

## NEW ADDITIONS TO THE BUTTERFLY FAUNA OF BELIZE

JOHN A. SHUEY

The Nature Conservancy, 1505 North Delaware Street, Suite 200 Indianapolis, IN 46202

VALERIE GILES

HCR-71 Box 583, Orbisonia, PA 17243

JAN MEERMAN

P.O. Box 208, Belmopan, BELIZE

PAUL LABUS

The Nature Conservancy, 2400 New York Ave., Room 269, Calumet College of Saint Joseph, Whiting, IN 46394

CAROL W. SCHUTTE

North Iowa Area Community College, 500 College Drive, Mason City, Iowa 50401

AND

PETER KOVARIK

Research Associate of the Florida State Collection of Arthropods, 239 Crestview Road, Columbus, OH 43202

**ABSTRACT:** We present records for 85 butterfly species new to Belize and discuss an additional seven species that were previously known from vague literature records. These records represent a 19% increase in the number of butterflies (excluding Hesperidae) known from the country. New records include 10 new Nymphalidae, and 75 new Lycaenidae (including Riodininae). A total of 521 species of true butterflies are now known from Belize. Using the nonparametric estimator Chao 2 in conjunction with our comprehensive database of Belize butterfly records, we estimate total species richness to be 633.

Faunal lists of invertebrate groups from tropical regions are potentially valuable to workers pursuing a wide variety of biological studies including biogeography analysis and community ecology. Although Belize has earned a growing reputation as a favored destination for such investigations, much remains to be learned about the composition and distribution of the Belize butterfly fauna. Older literature, such as Davis (1928), is either badly dated, or else represents the results of rather limited field efforts. Davis' (1928) account of the fauna, while providing interesting reading, reflected an era when transportation through the country was extremely limited, and butterfly taxonomy was badly confused. Although far from a comprehensive faunal review, his accounts of some 200+ species are still intriguing and provide valuable insights into the ecology of Belize 100 years ago. Ross (1961) provided a significant contribution by publishing an annotated list of species collected during a month stay in the country. More recently, Meerman (1999) produced the most complete summary of butterfly records to date based on field work throughout the country, making a significant contribution to butterfly faunal studies in the region. Meerman reported a total of 436 species of true butterflies from Belize and includes a thorough treatment of historical records as well.

Over the past 10 years, we have sampled butterflies

extensively throughout Belize and have documented the occurrence of numerous species not previously reported for the country. Although we have tried to distribute our sampling effort as widely as possible across habitats and geographic areas, the bulk of our most recent field work has been concentrated at a few key representative sites located primarily in the northern half of the country. Table 1 summarizes the most important ecosystems types (Meerman and Sabido 2001) present at each of these sites.

**Rio Bravo Conservation and Management Area, Orange Walk District.** Hill Bank Camp, located on the New River Lagoon, provides access to northern Belize limestone-substrate broadleaf forests, bajo forests (see Austin et. al., 1996), lake edge marsh, and pine-ridge savanna habitats. La Milpa Camp, located in extreme north-west Belize, provides access to vast swaths of broadleaf forest and bajo forest.

**Maya Mountains, Cayo District.** Guacamallo Bridge area at the Macal River - located on the road to Caracol Ruins. Due to an abrupt change in geologic substrates, this river defines the boundary between two important habitat types in the Maya Mountains. Broadleaf forest (limestone substrates) dominate the south side of the river, while pine/oak scrub on granite substrates dominates the north.

**Chiquibul Forest Reserve, Cayo District.** The Las Cuevas Research Station, at an altitude of

approximately 500m, is nestled in second-growth pre-montane, limestone-substrate broadleaf forest.

**Succotz, Cayo District.** Located in extreme west central Belize, this is a densely populated area. Habitats around the town and adjacent Xunantunich Ruins are highly disturbed and range from pasture and recently abandoned milpa, to young second-growth broadleaf forest.

**Mayflower Valley in Mayflower-Bocawina National Park, Stann Creek District.** Located at the foot of the Maya Mountains, this site provides access to second-growth granite-substrate broadleaf forest habitats.

**Cockscomb Basin Wildlife Sanctuary, Stann Creek District.** Located at the foot of the Maya Mountains, this site provides access to second-growth and mature granite-substrate broadleaf forest habitats.

**Blue Creek Cave and Village, Toledo District.** Although not well sampled, this site provides access to extreme southern Belize forests. Both second growth and primary forest are accessible at the site.

During the period of 1995 to the present we spent at total of approximately 29 person/months collecting a total of over 7000 records from Belize. These records represent over half of the data managed in a comprehensive database of Belize butterflies. In addition to opportunistic capture with hand nets, we trapped butterflies using fruit bated traps (Shuey, 1997). The extensive "photographic collections" of Belizean butterflies of James Young and Jane Ruffin were also reviewed and incorporated into this analysis. All identifications of photographic records incorporated into the database are made by the senior author.

In this paper, we present a list of 85 species not recorded from Belize by Meerman (in bold), a 19% increase in the number of species known for the country. We also provide specimen-based records for an additional seven species for which Meerman (1999) had only non-specific literature records available for Belize. All records based solely on photographs are noted in the text. Nomenclature follows Lamas (2004).

These new additions to the fauna substantiate

TABLE 1. Primary habitat types present in the sample areas. Ecosystem types are defined and mapped in Meerman & Sabido (2001).

---



---

<b><u>Rio Bravo Conservation and Management Area</u></b>	
	Tropical evergreen seasonal broad-leaved lowland forest on calcareous soils
	Evergreen broad-leaved lowland shrubland (=bajo)
	Tropical evergreen seasonal broad-leaved alluvial forest
	Tropical evergreen seasonal broad-leaved lowland swamp forest
	Tropical lowland tall herbaceous swamp
	Short-grass savanna with shrubs
	Short-grass savanna with needle-leaved trees
	Caribbean mangrove forest; freshwater mangrove scrub
<b><u>Guacamallo Bridge area on the Macal: Southside</u></b>	
	Tropical evergreen seasonal broad-leaved lowland hill forest on steep karstic terrain
	Tropical evergreen seasonal broad-leaved submontane forest on steep karstic terrain
<b><u>Guacamallo Bridge area on the Macal: Northside</u></b>	
	Tropical evergreen seasonal needle-leaved lowland hill forest
	Tropical evergreen seasonal needle-leaved submontane forest
	Tropical evergreen seasonal mixed submontane forest
<b><u>Las Quevas</u></b>	
	Tropical evergreen seasonal broad-leaved submontane forest on steep karstic terrain
	Tropical evergreen seasonal broad-leaved submontane forest on rolling karstic terrain
<b><u>Succotz/Xunantunich</u></b>	
	Agriculture (milpa), secondary growth and remnants of:
	Tropical evergreen seasonal broad-leaved lowland hill forest, on rolling karstic terrain
<b><u>Mayflower Bocawina National Park:</u></b>	
	Tropical evergreen seasonal broad-leaved lowland hill forest, Simarouba-Terminalia variant
<b><u>Cockscomb Basin</u></b>	
	Tropical evergreen seasonal broad-leaved lowland hill forest, Simarouba-Terminalia variant
	Tropical evergreen seasonal broad-leaved lowland forest on poor or sandy soils
<b><u>Blue Creek</u></b>	
	Tropical evergreen broad-leaved lowland hill forest on steep karstic terrain

Meerman's assessment of his annotated checklist. He felt that the "big three" families, Papilionidae, Pieridae, and Nymphalidae were very well sampled. We strongly concur, and add only 10 additional species to the country, all Nymphalidae. Meerman felt less sure that the Lycaenidae (including Riodininae) had been as well sampled, noting that only 9.9% of the data in his database pertained to this family. We add 75 species of Lycaenidae to the country, a 54% increase in the known fauna. Based on our recent field experience, we expect to add a substantial number of additional species of Lycaenidae to the fauna of Belize as we increase our sampling efforts in southern Belize over the next few years. A total of 521 species of true butterflies are now known from Belize: Papilionidae - 37 species; Pieridae - 39 species; Nymphalidae - 233 species; and, Lycaenidae - 212 species. Using the nonparametric estimator Chao 2 (Young, et. al 2004) in conjunction with the comprehensive database, we estimate total species richness to be 633 for Belize.

LYCAENIDAE - RIODININAE

***Apodemia hypoglauca wellingi*** Ferris. Known from two specimens collected from Consejo, Corozal District. (Jul 1988)

***Apodemia walkeri*** Godman and Salvin. Known from scattered localities in Stann Creek and Cayo Districts. (May, Jun and Oct)

***Argyrogrammana holosticta*** (Godman and Salvin). We have numerous records of this species, centered around Hill Bank, Orange Walk District and Succotz, Cayo District. (Feb, Mar, and Nov)

***Baeotis barce*** Hewitson. A single photographic record from Jane Ruffin taken at Crooked Tree Reserve, Belize District. (Feb 2003)

***Calospila cilissa*** (Hewitson). Known only from Mayflower Valley, Stann Creek District, where it is seasonally common. (May and Oct)

***Calephelis browni*** McAlpine. We have numerous records from Orange Walk and Cayo districts. (Apr, June, July and Sept)

***Calephelis clenchi*** McAlpine. Common in Toledo, Stann Creek, Belize and Orange Walk districts. (May, June and Sept)

***Calephelis maya*** Clench. We have numerous records from Toledo, Orange Walk and Cayo districts. (July and Sept)

***Calephelis stallingsi*** McAlpine. Reported without details in Meerman 1999 based on McAlpine's (1971) revision. We have many records from Cayo, Corozal and Orange Walk districts. (July and Sept)

***Calephelis tikal*** Austin. Known from scattered sites in Cayo, Orange Walk and Corozal districts. Otherwise,

this species is known only from two specimens from Tikal, Guatemala (Austin, 1991). (July and Sept)

***Calephelis wellingi wellingi*** McAlpine. Reported without details in Meerman 1999 based on McAlpine's (1971) revision. We have numerous records from Cayo, Stann Creek, Toledo and Orange Walk districts. (May, July, Sept, Nov and Dec)

***Caria ino*** Godman and Salvin. Known from a single specimen collected by Ron King at Succotz, Cayo District. (Sept 2002)

***Caria rhacotis*** (Godman and Salvin). Known from two records from Las Cuevas, Cayo District. (July and Sept)

***Emesis ocypore*** (Geyer). One record from Lubantun Ruins, Toledo District. (July 1988)

***Eusalasia eubule*** (Felder). A single specimen collected at Succotz, Cayo District. (Sept 2002)

***Eusalasia hieronymi*** (Salvin and Godman). Ron King collected a specimen at Shipstern, Corozal District. We have an additional records from Blue Creek Cave, Toledo District and Las Cuevas, Cayo District. (May and Sept)

***Eusalasia procula*** (Godman and Salvin). Known from four specimens collected at Hill Bank, Orange Walk District, and an additional specimen from the Macal River, Cayo District. (Jan, Mar and Sept)

***Eusalasia pusilla*** (Felder). Reported from Corozal by Godman and Salvin (1879-1901), we found it to be locally common in and around Succotz and Xunantunich Ruins, Cayo District (Sept and Nov 2003.)

***Pheles melanchroia*** (Felder and Felder). Known from a single record from Blue Creek Village, Toledo District. (May 1999)

***Menander menander purpurata*** (Godman and Salvin). Known from specimens collected at Las Cuevas and Mollejon, Cayo District, and a photograph taken by James Young at Cockscomb Basin Stann Creek District. (July and Dec)

***Notheme erota*** (Cramer). Known from three records, all from Las Cuevas, Cayo District. (July and Sept)

***Periplacis glaucoma*** Geyer. Known from a lone hindwing collected at Hill Bank, Orange Walk District. (Feb 1996)

***Rhetus periander*** (Cramer). Reported by Meerman (1999) based on records by Godman and Salvin (1879-1901). We have encountered this species at sites near Las Cuevas, Cayo District. (Sept 2002)

***Sarota craspediodonta*** (Dyar). Known from Las Cuevas and the oak - pine habitat at the Macal River, Cayo District. (Sept)

***Sarota myrtea*** Godman and Salvin. Known from a specimen collected at Las Cuevas, Cayo District and a

photographic record taken by Jane Ruffin at Blue Hole National Park, Cayo District. (Sept and Dec)

***Pirascuca sagaris*** (Cramer). A single record collected at Rio On Falls, Cayo District. (June 1988)

***Symmachia accusatrix*** Westwood. Known from a single record from Mayflower-Bocawina Valley, Stann Creek District. (May 1999)

***Symmachia rubina*** Bates. Known from two records taken in oak-pine scrub near the Macal River, Cayo District. (July and Sept)

***Theope eupolis*** Schaus. Numerous records from Cayo, Corozal and Stann Creek districts. (May, July and Sept)

***Theope pedias*** Herrich-Schaffer. Known from Succotz and Las Cuevas, Cayo District. (July and Sept)

#### LYCAENIDAE - LYCAENINAE

***Arawacuss hypocrita*** (Schaus). A single record collected by Mike McInnis from San Ignacio, Cayo District. (Mar 1994)

***Arawacus jada*** (Hewitson). Known from scattered localities in Cayo, Toledo and Corozal districts. (July and Sept)

***Arcas cypria*** (Geyer). Known from Las Cuevas, Green Hills and the Macal River, Cayo District, and La Milpa, Orange Walk District. (July, Sept and Oct)

***Atlites carpasia*** (Hewitson). A single record from Succotz, Cayo District. (Sept 2002)

***Atlites gaumeri*** (Godman) Known from 2 females collected from a tree-lined ditch in savanna east of Belmopan, Cayo District. (Sept 2002)

***Atlites inachus*** (Cramer). A single photographic record from Jane Ruffin taken at Crooked Tree Reserve, Belize District. (Feb 2003)

***Aubergina paetus*** (Godman and Salvin). Known from Gren Hills and Xinantunich Ruins, Cayo District and Consejo, Corozal District. (June and July)

***Calycopis atnius*** (Herrich-Schaffer). Known from Blue Creek Cave, Toledo District, and Mayflower Valley, Stann Creek District. (Apr and May)

***Calycopis cerata*** (Hewitson). Known from two specimens from Mayflower Valley, Stann Creek District and Blue Creek Cave, Toledo District. (Sept and Oct)

***Calycopis drusilla*** Field. Known from five records, all from Hill Bank, Orange Walk District. (Mar and Apr)

***Calycopis pisis*** (Godman and Salvin). A single record from Hill Bank, Orange Walk District. (Mar 1995)

***Calycopis quintana*** Johnson. Known from Consejo, Corozal District and La Milpa, Orange Walk District. The type locality is Consejo, Corozal District. (July) This taxon is synonymised under *Calycopis isobeon* (Butler and Druce) in Lamas (2004), but

ecologically behaves as a distinct entity in northern Belize and much of the Yucatan Peninsula.

***Camissecla vespasianus*** (Butler and Druce). Known from a single record from Hill Bank, Orange Walk District. (Apr 1994)

***Celmia conoveria*** (Schaus). Known from numerous records from scattered localities within the Rio Bravo Conservation Area, Orange Walk District. (Apr and July)

***Chlorostrymon simaethis*** (Drury). A single record collected by Mike McInnis from San Ignacio, Cayo District. (Mar 1994)

***Contrafacia imma*** (Prittwitz). Known from a single record from Mayflower Valley, Stann Creek District. (May 1999)

***Dicya carnica*** (Hewitson). Known from La Milpa, Orange Walk District and Blue Creek Cave, Toledo District. (June and July)

***Electrostrymon joya*** (Dognin). Known from Succotz, Rio On Falls and Douglas de Silva, all in northern Cayo District. (Sept 2002)

***Electrostrymon mathewi*** (Hewitson). Known from a single record from Xunantunich Ruins, Cayo District. (July 2003)

***Electrostrymon sangala*** (Hewitson). Known from numerous records from Toledo, Cayo, Corozal and Orange Walk districts. (Mar, Apr, May, June, July and Sept)

***Enos* nr. *falerina*** (Hewitson). Locally common at La Milpa, Rio Bravo Conservation Area, Orange Walk District in July 1996.

***Erora gabina*** (Godman and Salvin). Known from Las Cuevas, Cayo District and Mayflower Valley, Stann Creek District. (May and July)

***Eumaeus childrenae*** (Gray). Jan Meerman discovered a population of this species at a site near the Raspaculo River, along the west side of the Maya Mountains, Cayo District, which will soon be flooded by a hydroelectric reservoir. We have additional records from Las Cuevas, Cayo District. (Sept)

***Gargina thoria*** (Hewitson). Known from Las Cuevas and the Macal River, Cayo District. (July 2002)

***Iaspis* nr. *castitas*** (Druce). A single record from Blue Creek Village, Toledo District. (Apr 1996)

***Ignata gadira*** (Hewitson). Known from a single record from Mayflower Valley, Stann Creek District. (May 1999)

***Ignata norax*** (Godman and Salvin). A single specimen collected from Chaa Creek, Cayo District. (June 1994)

***Janthecla janthina*** (Hewitson). Known from a single record from Las Cuevas, Cayo District. (Sept 2002)

**Lamprospilus** nr. *arza* (Hewitson). Known from a single record from Las Cuevas, Cayo District. (July 2003)

**Lamprospilus** *collucia* (Hewitson). Known primarily from Hill Bank, Orange Walk District, with an additional record from Las Cuevas, Cayo District. (Feb, Mar, Apr and Sept)

**Ministrymon** *arola* (Hewitson). A single record collected by Mike McInnis from San Ignacio, Cayo District. (Mar 1994)

**Ministrymon** *zilda* (Hewitson). A single photographic record taken by James Young at the Belize Botanical Gardens, Cayo District. (Apr 2003)

**Nicolaea** *heraldica* (Dyar). Known from a single record from Mayflower Valley, Stann Creek District. (May 1999)

**Ocaria** *ocrisia* (Hewitson). Known from Rio On Falls, San Ignacio and Las Cuevas, Cayo District. (Mar, June and July)

**Ocaria** *thales* (Fabricius). Known from Las Cuevas, Cayo District and Hill Bank, Orange Walk District. (Feb, July and Sept)

**Ostrinotes** *keila* (Hewitson). Known from scattered localities in Cayo, Corozal, Stann Creek and Belize districts. (April and Sept)

**Paiwarria** *antinous* (Felder and Felder). First reported by Owen (2000) from Las Cuevas, Cayo District, as collected in bait traps. We have additional Cayo records from Las Cuevas, northern Pine Ridge and Succotz. (July, Sept, Oct and Nov)

**Panthiades** *phaleros* (Linnaeus). Originally reported without specific data by Nicolay (1976). We have records from Succotz, Cayo District and La Milpa, Orange Walk District. (Sep and Dec)

**Semonina** *semones* (Godman and Salvin). Known from a single record from the Macal River, Maya Mountains, Cayo District. (July 2003)

**Siderus** *philinna* (Hewitson). Known from six records from the area around Succotz, Cayo District as well as a single record from Rio Frio Cave, Cayo District. (Jan and Sept)

**Strephonota** *sphinx* (Fabricius). Known from Succotz, Cayo District, Mayflower Valley, Stann Creek District and Blue Creek Cave, Toledo District. (May and Sept)

**Strephonota** *syedra* (Hewitson). Known from a single record from Blue Creek Cave, Toledo District. (May 1999)

**Strymon** *rufofusca* (Hewitson). Known from numerous records from Cayo, Corozal and Toledo districts. (June, July Sept, Oct and Nov)

**Theclopsis** *demea* (Hewitson). Known from a single record from Mayflower Valley, Stann Creek District.

(May 1999)

**Theclopsis** *mycon* (Godman and Salvin). Known from two records from Mayflower Valley, Stann Creek District. (May 1999)

**Thereus** *citoniuss cambes* (Godman and Salvin). Known from a single record from Consejo, Corozal District. (July 1988)

**Thereus** *lausus* (Cramer). Known from a single record from Consejo, Corozal District. (July 1988)

**Thereus** *oppia* (Godman and Salvin). Known from the Macal River, Maya Mountains, Cayo District and Sarteneja, Corozal District. (July and Sept)

**Thestius** nr. *lycabas* (Cramer). A single record from oak-pine forest along the Macal River, Cayo District. (July 2003)

**Tmolus** *mutina* (Hewitson). Known from a single record from Blue Creek Cave, Toledo District. (May 1999)

**Ziegleria** *syllis* Druce. Known from numerous localities in Belize, Orange Walk and Cayo districts. (Feb, Mar, July and Sept)

#### NYMPHALIDAE - LIMENITIDINAE

**Adelpha** *boeotia oberthurii* (Boisduval). Known from a single record from Las Cuevas, Cayo District. (July 2003)

**Adelpha** *paraena massilia* (Felder and Felder). Initially attributed to Belize by Willmont (2003) based on his miss-interpretation of literature records (Meerman 1999) of *Adelpha nea sentia* Godman and Salvin. Despite this, we have three specimen-based records of *A. paraena massilia* from Las Cuevas, Cayo District and Blue Creek, Toledo District. (May and Sept)

**Adelpha** *leuceria* (Druce). Locally common at Doyle's Delight (elev. 1124m), located on the Toledo and Cayo districts border. (August 2004)

#### NYMPHALIDAE - CHARAXINAE

**Agrias** *amydon* Hewitson. Based on a single sight record at Las Cuevas, Cayo District. A male of this species landed on a bait trap as we were setting bait inside the trap. Unfortunately, it flew off without entering the trap. (Sept 2002)

**Agrias** *aedon rodriguezii* Shaus. A single record from Cockscomb Basin, Stann Creek District. (Mar 2004).

**Memphis** *proserpina* (Salvin). Locally common around the base camp at Cockscomb Basin, Stann Creek District and from Doyle's Delight (elev. 1124m), located on the Toledo and Cayo districts border. (Feb, Mar, Aug and Sept)

## NYMPHALIDAE - BRASSOLINAE

***Opoptera staudingeri*** (Godman & Salvin) Locally common at Doyle's Delight (elev. 1124m), located on the Toledo and Cayo districts border. (August 2004)

## NYMPHALIDAE - ACREIINAE

***Actinote anteus*** (Doubleday). One specimen was caught (Meerman) near Placencia, Stann Creek District on (February 2000).

## NYMPHALIDAE - SATYRINAE

***Cissia labe*** (Butler). Although Meerman (1999) includes the species based on Davis' (1928) report, he had no personal experience with it in Belize. Meerman notes the historical confusion associated with the identification of this species relative to *Cissia confusa* (Staudinger) and *Cissia pseudoconfusa* DeVries and Ehrlich and the high probability that Davis was in fact, referring to one of these two common species. We have a single specimen-based record of *C. labe* from Las Cuevas, Cayo District. (Sept 2002)

***Cissia terrestris*** (Butler). Initially reported by Owen (2000) from Las Cuevas, we believe that this is also the "*Cissia* with distinctive orange lines on the hindwings" referred to as *Cissia* sp. by Meerman (1999) from Slate Creek Preserve (Cayo Dist). We have three additional records from Hill Bank, Orange Walk District. (Feb, Mar and Oct)

***Euptychia mollis*** Staudinger. Known from Mayflower Valley and Cockscomb Basin, Stann Creek District. (Mar and May)

***Megeuptychia antonoe*** (Cramer). Known from Mayflower Valley, Stann Creek District and Green Hills, Cayo District. (May, Oct and Dec)

## ACKNOWLEDGEMENTS

We owe a debt of gratitude to many people for supporting this work. For help with identifications: Robert Robbins, George Austin, Kurt Johnson and Jason Hall. For access to their extensive photo archives from Belize: James Young and Jane Ruffin. Mike McInnis and Ron King provided access to specimens and data in their care. Much of the field work reported here was supported by The Nature Conservancy's Hoosier Science Fund. V.Giles field work was funded by Manomet Observatory for Conservation Sciences and The Programme for Belize. C. Schutte was supported in part by the Iowa Science Foundation and Belize Audubon Society. We are also grateful to the following institutions for providing access to the collections in their care: The American Museum of Natural History and United State National Museum of Natural History. We also wish to thank Kim Kovarik for critical review of this manuscript.

## LITERATURE CITED

- AUSTIN, G. T. 1991 (1993). A New Species of *Calephelis* from Guatemala (Lycaenidae: Riodininae). J. Research Lepidoptera 30: 245-247.
- AUSTIN, G. T., N. M. HADDAD, C. MENDEZ, T. D. SISK, D. D. MURPHY, A. E. LAUNER, & P. R. EHRLICH. 1996. Annotated checklist of the butterflies (Lepidoptera) of Tikal National Park and vicinity (Petén, Guatemala). Tropical Lepidoptera 7: 21-37.
- DAVIS, F. L. 1928. Notes on the Butterflies of British Honduras. London, Old Royalty Book Publishing. 102p.
- GODMAN, F. C. & O. SALVIN 1879-1901. Biologia Centrali Americana. Insecta. Lepidoptera-Rhopalocera. London. 1269p.
- LAMAS, G. 2004. Atlas of Neotropical Lepidoptera. Checklist: part 4A. Hesperioidea - Papilionoidea. Scientific Publishers, Gainesville, FL. 439p.
- MCALPINE, W. S. 1971. A revision of the Butterfly Genus *Calephelis* (Riodinidae). Jour Res. Lepid. 10: 1-125.
- MEERMAN, J. C. 1999. Lepidoptera of Belize. Tropical Lepidoptera, Volume 10, Supplement I, 61p.
- MEERMAN, J.C. & W. SABIDO. 2001. Ecosystems Map of Central America: Belize. 2 vols + map. Programme for Belize.
- NICOLAY, S. S. 1976. A review of the Hubnerian genera *Panthiades* and *Cycnus* (Lycaenidae: Eumaeini). Bull. Allyn Mus. (Sarasota) 35:1-30.
- ROSS, G.N. 1964. An annotated list of butterflies collected in British Honduras in 1961. J. Lepid Soc. 18:11-26.
- SHUEY, J. A. 1997. An optimized portable bait trap for quantitative sampling of butterflies. Tropical Lepidoptera 8(1): 1-4.
- WILLMOTT, K. R. 2003. The Genus *Adelpha*: Its systematics, Biology and biogeography (Lepidoptera: Nymphalidae: Limenitidini). Scientific Publishers, Gainesville. 322p.
- YOUNG, C. A., D. P. LARSON & D. WHITE, 2004. Estimating regional species richness using a limited number of survey units. Ecoscience 11: 23-35.

Received for publication 7 April 2004; revised and accepted 15 January 2005