namely *Metanema brunneilinearis* Grossbeck and *Sabulodes triangulata* Barnes & McDunnough. Pitkin (2002) also suggested that *Synaxis* was near to and might be a (junior) synonym of *Tetracis*. The purpose of the current work is to revise the generic concepts of *Tetracis* and *Synaxis*, and provide descriptions of three new western North American species together with a synopsis and diagnosis of all North American species.

There have been no modern reviews of either *Synaxis* or *Tetracis*, although Pitkin (2002) discussed the neotropical species of *Tetracis*, and suggested that *Synaxis* may prove to be synonym. McGuffin (1987) gave diagnoses of both genera, with differences between the two essentially limited to wing markings. Comparison of the type-species of both genera, and additional species not examined by McGuffin (1987) and/or Pitkin (2002) shows that genitalic structure is remarkably consistent across these taxa, and fit well within the generic diagnosis of *Tetracis* by Pitkin (2002). *Synaxis triangulata* is not congeneric with *Tetracis* (*sensu stricto*), as it lacks the characteristic gnathos and juxta (Ferris 2009a). Larval characters are also indicative of a monophyletic *Tetracis/Synaxis* group; for species where larvae are known (*S. pallulata*, *S. jubararia*, *S. cervinaria*, *T. cachexiata*, *T. crocallata*), The following structural characters are common to all species and in combination may prove to be synapomorphic: second thoracic segment abruptly swollen dorsally, 4th, 5th and 8th abdominal segments with paired dorsal warts (sometimes joined by ridge) (McGuffin 1987; Miller 1995; Wagner *et al.* 2001; Duncan 2006). Three adult morphological characters are synapomorphic for *Tetracis*, a quadrate dorso-caudal margin of the gnathos, and the presence of two to four (occasionally five) widely separated, dorsally projecting teeth on the dorso-caudal margin of the gnathos and an anellus with median spinulose furca. Possibly a fourth synapomorphy is the symmetric or only slightly asymmetric placement of the furca, which is usually strongly asymmetric in the Ourapterygini (Pitkin 2002). Based upon these factors, *Synaxis* is synonymized under *Tetracis*, which takes publication priority.

Materials and methods

Abbreviations and definitions used herein (See also Fig. 1)

AM antemedian line.

A/P female genitalia: approximate length ratio of anterior apophysis to posterior apophysis.