

## Theclinae of Rondônia, Brazil: *Strymon* Hübner, with descriptions of new species (Lepidoptera: Lycaenidae)

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**Abstract:** Twenty-two species of *Strymon* are known from the vicinity of Cacaúlândia in Rondônia, Brazil, of which 14 are new species. These belong to 5 species groups: the "oreala" group [*Strymon megarus* (Godart)]; the "ziba" group [*Strymon ziba* (Hewitson), *Strymon thulia* (Hewitson), *Strymon spinatus* new species, *Strymon latamaculus* new species, *Strymon pallidulus* new species, *Strymon tholus* new species]; "valentina" group [*Strymon rotundum* new species]; "crosssoea" group [*Strymon crosssoea* (Hewitson), *Strymon crambusa* (Hewitson), *Strymon germana* new species, *Strymon novasignum* new species, *Strymon clavus* new species, *Strymon implexus* new species, *Strymon inimirum* new species, *Strymon incanus* new species, *Strymon faunalia* (Hewitson), *Strymon halos* new species, *Strymon conspergus* new species, *Strymon bazochii* (Godart), *Strymon diagonalis* new species]; and "eurytulus" group [*Strymon bubastus* (Stoll)]. Tentative subgroups of species are suggested for the "crosssoea" group as they occur in Rondônia. A neotype is designated for *Tmolus basilides* and the name synonymized with *Strymon megarus*. The "basilides" group of Johnson *et al.* (1990) is renamed the "ziba" group. Based on lectotype designations and superficial and genital differences, *S. ziba* and *S. thulia* are elevated to specific status.

**Key words:** Brazil, hairstreaks, Lepidoptera, Lycaenidae, *Strymon*, Theclinae, tropical.

### Introduction

This continues a series of papers on the Theclinae (Lepidoptera: Lycaenidae) from the vicinity of Cacaúlândia in central Rondônia, Brazil (Austin and Johnson 1995, 1996). This region is partially disturbed typical lowland tropical rainforest with a strikingly seasonal climate (Austin and Johnson 1995, Austin *et al.*, ms) where about 4000 ha have been studied since 1989 (Emmel 1989, Emmel and Austin 1990). The butterfly fauna of over 1700 recorded species (Austin *et al.*, ms) is the richest known. In this paper we discuss the genus *Strymon* Hübner.

This investigation reemphasizes the importance of careful study of large local samples in elaborating the diversity of Neotropical faunas of Eumaeini. Central Rondônia is particularly rich in *Strymon* species, well above that known for other local Neotropical regions which represent a range of areas sampled and ecological and topographical diversity.

### Methods and Materials

We treat previously described and new species using species groups modified after those erected by Johnson *et al.* (1990) and conforming to those in a forthcoming treatment of the *Strymon* of Colom-

bia (LeCrom and Johnson 1997). This new species group scheme, defined here by combinations of wing and genitalic characters of both sexes, has been badly needed to embrace the increased diversity now recognized in *Strymon* and can serve as a baseline for consistency in future studies of the genus. Johnson and Kroenlein (1993) have referred to the entire worldwide monophyletic group, of which *Strymon* is a part, as the infratribe "Strymonina", and we will use this term in discussion as appropriate. Consistent with the above studies, we use DFW/DHW and VFW/VHW for dorsal fore- and hindwing and ventral fore- and hindwing, respectively. For well known species, we incorporate ranges of FW length from the larger samples treated by Johnson *et al.* (1990). We refer to the usually prominent cluster of androconial (= pheromonal) scales on the male DFW of some *Strymon* species as the "brand" consistent with long-term common usage and Eliot (1973). Numbers associated with types and other specimens refer to genitalia vial numbers. Type localities are considered to be the locality of capture of the holotype.

Wing characters of *Strymon* are extremely divergent. In fact, Johnson and Kroenlein (1993) called special attention to species that would not be readily associated with the genus except by genitalia. Dorsal surfaces range from brightly iridescent

blue to concolorous gray or brown, brands on males occur differently, and ventral wing markings include lineate and spotted bands as well as cryptic patterns. Thus, genitalia are particularly important in recognizing and distinguishing members of the genus. In the taxonomic entries, the phrase "typical of the genus" refers to the genital habitus of *Strymon* described in Johnson *et al.* (1990, 1992a) and Johnson and Salazar E. (1993). We have found the female genitalia of *Strymon* to be particularly diagnostic in defining species groups and often to have the most useful characters for distinguishing taxa. The form of the ductus bursae and its juncture with the corpus bursae are especially instructive. Although most groups of Theclinae have a relatively straight ductal tube, the ductus bursae of all examined *Strymon* exhibits some modification towards its anterior end. We describe and categorize the several configurations of the ductus bursae of the *Strymon* treated here to standardize description and facilitate discussion of these structures as follows:

1) deflexed (Figs. 51-56; also Figs. 14, 15 in Johnson *et al.* 1990): The ductus bursae curves slightly to moderately ventrad and then dorsad before the cervix bursae. On many such species, the ductus is also twisted (up to a half turn) at or near the deflexion. All species examined with a deflexed ductus bursae also have a prominently sclerotized hood-like structure at the cervix bursae.

2) sigmoidal (Figs. 57-59; also Fig. 17 in Johnson *et al.* 1990): The ductus bursae is twisted with prominent curves both laterad and ventrad and appearing "S"-shaped in both lateral and ventral views.

3) horizontally looped (Figs. 60-66; also Figs. 16, 18 in Johnson *et al.* 1990): The ductus bursae is curved back on itself in a horizontal plane parallel to the venter of the abdomen and appears as a loop in ventral view and as an extreme sigmoidal in lateral view.

4) vertically looped (Fig. 67; also Fig. 27 in Johnson *et al.* 1990): The ductus bursae is curved back on itself in a vertical plane parallel to the sides of the abdomen and appears as a loop in lateral view and as an extreme sigmoidal in ventral view.

Other useful characters of the female genitalia include modification of the cervix bursae, modification of the caudal end on the corpus bursae, and the shape of the lamellae, especially in ventral view. These characters have shown particular utility in differentiating *Strymon* species which show either complex orbiculate wing patterns (as in some of the

members of the "*crossocae*" group which morphology shows to be far more diverse than anticipated) or peculiar ventral wing patterns (as shown by *S. bazochii* or *S. crambusa* which might be of unclear phylogenetic affinity without reference to morphology).

Male genitalia of *Strymon* are characterized by their long and narrowly tapered valvae, but do not usually show obvious differentiating features as seen on the genitalia of females. Such features as length and robustness of the valvae; orientation, length, and shape of the saccus; shape of the vinculum; and length and shape of the aedeagus are useful characters. These are often difficult to interpret without comparative material. In the present paper, consistent with cited prior treatments of *Strymon*, male genitalia are illustrated both ventrally and laterally. The ventral view assesses overall genital symmetry (which varies between *Strymon* species groups) along with valval shape (which is distinctly sculptured in some groups). The lateral view emphasizes differences in dorsal shape of the vinculum where brush organs attach in many species. Since characters of females are more obvious than those of males and more useful in distinguishing species, this sex is designated as the holotype of new species in many instances.

Males and females of a species were associated largely by the near identity of their ventral patterns. Due to the many superficially similar species of *Strymon* encountered, this method, however, may not be infallible. Whenever there was doubt on the correct association of the sexes, we used only one sex as types to avoid potential future taxonomic problems. In these cases, specimens of the presumed opposite sex are listed as additional material. Collections of pairs in copula and rearing series from individual females will eventually allow unequivocal association of males and females.

In our study of the *Strymon* of Rondônia, we have been further guided by results of a companion study by us involving elaboration of all new Neotropical *Strymon* species noted in collections surveyed or supplied by other curators or field workers. This parallel effort has provided significant insight into the consistency of characters among various assemblages of *Strymon* and the geographic distributions of such characters. It has also given us confidence in the validity of describing as species entities which, despite appearing similar in a general array of superficial characters, exhibit distinctive genitalia in both sexes, unique secondary sexual characters, and consistently occurring unique char-

acters among various details of the dorsal and ventral wing patterns. In this regard, we are particularly grateful to workers who have called our attention to biological data paralleling such distinctions. Such biological distinctions lead us to believe that it is more likely than not that entities so defined will prove, in the long run, to represent reproductively distinct species.

Voucher specimens from this study are to be deposited as follows: primary types and other specimens — Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil (UFPC); paratypes and other material — American Museum of Natural History (AMNH), The Natural History Museum (London) (NHM), and the Nevada State Museum (NSM).

### *Strymon* Hübner

*Strymon* is one of the largest of the Eumaeini genera, with some 50 Neotropical species critically examined and now associated (Schwartz and Miller 1985, Johnson and Matusik 1988, Johnson *et al.* 1990, Smith *et al.* 1991, Johnson and Salazar E. 1993, Johnson and Kroenlein 1993). Fortunately for the purposes of the present paper, much of the type material for Neotropical *Strymon* and the closely allied *Eiseliana* Ajmat de Toledo and *Heoda* Johnson, Miller, and Herrera has been reviewed (Johnson *et al.* 1990, 1992a, 1992b; Johnson and Salazar E. 1993; Johnson and Kroenlein 1993, and studies in progress involving the present authors). Twenty-two species of *Strymon* were encountered in central Rondônia of which fourteen represented undescribed species. Herein, we review this fauna and describe the new taxa.

### *Tmolus basilides* and associated taxa

The identity of *Tmolus basilides* Geyer [1837] has been a long-standing nemesis to students of Neotropical Eumaeini. The type is not known to be extant, and the original editions of Hübner's 1832-1837 "Zuträge zur Sammlunge exotischer Schmetterlinge" (in which the description attributed to Geyer appears, with a hand-colored illustration) are difficult to locate. Johnson *et al.* (1990) pointed out that a diverse assemblage of phenotypes had been included with the name. They attempted to resolve this with the identification of a species from Argentina with a hooded cervix bursae as *Tmolus basilides* and defined a species group with similar morphology as the "*basilides*" group. Our studies indicated that this was incorrect and only further

complicated the confusion. This issue needs to be addressed once again in conjunction with our studies of *Strymon* from Rondônia. Through the courtesy of rare book archivists at the AMNH library, we were able to examine an original edition of Geyer [1837] including an original hand-colored plate of *T. basilides* and compare this to type specimens of two putative synonyms (Bridges 1988): *Thecla ziba* Hewitson 1868 and *Thecla thulia* Hewitson 1868. Our resolution of this problem, based upon designation of a neotype for *T. basilides* and lectotypes of *T. ziba* and *T. thulia* follows below in our discussions of the "*oreala*" and "*ziba*" groups of *Strymon*.

### "oreala" group

#### *Strymon megarus* (Godart)

Fig. 1

*Polyommatus megarus* Godart [1824].

*Tmolus basilides* Geyer [1837], **new synonymy**, neotype designated below.

*Strymon megarus*: Johnson *et al.* 1990.

**Diagnosis.** Wings. Medium in size (11-14.5 mm); male dorsum black with prominent bright blue band on FW and on posterior half of HW; FW with relatively prominent black band; HW with 2 tails; female gray without blue; venter of both sexes tan with prominent postmedian and postbasal orbicular macules on HW. Morphology. Male and female genitalia illustrated by Johnson *et al.* (1990); female distinguished from superficially similar "*ziba*" group species by the vertically looped ductus bursae without cervical hood.

**Remarks.** Characters and Affinities. This species was discussed and illustrated by Johnson *et al.* (1990). This is the only relatively large species of *Strymon* encountered in central Rondônia with prominent blue on both the DFW and DHW. The single male known from the area is virtually identical to that illustrated by Johnson *et al.* (1990). The female, without blue, superficially resembles females of the following "*ziba*" group, but is recognizable by the looped ductus bursae and lack of a hooded cervix bursae. Types. Type information for *S. megarus* was presented by Johnson *et al.* (1990) and Johnson (1991), but, as noted above, the identity of *Tmolus basilides* had historically remained unresolved. The type of *T. basilides* (and indeed much of the material representing Geyer's smaller butterfly taxa) is considered lost (Miller and Brown 1981, P. Ackery, *in litt.* to the present authors,

1995). Determination of the identity of *T. basilides* and designation of a neotype is crucial to *Strymon* taxonomy for at least three reasons: (1) previous views of it have proven incorrect vis-a-vis its original description, (2) a number of superficially similar phenotypes have historically been associated with the name, and (3) these phenotypes actually represent a number of distinctive species each requiring either proper association with historical names or descriptions as new species. Johnson *et al.* (1990) considered *T. basilides* to be one of the species with a deflexed ductus bursae and a hooded cervix bursae, including one such phenotype from Argentina. Examination of the figures of *T. basilides* accompanying its original description (which illustrated a male) indicated an insect virtually identical with *Strymon megarus*. Specimens matching this phenotype were found among the holdings of the American Museum of Natural History and the genitalia of both sexes are as shown for *S. megarus* by Johnson *et al.* (1990). We thus designate a male in the collection of the American Museum of Natural History as the neotype of *Tmolus basilides* Geyer [1837]. This specimen has the following labels: "Rolandia, IV 48" [Brazil: Paraná; Rolandia, coll. Mahler]. An appropriate label will be added to its pin. *Tmolus basilides* Geyer [1837] thus falls into synonymy with *S. megarus*.

The name *Strymon basilides* has been used in numerous regional works (*e.g.*, Lamas 1983, de la Maza *et al.* 1989, Johnson *et al.* 1990, Emmel and Austin 1990, and numerous others). These designations must be viewed as suspect until specimens upon which the determinations were based are critically examined. Any one or more of a number of superficially similar (or dissimilar) species may have been involved. Similarly, the identifications of those butterflies feeding as larvae on various monocots (*e.g.*, Robbins and Aiello 1982 and several citations therein) remain unknown. Robbins and Aiello (1982) recognized the existence of sibling species of *S. "basilides"* and their material from Panama was attributed to a species "clearly" with "a close relationship with *melinus* Hbn." based on behavior and genital morphology of both sexes. This indicates a species having a looped or sigmoidal ductus bursae and no "hood" on the female

genitalia. Thus those specimens are not of the "ziba" group (see below), but of the "oreala" or other species group. The species considered to be *S. basilides* by Johnson *et al.* (1990) is obviously not of this concept, but was an undescribed species of the "ziba" group. In the interest of resolving as quickly as possible matters involving the misidentification of *Strymon basilides*, this problem pertaining to the Argentine fauna is being treated simultaneously by Johnson *et al.* (in press).

Previously in common usage, the name *T. basilides* was widely used for any entity with both sexes gray or gray-brown above and with macules occurring across the postbasal area of the ventral hindwing. This generalization not only led to a number of species (of both the "ziba" and the "oreala" groups) being misidentified as *T. basilides* but apparently accounts for the frequent misspelling of this latter name as "*basalides*" (as in "postbasal" [emphasis ours])(Bridges 1988, see also comments by Robbins and Aiello 1982).

**Distribution in study area.** A single male (GTA #5853) was taken on 18 September 1994 at Linha C-10, 5 km S of Cacaúlândia.

### "ziba" group

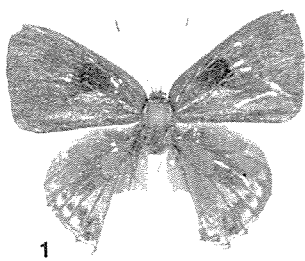
Our studies showed that *Tmolus basilides* Hewitson 1868, does not refer to a species with a hooded cervix bursae (see above under "oreala" group). The "*basilides*" group of Johnson *et al.* (1990) is therefore renamed here as the "ziba" group after the apparently first named species with a hooded cervix bursae; this character readily distinguishes the group. The species of this group lack dorsal structural color, but their ventral wing pattern resembles that of the "oreala" group.

### *Strymon ziba* (Hewitson), revised status

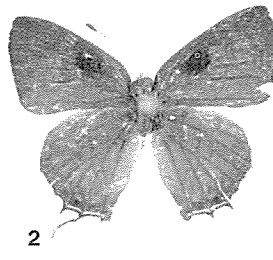
Figs. 2, 3, 38, 51

*Thecla ziba* Hewitson 1868. TL: unknown; lectotype female in NHM designated here, labeled "Hewitson Coll. / 79-69 / *Thecla ziba* 4.", "ziba", "thulia", "R. 1953 / N. H. B. / 1076", "Type", "B.M. TYPE / No. Rh. 1028."

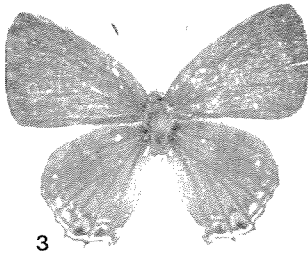
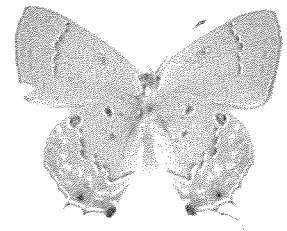
**Figs. 1-12 (facing page).** *Strymon "oreala"* and *Strymon "ziba"* groups. All from Brazil: Rondônia; vicinity of Cacaúlândia, dorsal surface on left and ventral surface on right. Fig. 1. *Strymon megarus*, male, 18 Sept. 1994; Fig. 2. *Strymon ziba*, male, 20 Nov. 1995; Fig. 3. *S. ziba*, female, 25 Apr. 1995; Fig. 4. *Strymon thulia*, female, 16 Nov. 1991; Fig. 5. *Strymon spinatus*, male, 17 Apr. 1995; Fig. 6. *Strymon spinatus*, holotype female; Fig. 7. *Strymon latamaculus*, male, 1 May 1995; Fig. 8. *Strymon latamaculus*, holotype female; Fig. 9. *Strymon pallidulus*, male, 15 Nov. 1991; Fig. 10. *Strymon pallidulus*, holotype female; Fig. 11. *Strymon tholus*, male, 3 Mar. 1994; Fig. 12. *Strymon tholus*, holotype female.



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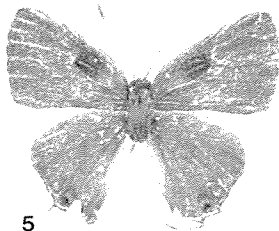
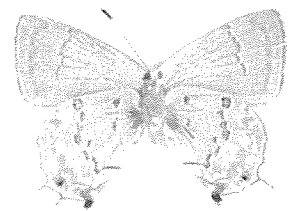
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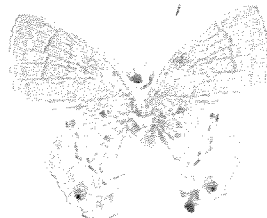
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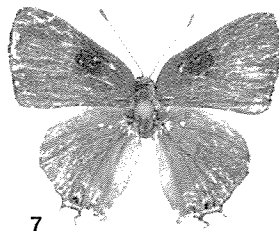
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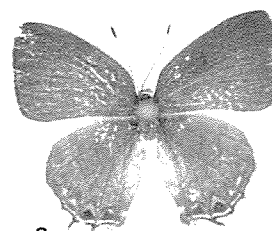
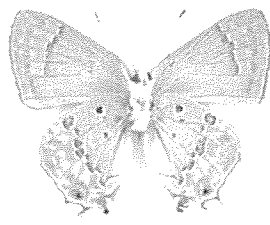
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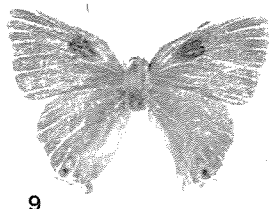
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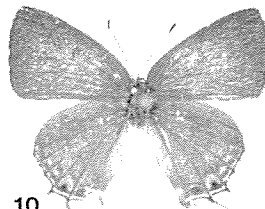
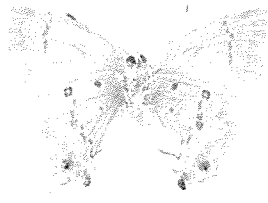
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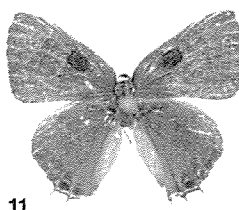
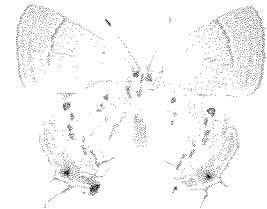
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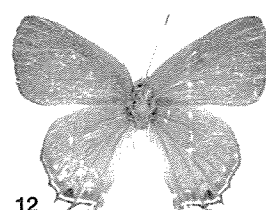
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