

A NEW CENTRAL AMERICAN *ANASTRUS* WITH UNEXPECTEDLY DISTINCT GENITALIA (LEPIDOPTERA, HESPERIIDAE, PYRGINAE)

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Abstract - *Anastrus isidro* n. sp. is described from Panama and Costa Rica. This new species is most similar to its South American counterpart *A. obliqua*, but differs from it by wing coloration, pattern and many prominent characters of male and female genitalia. A lectotype for *Antigonus obliqua* Plötz, 1884 is designated to ensure nomenclatural stability.

Key words: biodiversity, species and subspecies, skipper butterfly, genitalia, *Anastrus obliqua*

The classic key by Evans (1953) partitions *Anastrus* Hübner, [1824] into several groups on the basis of wing patterns. The *A. obscurus* Hübner, [1824] group has been worked on with two additional taxa described recently (Austin 1999, Austin & Warren 2002). The taxonomic status of *A. sempiternus* (Butler & H. Druce, 1872) group species, defined by at least traces of dark bands below, has been addressed (Austin & Warren 2002), and *A. s. sempiternus* has been recently recorded from Texas, USA (Bordelon & Knudson 2003). However, the *A. petius* (Möschler, 1877) group, characterized by more or less conspicuous diagonal dark bands on the dorsal forewing, the absence of bands below, and prominent projections on the sacculus of valvae, has received little attention from taxonomists since Evans (1953), although all described *Anastrus* taxa reported from North America are illustrated on-line (Warren *et al.* 2011) and a comprehensive bibliography (up to 2005) is assembled by Mielke (2005).

Frequently, one is asked by colleagues around the world to look at butterfly photos and give opinions about their identification. Some of these butterflies cannot be identified because they do not yet have names. Isidro Chacón contacted Dan Janzen and Winnie Hallwachs, who are spearheading a comprehensive Lepidoptera investigation of Área de Conservación Guanacaste in northwestern Costa Rica (Janzen & Hallwachs 2011, Janzen *et al.* 2011), to examine a photograph of an unusual skipper with profound diagonal bands on the forewing, like no other specimen seen by him. This specimen prompted further investigation and assembly of a series attributable to a rare undescribed species that is named herein.

Anastrus isidro Grishin, new species

(Figs. 1-6, 13-18, 25, 27, 28, 30, 32, 34, 36, 38, 40, 42, 44)

Description: Male (n=3, Figs. 1, 3, 4, 13, 15, 16, 25) – holotype forewing length 21mm; forewing relatively broad, with a costal fold about half of its length, apex pointed, termen mildly convex; hindwing more or less triangular, rounded at the apex, termen convex, very slightly indented at M2 vein; dorsal forewing with four blackish dark-brown diagonal bands: the basal band broad, from mid-costal fold to mid-dorsum in length and from 1/4 to 1/2 of costal fold in width, median band as broad as basal, from mid-costa to A2 vein basad of tornus, broader in Cu1-Cu2 cell and narrower towards A2 vein, subapical band narrower, dark from the end of R2 to M3 vein and lighter towards tornus, apical band lighter in color, prolonged along the termen and fused with subapical band at M3 vein, border of the bands somewhat irregular and wavy, indented

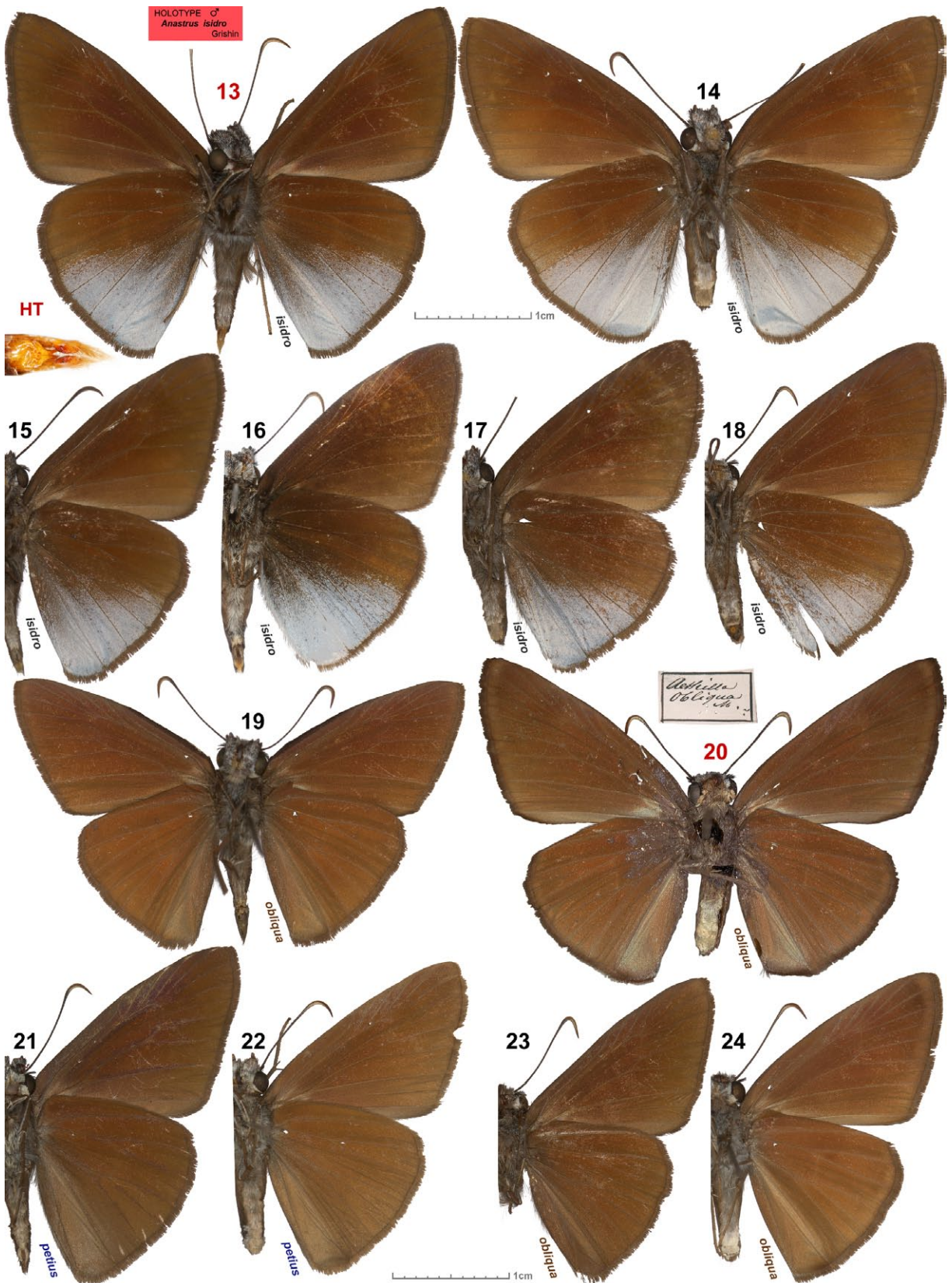
at veins; dorsal forewing plain brown between the bands, dark-brown basad of the basal band, no grayish, violet or bluish flush; dorsal hindwing blackish dark brown basad, broadly dark brown along the termen, residual postmedian diagonal dark band from Sc+R1 to near M3 vein, plain-brown between the darker areas, no grayish, violet or bluish flush; ventral forewing without clearly defined bands, brown, but narrow darker terminal line and lighter at dorsum and base posteriad of discal cell; hindwing the same ground color, narrow darker terminal line, posterior third largely up to discal cell and M3 vein bluish-white, less densely basad, mostly as bluish-white overscaling in basal half; fringes concolorous brown on both wings above and below. Head dark brown, bluish-white beneath eyes; palpi porrect, the third segment rooted in the external half of the second, mostly dark brown above, with mixed bluish-white and brown scales below; eyes brown; antennae almost black, below with whitish scales, chequered towards the club, club whitish beneath, somewhat yellower towards apiculus, and brown nudum with 24 segments (n=2); collar brown with sparse whitish scales, thorax and abdomen dorsally dark brown, ventrally mixed brown and bluish-white; thoracic pouch with whitish scales (Fig. 25); legs brown with many bluish-white scales, tibia without spines, mid-tibia with single pair of spurs, hind tibia with two pairs of spurs and light-brown hair tuft entering the thoracic pouch. **Male genitalia** (Figs. 27, 28, 30, 32, 34, 36, 38) - tegumen oblong in dorsal view, terminating centrally in a pair of small knobs (Fig. 32); uncus long, divided (Fig. 30), arms terminally divergent (Fig. 32), hook-like in lateral view (Figs. 34, 36), about twice as long as the distance between their termini; gnathos divided (Fig. 36); saccus as long as wide (Fig. 32); valva with margin of costa-ampulla broadly triangular, ampulla without style; harpe extended caudad, broad dorsal triangular projection and blunt rounded caudal end covered with dense long setae, no spines or teeth (Figs. 34, 36, 38); sacculus with two projections armed with numerous short sclerotized teeth; basal, longer style-like projection directed dorso-caudad, caudal projection broadly triangular, terminally rounded (Figs. 36, 38); aedeagus with downturned distal third, no cornuti (Fig. 36), phallobase with two short lateral processes (Figs. 30, 31).

Female (n=3, Figs. 2, 5, 6, 14, 17, 18) – forewing length = 21 to 22mm, similar to male, but with more rounded, slightly broader wings and noticeably lighter areas between the dark bands. **Female genitalia** (n=1, Figs. 40, 42, 44) - lamella postvaginalis slightly and broadly concave on the narrowly sclerotized and somewhat undulate caudal edge; lamella antevaginalis deeply U-shaped centrally, cleft narrow, about a third of lateral lobe width, lateral lobes broad and long, shovel-like, their caudal margin exceeds that of lamella postvaginalis (Figs. 42, 44); antrum sclerotized, narrow; corpus bursae narrow, twice the length of very narrow ductus bursae (Fig. 40); seventh tergite with short and broad caudal lateral processes (Fig. 42).

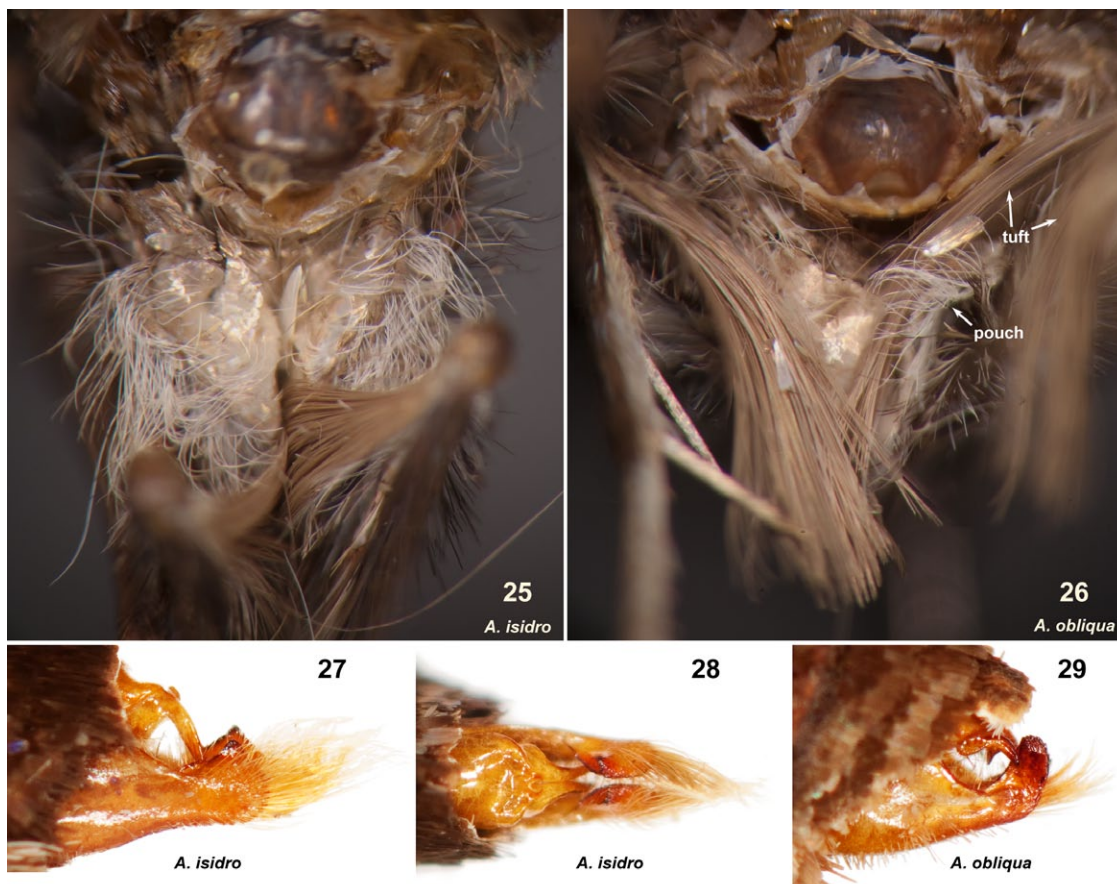
Types: Holotype male with the following labels: white handwritten - / Cerro Jefe / 2500' / Pan., Panama / Nov. 1970 /, red printed - /HOLOTYPE ♂ / *Anastrus isidro* / Grishin /. Allotype female - Panama: Panamá Province, 6mi N El Llano, 396m, 9° 17'N 79° 00'W, 30 December 1974, leg. G.B.Small. Paratypes: male - Panama: Panamá Province, 5mi N El Llano, 330m, 9° 17'N 79° 00'W, 18 June 1978, leg. G.B.Small; female - Panama: Panamá Province, 5mi N El Llano, 330m, 9° 17'N 79° 00'W, 6 June 1978, leg. G.B.Small; female - Panama: Colón Province, Santa Rita Ridge, 457m, 9° 22'N 79° 43'W, 11 January 1969, leg. G.B. Small; one male and three females – Costa Rica: Heredia Province, Sarapiquí Canton, La Virgen District, Tirimbina Biological Reserve, La Isla, 100-200m, 10° 24.9'N 84° 7.8'W, 14 July 2010, leg. I.A.



Figs. 1-24. *Anastrus* specimens. 1-12. dorsal view and 13-24. ventral view of the same specimens. 1, 13. *A. isidro* n. sp. holotype ♂ - PANAMA: Panamá Province, Cerro Jefe, 760m, November 1970 [USNM], genitalia *in situ* on the left; **2, 14. *A. isidro* n. sp. allotype ♀** - Panama: Panamá Province, 6mi N El Llano, 396m, 9° 17'N 79° 00'W, 30 December 1974, leg. G.B.Small; **3, 15. *A. isidro* n. sp. paratype ♂** - Panama: Colón Province, Santa Rita Ridge, 457m, 9° 22'N 79° 43'W, 11 January 1969, leg. G.B. Small [USNM]; **4, 16. *A. isidro* n. sp. paratype ♂** - Costa Rica: Heredia Province, Sarapiquí Cantón, La Virgen District, Tirimbina Biological Reserve, La Isla, 100-200m, 10° 24.9'N 84° 7.8'W, 14 July 2010, leg. I.A. Chacón [INBio], photo by Isidro A. Chacón; **5, 17. *A. isidro* n. sp. paratype ♀** - Panama: Panamá Province, 5mi N El Llano, 330m, 9° 17'N 79° 00'W, 6 June 1978, leg. G.B.Small; **6, 18. *A. isidro* n. sp. paratype ♀** - Panama: Colón Province, Santa Rita Ridge, 457m, 9° 22'N 79° 43'W, 11 January 1969, leg. G.B. Small;



Figs. 1-24. *Anastrus* specimens (continued from page 2): 7, 19. *A. obliqua* ♂ - Brazil: Paraíba, João Pessoa, 26 September 1953, leg. Jorge Kesselring, collection of S. S. Nicolay, genitalia slide H239 prep. S. S. Nicolay [USNM]; 8, 20. *A. obliqua* ♀ lectotype (designated herein) - locality unknown [MNHU]; 9, 21. *A. petius* ♂ - Brazil: Rondônia, 8km N Cacaúlândia, 10° 30S 62° 52' W, 11 November 1989, 190m, leg D.H. Ahrenholz, S.S. Nicolay curator [USNM], genitalia shown are for a different specimen - Peru: 30km SW Puerto Maldonado, 300m, 3 May 1984, leg. S. S. Nicolay [USNM]; 10, 22. *A. petius petius* ♀ - Guyana: Tropenbos Forest Reserve, Middle Demerara River, 61-122m, 5° 9.32'N 58° 41.98'W, 31 January - 12 February 2001, leg. S Fratello et al. USNM ENT 00179075 [USNM]; 11, 23. *A. obliqua* ♂ - French Guiana: Cayenne, Wm. Schaus Collection [USNM]; 12, 24. *A. obliqua* ♀ - Brazil: Paraíba, João Pessoa, 26 December 1953, leg. Jorge Kesselring, collection of S. S. Nicolay, genitalia NVG120207-04 [USNM]. Figure numbers for primary type specimens are printed in red and labels are shown. Labels are at 1/3 the scale, except for 8, which is 1/2 the scale, and genitalia are 4 times the scale of specimens



Figs. 25-29. *Anastrus* thoracic pouch and “dry” male genitalia. 25, 26. thorax and thoracic pouch, abdomen removed, posterior view. 25. *A. isidro* n. sp. paratype - Panama: Panamá Province, 5mi N El Llano, 330m, 9° 17N 79° 00'W, 18 June 1978, leg. G.B.Small [USNM]; 26. *A. obliqua* - Brazil: Mato Grosso, Diamantino, Alto Rio Arinos, 350-400m, 14° 13'S 56° 12'W, 12 October 1990, leg. E. Furtado [USNM]; 27-28. “dry” male genitalia *in situ*, left lateral (27, 29) and dorsal (28) views. 27, 28. *A. isidro* n. sp. holotype PANAMA: Panamá Province, Cerro Jefe, 760m, November 1970 [USNM]; 29. *A. obliqua* - French Guiana: Cayenne, Wm. Schaus Collection [USNM].

Chacón. Holotype, allotype and 3 paratypes from Panama are at the National Museum of Natural History, Smithsonian Institution, Washington DC (USNM). All four paratypes from Costa Rica are in the Entomological Collection of the Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (INBio).

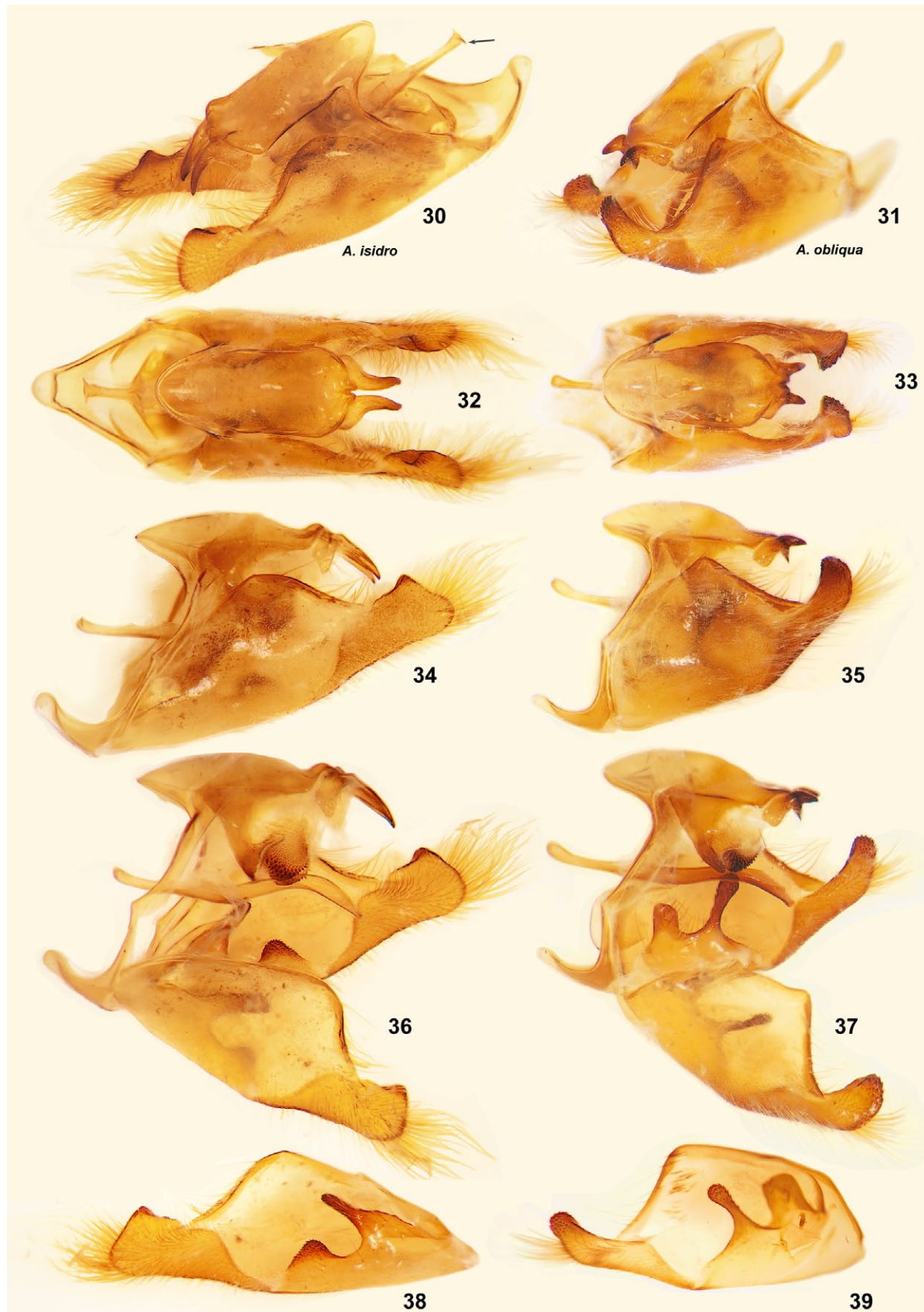
Type locality: PANAMA: Panamá Province, Cerro Jefe, 760m.

Etymology: The name of the species honors Costa Rican lepidopterist Isidro Chacón, who brought a recently caught male to our attention, and it is an indeclinable noun in apposition.

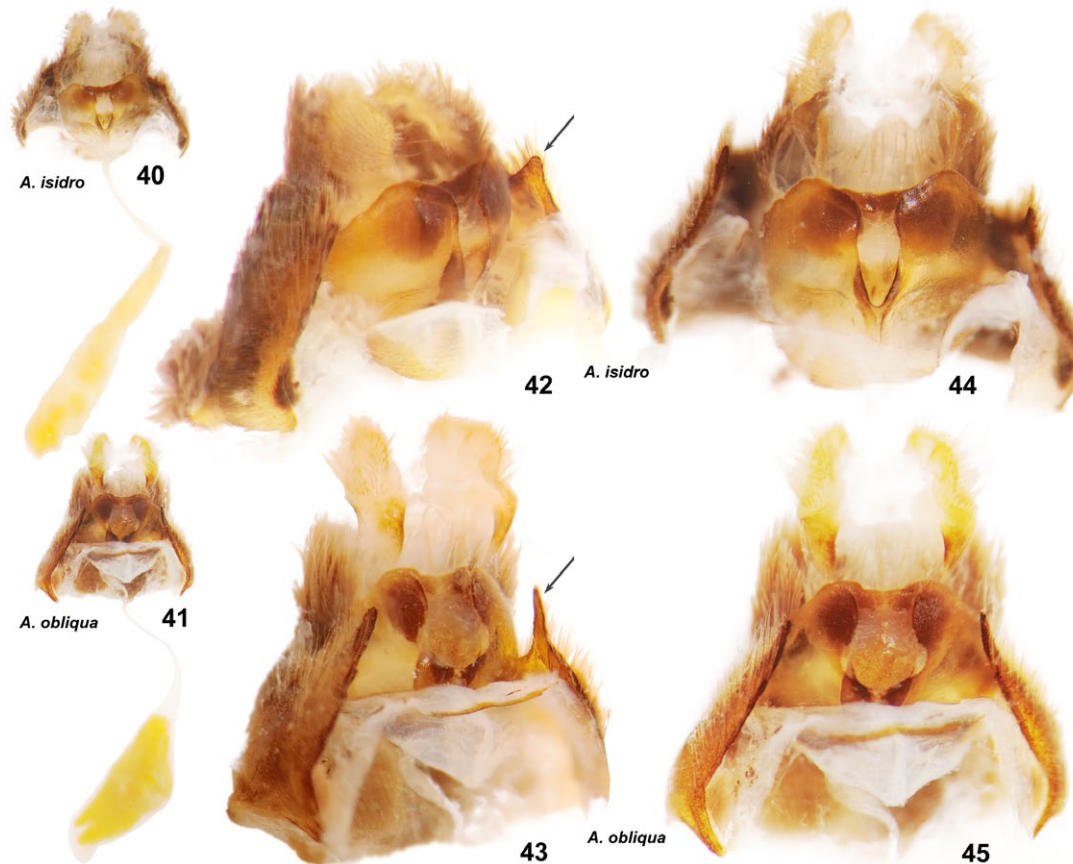
Distribution and phenology: Currently, the species is known from Costa Rica (Heredia Province) and Panama (Colón and Panamá Provinces), and has been recorded from November, December, January, June and July.

Diagnosis: *A. isidro* n. sp. is characterized by: 1) four continuous dark-brown diagonal bands on the forewing, central band being most prominent, traversing the wing from the mid-costa to near tornus; 2) plain brown color between the bands without grayish, violet, or bluish flush; 3) largely uniformly colored ventral forewing without spots or bands; 4) bluish-white posterior third of the hindwing underside contrasting prominently with the uniformly brown forewing-like ground color; 5) poorly defined dark-brown band between the dark base and dark margin on dorsal hindwing, this postmedian band is not entire and is broken or weaker, wider and diffuse around veins M3 and Cu1, and mostly has an appearance of a diagonal dark streak from costa to M3; 6) male genitalia with long hook-like uncus arms (Fig. 36), narrower more elongated valva with harpe width being about half of valva width, harpe with a blunt broad tip not bending dorsad (Fig. 34), two processes off sacculus with the caudal process much shorter, bump-like and the basal process longer, style-like (Fig. 38), a pair of small lateral processes off the basal tip of phallobase (Figs. 30, 32); 7) female genitalia with broad shovel-like lateral lobes of lamella antevaginalis, a narrow oblong cleft between them (Fig. 44), and a pair of wide blunt lateral processes off the seventh tergite (Fig. 42).

The closest species is *Anastrus obliqua* (Plötz, 1884), and evident similarities to it place *A. isidro* n. sp. in the same genus. *A. obliqua* differs by characters 2), 4), 6) and 7). In *A. obliqua*, lighter dorsal wing color between the dark bands is with more or less prominent light-violet, grayish flush; and ventral hindwing is largely uniformly colored without bluish-white area in the tornal third. It should be noted that in *A. obliqua*, somewhat lighter-colored scales do occur along the veins, and the anal fold ventrally is slightly lighter than the rest of the wing. In addition, *A. obliqua* has narrower, more angular wings; dark forewing bands are mostly lighter than those of *A. isidro*, especially in males, e.g. compare Figs. 1 with 7, and 3 or 4 with 11; and the subapical forewing darker band appears distally concave due to wider dark-brown patch in the cells M1-M2 and M2-M3 and narrower, slightly offset basad patch in the radial sector, and is more straight or even convex in *A. isidro*, resulting from wider light-brown submarginal diffuse spots in these two cells and wider dark brown band from costa to M1. Both male and female genitalia of *A. obliqua* show many prominent differences from those of *A. isidro* (Figs. 27-45). *A. obliqua* male genitalia are characterized by a far shorter than that of *A. isidro* claw-like uncus (arms about as long as the distance between their termini, Figs. 31, 35), broader more triangular valva with narrower no more than 1/3 of valva width harpe that is bent dorsad (Figs.



Figs. 30-39. *Anastrus* male genitalia. 30, 32, 34, 36, 38. *A. isidro* n. sp. paratype - Panama: Colon Province, Santa Rita Ridge, 457m, 9° 22'N 79° 43'W, 11 January 1969, leg. G.B. Small, genitalia NVG120207-01 [USNM]; 31, 33, 35, 37. *A. obliqua* - Brazil: Pará, Belem, August 1960, genitalia NVG120207-03 [USNM]; 39. *A. obliqua* - Brazil: Paraíba, João Pessoa, 26 September 1953, leg. Jorge Kesselring, collection of S. S. Nicolay, genitalia slide H239 prep. S. S. Nicolay [USNM]. 30-37. genitalia capsule in the following views: 30, 31. dorso-latero-posterior; 32, 33. dorsal; 34, 35. left lateral; 36, 37. left lateral with the left valva bent ventrally. 38, 39. left valva, interior lateral view. Arrow points at a lateral projection on the phallobase.



Figs. 40-45. *Anastrus* female genitalia. 40, 42, 44. *A. isidro* n. sp. paratype - Panama: Colon Province, Santa Rita Ridge, 457m, 9° 22'N 79° 43' W, 11 January 1969, leg. G.B. Small, genitalia NVG120207-02 [USNM], 41, 43, 45. *A. obliqua* - Brazil: Paraíba, João Pessoa, 26 December 1953, leg. Jorge Kesselring, collection of S. S. Nicolay, genitalia NVG120207-04 [USNM]. 40, 41. ventral view of the entire structure; 42-45. enlarged caudal structures in ventro-lateral (42, 43) and ventral (44, 45) views. Arrows point to a caudal lateral projection on the seventh tergite.

35, 39), caudal process of sacculus being style-like, longer and thinner than the basal process (Figs. 37, 39), and phallobase round, without any processes (Figs. 31, 33). *A. obliqua* female genitalia are characterized by narrower smaller lateral lobes of lamella antevaginalis, a broad almost circle-shaped cleft between them (Fig. 45), and a pair of unusually narrow pointed lateral processes off the seventh tergite (Fig. 43). *A. obliqua* is currently known only from South America (Amazonian region to south Brazil, (Evans 1953)), and I have examined specimens from the following localities: Peru, French Guiana, and Brazil (Mato Grosso, Paraíba, Pará).

The next closest taxon to *A. isidro*, also characterized by continuous forewing dark bands (if present), uniform ventral forewing color and processes off the sacculus, is *Anastrus petius* Evans, 1953, which has been recorded from Guatemala, Honduras and Costa Rica (Evans 1953, Warren et al. 2011), and differs in characters 2), 5), and 6). Indeed, the most prominent difference is in the light-bluish dorsal overscaling between the dark bands in *A. p. peto*, particularly noticeable on the hindwing, even in worn specimens and specimens with weakly defined or virtually absent darker bands. Additionally, the postmedian dorsal hindwing band is usually bordered by areas of bluish scales on both sides, entire and typically has an appearance of 1/5 of a circle from costa to anal fold. The nominal *A. petius* subspecies (Möschler, 1877) known from South America (Colombia to South Brazil, (Evans 1953)) additionally differs

in character 4). It lacks the white tornal ventral hindwing area. An obvious difference in male genitalia of *A. petius* (Fig. 11) is a very narrow tapered harpe, armed with spines.

The combination of characters 1) and 3) differentiate *A. isidro* n. sp. from all other *Anastrus* species.

Lectotype designation for *Antigonus obliqua* Plötz, 1884 (Maassen in litt.)

A specimen in the Museum für Naturkunde der Humboldt Universität, Berlin (ZMHU) bearing three labels: large, white, handwritten, framed: / *Aethilla* / *Obliqua* / *M* . . . / ; small, white, printed / *Mssn.* / *G.* / ; medium, red, printed, framed except on top / *Typus* / is here designated as the lectotype of *Antigonus obliqua*. The following label will be added to the specimen after publication of this study: / LECTOTYPE / *Antigonus obliqua* Plötz, 1884 / (Maassen in litt.) / *Jahrb. nass. Ver. Nat., Wiesbaden, 37: 25* / designated by Grishin, 2012 / . This specimen and its labels are illustrated on Figs. 8 and 20. It is a female in good condition, with minimal scale loss, complete fringes and both antennae present, but palpi missing. It can be recognized by pin damage in the right forewing cell (3 tears) and a tear of costa in basal third; left hindwing tornus bent ventrad, and costal margin folded dorsad; right hindwing margin straight, not folded (except near the base); abdomen glued on, glue signs also visible ventrally near the pin. This specimen seems to be the only known syntype in collections.

The Plötz text (Plötz 1884) considered to be the original description of *A. obliqua* is in a form of identification key and mentions neither the number of specimens, nor their locality. Locality was marked by “?” and remains unknown (Plötz 1884, Godman 1907). Thus, if more than one specimen constituted the type series, it cannot be excluded that they were from several localities, e.g. from both North and South America, and some of these specimens might have been of the species described here. While *A. isidro* n. sp. specimens from Costa Rica and Panama possess bluish-white scaling of ventral hindwing, a number of Hesperidae taxa (see Discussion below) include forms and subspecies with and without such scaling. Due to the rarity of this new species in collections, its range and geographic variation are very poorly known, and it cannot totally be excluded that some populations of *A. isidro* may have completely brown ventral hindwing. While the original description of *A. obliqua* states that underside of both wings is “ganz braun”, if some *A. isidro* populations indeed lack the bluish-white coloration, such specimens might have been part of the *A. obliqua* type series. It is clear that the ZMHU specimen bearing the “Typus” label: 1) agrees with *A. obliqua* original description, 2) is different from the taxon described in this study, and also 3) South American specimens of this species have been treated as *A. obliqua* in subsequent publications (e.g. Godman 1907, Draudt 1922, Lindsey 1925, Evans 1953) and curated as *A. obliqua* in museum collections. Therefore, designation of this specimen as lectotype is necessary to firmly define the identity of *A. obliqua* in accord with the original description and subsequent usage, and to set *A. obliqua* apart from *A. isidro* in case other specimens from the *A. obliqua* type series are discovered.

DISCUSSION

The most prominent difference in facies of *A. isidro* n. sp. from *A. obliqua* is the bluish-white coloration of ventral hindwing posterior. This difference by itself, although very noticeable, might not be sufficient to support a new taxon as a species and not a subspecies. Indeed, there are a number of Pyrginae species for which one subspecies possesses a bluish-white area and the other subspecies lacks it: for instance, *Anastrus sempiternus sempiternus* (Butler & H. Druce, 1872) vs. *A. s. dilloni* (E. Bell & W. Comstock, 1948) and *Anastrus neaeris neaeris* (Möschler, 1879) vs. *Anastrus n. narva* Evans, 1953. Currently, taxa in these pairs are considered conspecific, however, future research may show otherwise. The Caribbean subspecies *A. s. dilloni* may well be considered a full species with further investigation. Indeed, in a few examples evidence suggests that the difference in coloration correlates with the species identity, e.g. for the congeners *Anastrus tolimus* (Plötz, 1884) vs. *A. luctuosus* (Godman & Salvin, 1894), or others like *Zera zera* (Butler, 1870) vs. *Z. difficilis* (Weeks, 1901). In any case, it is clear that species status of taxa differing in the ventral hindwing coloration needs to be additionally supported, usually by areas of sympatry, differences in genitalia, wing shape, or additional differences in wing patterns. Currently, there are no data to suggest sympatry of the new taxon with *A. obliqua*, and due to the rarity of both species it is not very likely that this question will be clarified in the nearest future. However, very

significant differences in both male and female genitalia are observed (Figs. 27-45). These differences discussed above are numerous, and by themselves warrant placement of *A. isidro* as a distinct species significantly diverged from *A. obliqua* despite many superficial similarities. Moreover, the dispersal of light-bluish or violet scales over the lighter areas of dorsal wings in both *A. obliqua* and *A. petius*, and the lack of non-brown scales in corresponding areas in the new taxon, which contrasts its bluish-white coloration of hindwing underside absent in *A. obliqua*, complemented by the differences in arrangement of the subapical lighter areas on dorsal forewing, and noticeably broader, less angular wings in the new taxon, strongly support distinctness of *A. isidro* as a species.

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