THE NEW WORLD HAIRSTREAK GENUS ARAWACUS KAYE
(LEPIDOPTERA: LYCAENIDAE: THECLINAE: EUMAEINI)

ROBERT K. ROBBINS

Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560-0127 U.S.A. (e-mail robbins.robert@nmnh.si.edu)

Abstract.—Even though Arawacus Kaye is widely used in works on North American butterflies, its characterization has been inconsistent and its included species have not been listed. Subterminally constricted tips of the papillae anales are proposed to be the best way to characterize Arawacus. They are consistent with the higher classification of the Thereus Section of the Eumaeini, to which Arawacus belongs. They are consistent with patterns of oviposition specificity. This characterization re-confirms that Polyniphes Kaye and Dolymorpha Holland are junior synonyms of Arawacus. Tigrinota Johnson is synonymized with Arawacus, new synonym. All nomenclaturally available specific names that belong to Arawacus are listed.

Key Words: Thereus, Rekoa, Contrafacia, Dolymorpha, Polyniphes, Tigrinota, Solanaeaceae

The generic name Arawacus Kaye was rarely used until 1981. The original description was based on superficial wing pattern elements of the South American type species, A. aetolus (Sulzer) (Kaye 1904). As a result, besides being cited in nomenclatural lists (e.g., Comstock and Huntington 1959–1964, Eliot 1973), Arawacus was used only for species with wing patterns similar to the type (Brown and Mielke 1967; Robbins 1980, 1981). But after Miller and Brown (1981) made Dolymorpha a senior synonym of Arawacus using the same two character states an unpublished manuscript that is being deposited in the Archives of the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, U.S.A.). Miller and Brown (1981), who received a copy of the manuscript after Clench’s death, published this synonymy in their catalog without explanation.

Arawacus has been characterized in different ways since 1991. Because Clench mistakenly lumped five distinct species in the A. aetolus complex (Robbins, Hudson, and Clench, in preparation), he did not realize that the type species of Arawacus lacks both male genitalia traits that he had proposed (Fig. 2). Consequently, when Robbins (1991: 3) briefly treated Arawacus as an outgroup of Rekoa Kaye, he provi-
The purpose of this paper is to stabilize usage of *Arawacus* and to provide a generic taxonomy for revision at the species level. Specifically, this paper shows that the con-
stricted papillae anales occur in the type species of *Arawacus*, *Dolymorpha*, *Polyniphes*, and *Tigrinota*, but not in other genera of the *Thereus* Section, to which *Arawacus* belongs. It is further shown that *Tigrinota* was delimited by characters that are incorrectly described or that occur in other genera of the *Thereus* Section. Finally, the specific taxa that belong to *Arawacus* are listed for the first time.

**Materials and Methods**

This study was based upon the approximately 3,250 specimens belonging to the *Thereus* Section genera *Arawacus*, *Rekoa*, *Thereus* Hubner, *Contrafacia* Johnson, and the "*Thecla*" ligurina species group (an undescribed genus whose species are placed, following convention, in *Thecla* F., a genus that does not belong to the Eumaeini, Elliot 1973) in the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (USNM). Included were all species that belong to these genera as delimited by Robbins 1991. Preparation of genitalia for examination using light and scanning electron microscopes follows the procedures in Robbins 1991. The male and female genitalia of all species in the *Thereus* Section were dissected except for those few species known from only one sex, including more than 120 genital dissections of those species placed in *Arawacus* in this paper.

**Previous Results**

The *Thereus* Section.—Robbins (1991) proposed two phylogenetic hypotheses involving *Arawacus*. First, *Arawacus*, *Rekoa*, *Thereus*, *Contrafacia*, and the "*Thecla*" ligurina group form the *Thereus* Section of the Eumaeini because they share a unique process of the vinculum abutting the brush organs, when present (illustrated in Robbins 1991). Second, the first three genera form a monophyletic group. The ductus seminalis arises from a pouch of the posterior corpus bursae. This pouch is dorsal of the ductus bursae, sclerotized laterally, and membranous dorsally (again illustrated in Robbins 1991). This classification is a framework within which the monophyly of *Arawacus* can be assessed.

Type species nomenclature.—Synonymy of the type species of *Arawacus*, *Contrafacia*, and *Tigrinota* is a bit confused. The type of *Arawacus* is *Papilio linus* Fabricius, which is a junior synonym of *P. aetolus* Sulzer (Comstock and Huntington 1959–1964). The type of *Contrafacia* is *C. mexicana* Johnson 1989, a species that is indistinguishable from *C. imma* (Prittwitz 1865) (Robbins 1991). The type of *Tigrinota* is *Thecla elida* Hewitson, which occurs from northern Venezuela to central Argentina. Its wing pattern varies slightly over this wide range with virtually no geographical variation in genitalic structures (Robbins, in prep.), contrary to the treatments in Johnson (1992, 1993).

**Results**

Monophyly and *Arawacus*.—The papillae anales ("ovipositor valves") were examined for 57 of the approximately 63 species that belong to the *Thereus* Section. Females are not known for the other 6 species. The tips of the papillae anales (ventral aspect) for the type species of *Arawacus* (Fig. 3), *Dolymorpha* (Fig. 4), *Tigrinota* (Fig. 5), and *Polyniphes* (Fig. 6) have a subterminal constriction, which might alternately be described as terminally expanded. The tips of the papillae anales of *Rekoa* (Figs. 7–9) are notched, not subterminally constricted. The papillae anales of *Thereus* (Figs. 10–11) are similar to those of *Rekoa*, but contain a sclerotized patch that is otherwise unreported in the Eumaeini (Robbins 1991). The tips of the papillae anales of *Contrafacia* (Fig. 12) and the "*Thecla*" ligurina group (Fig. 13) are regularly tapered. Although the papillae anales in the *Thereus* Section vary in shape, only those of *Arawacus* have a conspicuous subterminal constriction.

Larval food plant specificity.—Among the eumaeine genera, larval feeding on the
leaves of Solanum (as opposed to flowers) occurs only in Arawacus, but the larvae of three Arawacus species have recently been reported to eat plants in the Compositae and Leguminosae (Robbins, in press). Leaf feeding on Solanum has been recorded for 11 of the 17 Arawacus species (noted in the list at the end of this paper), including the
type species of Arawacus, Dolymorpha, Tigrinota, and Polyniphes (Guppy 1904, 1914; Bourquin 1945; Kendall 1975; Robbins, in press). However, larvae of A. ellida (Hewitson), which have been reared repeatedly from the leaves of Solanum, and A. binangula (Schaus) were both recently recorded eating flowers of Compositae—a larval food plant used in the related genus Rekoa—and the larvae of A. tarania were recorded on legumes (Brown 1993). Consequently, although larval feeding on the leaves of Solanum is widespread in Arawacus and is unreported in other Eumaeini, it cannot be used to delimit the genus.

The larvae of other Thereus Section species primarily use plants in families other than the Solanaceae as larval food (Robbins 1991, in press). Rekoa larvae are extremely polyphagous on buds, flowers, and shoots of plants in 16 families, including Solanaceae, but most records are in the Compositae, Leguminosae, and Malvaceae. In contrast, larvae of Thereus specialize on Loranthaceae, with one species eating Malpighiaceae and Chrysobalanaceae. Contrafacia larvae are recorded eating plants in the Compositae and Leguminosae, and the only food plant record in the "Thecla" ligurina group is in the Erythroxylaceae.

Monophyly and Tigrinota.—The only alternative to the proposed classification in this paper is that of Johnson 1992, 1993. It is the purpose of this section to assess the evidence supporting the monophyly of Tigrinota.

The diagnosis of Tigrinota (Johnson 1992, 1993) is similar in both works, but difficult to interpret. The diagnosis of the wings refers to the hindwing "with concentric bands," but bands on the wings of these species are not concentric. It refers to the "ovate brand," but the type species lacks an ovate brand or other scent patch. It mentions alternating bands on the hindwing, but these also occur in Rekoa paeleon (Cramer) and R. malina (Hewitson). Since Rekoa is a close relative of Arawacus (Robbins 1991), these bands would appear to be a symplesiomorphy and are questionably diagnostic.

The diagnosis of the male genitalia of Tigrinota in Johnson (1992: 186) is cited in its entirety because it is confusing. "Ventrally, valvae appearing as paired and rather smoothly sclerotized oblongate lobes separated by a thin transparent fissure which at each end, shows sclerotized ridges forming (1) prominent rims about the bilobed area and (2) caudo-lateral sculptures of the valval terminus from which emerge clusters of robust microtrichia." The valva of the type species of Tigrinota are illustrated in ventral aspect (Fig. 14). There are no rims. There are no microtrichia, robust or not. Perhaps setae were mistaken for microtrichia, but if so, their occurrence on the ventral valves is true for virtually all eumaeines (e.g., Clench [1961] characterized Callo-
phrys Westwood by the unusual lack of setae on the valve tips. It is unclear to what the "caudo-lateral sculptures" refer (Fig. 14). Johnson (1993: 2) repeats these characters and adds "brush organ occurrences differential (sic)", but it is unclear what this means or how it might be diagnostic. As best I can tell, those parts of this diagnosis that are accurate do not differentiate Tigrinota from most eumaeines.

The diagnosis of the female genitalia is similarly confusing (Johnson 1992, 1993). The description (I presume of the ductus bursae) with a "transparent neck" refers to the ductus bursae of most Rekoa and Arawacus (Robbins 1991; Robbins, Hudson, and Clench, in preparation) and is not diagnostic. The description of a simple "subcordate incised posterior cavity (abbreviated sipc in the diagnosis) of the 8th tergite" (probably referring to the shape of the 8th abdominal tergum) is difficult to interpret. However, the shape of this tergum is similar in Tigrinota and some Rekoa, such as R. zebina (Hewitson), so it is unlikely to be diagnostic.

**DISCUSSION**

Taxonomy.—The genus Arawacus appears to be monophyletic, characterized by the shape of the papillae anales. Although it is not desirable to delimit Arawacus by only one character, this classification is consistent with the hierarchical classification of the Thereus Section, and other morphological traits support the monophyly of Thereus and Rekoa (Robbins 1991). These characterizations of Arawacus, Thereus, and Rekoa are reasonably consistent with patterns of larval plant use. For these reasons, this classification appears to be the best option for promoting a stable generic nomenclature in the Thereus Section.

Recognition of Tigrinota is unlikely to be a reasonable alternative. Its use leaves Arawacus and Polyniphes uncharacterized and would consequently destabilize the generic taxonomy of the Thereus Section. There is little, if any, evidence to support the monophyly of Tigrinota. Either its diagnostic traits are incorrect, such as the concentric hindwing bands and rims on the valves, or appear to be symplesiomorphic, such as the alternating hindwing bands and "transparent neck" of the ductus bursae.

Provisional classification of Arawacus.—The status of Polyniphes as a synonym (Robbins 1991) is confirmed. The status of Dolyniorpha as a synonym (Miller and Brown 1981), which was not recognized in Johnson (1992), is also confirmed. Tigrinota is synonymized with Arawacus, new synonym.

Johnson (1992, 1993) presented a classification of almost half the specific names listed below. He did not assess intraspecific geographical variation and reported "diagnostic" morphological traits, such as concentric hindwing bands and rims on the valves, that do not exist. Further, my examination of more than 120 genital sections and detailed comparison of androconia and wing patterns from throughout the range of each species failed to confirm most of his conclusions. Rather than await detailed species level revisions, I present an alternate classification below that is intended to be a working hypothesis for species level revisions. Although it is unusual to present a tentative classification, such as this one, the extensive reporting of characters that do not exist (Johnson 1992, 1993) is perhaps a more unusual circumstance that creates the need for a more reasonable working classification.

As characterized in this paper, Arawacus contains 39 available specific names representing 17 biological species. There is also one undescribed species (Robbins, Hudson, and Clench, in preparation). The female genitalia of all have been examined except for A. euptychia, for which no females are known. However, A. euptychia is placed in Arawacus because its male genitalia are barely distinguishable from those of A. dumenillii and A. tadita.

Those species that have been reared from plants in the Solanaceae, Compositae, or...
Leguminosae are designated respectively in bold with S, C, or L.

1. Arawacus togarna (Hewitson, 1867)
2. Arawacus lincoides (Draudt, 1917)—S
3. Arawacus aetolus (Sulzer, 1776)—S
   Papilio linus Fabricius, 1776
   Papilio amelia Herbst, 1840
4. Arawacus separata (Lathy, 1926)—S
   Thecla paraguayensis Lathy, 1926
5. Arawacus aethesa (Hewitson, 1867)
6. Arawacus sito (Boisduval, 1836)—S
   Thecla phaena Godman and Salvin, 1887
   Arawacus mexicana D’Abrera, 1995
7. Arawacus leucogyna (Felder and Felder, 1865)—S
   Thecla phaea Godman and Salvin, 1887
8. Arawacus meliboeus (Fabricius, 1793)—S
   Jolaus eurisides Hübner, 1823
   Thecla barreensis Rosa, 1936
9. Arawacus jada (Hewitson, 1867)—S
10. Arawacus ellida (Hewitson, 1867)—S,C
   Thecla toba Hayward, 1949
   Tigrinota perinota Johnson, 1992
   Tigrinota jennifera Johnson, 1992
   Tigrinota catamarciana Johnson, 1993
   Tigrinota chaosa Johnson, 1993
11. Arawacus hypocrita (Schaus, 1913)
12. Arawacus dolylas (Cramer, 1777)—S
   Pseudolycaena spurius Felder and Felder, 1865
   Thecla dolosa Staudinger, 1888
   Thecla pallida Lathy, 1930
13. Arawacus damenili (Godart, 1824)—S
   Thecla argiva Hewitson, 1877
   Thecla obscura Staudinger, 1888
   Thecla carteri Weeks, 1906
14. Arawacus euptychia (Draudt, 1921)
15. Arawacus tadita (Hewitson, 1877)—S
   Thecla datti Jones, 1912
16. Arawacus binangula (Schaus, 1902)—C
   Thecla bolima Schaus, 1902
17. Arawacus tarania (Hewitson, 1868)—L
   Thecla atrana Schaus, 1902.

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