*J. New York Entomol. Soc.* 112(1):1–17, 2004

# A NEW SPECIES OF *TITHOREA* (LEPIDOPTERA: NYMPHALIDAE: ITHOMIINAE) FROM THE CHOCÓ REGION OF NORTHWESTERN SOUTH AMERICA AND PANAMA

KEITH R. WILLMOTT[1] AND GERARDO LAMAS[2]

[1]Department of Entomology, The Natural History Museum, Cromwell Road, London, SW7 5BD, United Kingdom; and
[2]Museo de Historia Natural, Universidad Mayor de San Marcos, Lima, Peru

*Abstract*.—A new species of *Tithorea*, *Tithorea pacifica* n. sp., is described and diagnosed from pluvial premontane rain-forest in northwestern Ecuador. Two additional new subspecies, *T. pacifica euphonia* n. ssp. and *T. pacifica concordia* n. ssp., are also described, from western Colombia and extreme eastern Panama, respectively. Adult specimens and genitalia of both sexes are illustrated for the three known species of *Tithorea* and the characters that distinguish the species are tabulated.

*Key words:* Colombia, Darién, Ecuador, Neotropical, *Tithorea harmonia*, *Tithorea pacifica* n. sp., *Tithorea tarricina*.

---

Few genera of the nymphalid butterfly subfamily Ithomiinae can be regarded as taxonomically straightforward, but, since the revision by Fox (1956), the taxonomy of the primitive genus *Tithorea* Doubleday, 1847, has remained stable for almost 50 years. Fox (1956) reduced the larger number of species recognized by earlier authors (e.g., Doubleday, 1847; Godman, 1901; Haensch, 1909) to two, whose ranges collectively extend throughout the Neotropical region. *Tithorea harmonia* (Cramer), 1777 with some thirty geographical races (Lamas, in press), is common and widespread in forest habitats from sea-level to at least 1,600 m, from Mexico to western Ecuador, the Amazon, Guianas, Trinidad and Tobago, and eastern and southeastern Brazil, Paraguay and northern Argentina. *Tithorea tarricina* Hewitson, 1858, containing eight subspecies (Lamas, in press), is a rather more scarce inhabitant of lowland to lower montane forest habitats from Mexico to western Colombia and along the eastern Andes from Venezuela to Bolivia. It occurs from sea-level to 1,500 m in Central America (DeVries, 1987), and more locally from 450–2,000 m in the Andes.

A number of new subspecies have been recognized in recent years (e.g., Brown, 1977), while others remain undescribed (Lamas, in press), but in most cases these reflect better distributional knowledge and a more fine-grained approach to taxonomy than used by previous authors. However, a distinctive new taxon has been collected during the last ten years in extreme northwestern Ecuador, in pluvial forests that have become more accessible since 1994 with the completion of a new road connecting the highland town of Ibarra with the coastal town of San Lorenzo. Several other distinctive species have also recently been discovered in this area of high diversity and endemism (e.g., Willmott and Hall, 1994, 1999; Hall and Willmott, 1995). Although this taxon is not currently known to be micro-sympatric with either *T. harmonia* or *T. tarricina*, it possesses unique morphological and wing pattern characters. Two additional rare undescribed taxa, from northwestern Colombia and the Darién region of eastern Panama, have the same characters, and the three taxa are recognized here as constituting an undescribed third species of *Tithorea*.

## METHODS

*Tithorea* material has been examined by the authors in collections in Europe, North and South America to study variation in wing patterns, venation and androconial structures. Dissections were made of specimens from localities spanning the range of each species to account for variation and identify stable characters (Table 1). Abdomens were soaked in hot 10% KOH solution for 15 min and subsequently stored in glycerol for study under binocular microscope. Morphological terms for genitalia largely follow Klots (1956) and venation follows Comstock & Needham (1918). Original descriptions were consulted by GL for all published *Tithorea* names and attempts made to locate type material (Lamas, in press). The following collection codens are used:

BMNH: The Natural History Museum, London, UK
FV: Fabio Vitale Collection, Lecce, Italy
KWJH: Keith Willmott and Jason Hall Collection, London, UK
MECN: Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador
MUSM: Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru
MZPAN: Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland
PB: Pierre Boyer Collection, Le Puy Sainte Réparade, France
USNM: National Museum of Natural History, Smithsonian Institution, Washington DC, USA

## SYSTEMATICS

### **Tithorea pacifica** new species
Figs. 1A–B, 3, 4A, 5A–C, G–H, P–R, 6A–E, 7

**Description.** *Male* (Figs. 1A, 3, 4A, 5A–C, G–H, P–R): Forewing length 40 mm. Forewing similar to *T. harmonia*, more elongate than in *T. tarricina* (Fig. 2); costa slightly concave, apex rounded, distal margin straight, anal margin with double curve at middle. Hindwing subrounded, more squat than in *T. harmonia* (Fig. 2A–C). *Dorsal surface* (Fig. 1A): ground color black. Forewing with base of cubital vein and small indistinct ovoid spot at anterior edge of cell 2A-Cu2 just basal of base of vein Cu2 reddish brown; costa and adjacent distal end of discal cell with bright yellow marking, extending right across discal cell; broad, uneven, bright yellow postdiscal patch in cells M3-R5; bright yellow postdiscal marking extending from posterior half of cell Cu2-Cu1 into anterior half of cell 2A-Cu2; series of bright yellow submarginal spots from cell 2A-Cu2 to costa, displaced basally in cell Cu1-M3; distal margin fringe black with white dashes in middle of each cell. Hindwing with broad discal band extending from anal margin to anterior edge of discal cell and vein M1 and filling distal two-thirds of discal cell; this band is bright yellow anteriorly, shading to reddish brown at anterior edge of discal cell and remaining this colour to anal margin; bright yellow postdiscal band becoming reddish brown along basal edge and at anal margin, where fused with discal band, extending from anal margin to cell M2-M1; this band is composed of large contiguous blocks from anal margin to vein M3, an isolated spot in cell M3-M2, and a smaller spot slightly fused with discal band in cell M2-M1. *Androconial structures* (Figs. 3, 4A): anterior edge of hindwing discal cell with two separate patches of hair-like androconial scales (“hair pencils”); basal hair pencil narrow (1.5 mm), blackish in basal half of hairs and buff in distal half; distal hair pencil three times width of basal patch (4.5 mm), black; a small, ovoid patch of pale androconial scales underlying distal half of basal hair pencil in cell Rs-Sc+R1; a large, ovoid

Table 1. Genitalic dissections.

| Taxon | Locality | Collection | Dissection # |
|---|---|---|---|
| Male | | | |
| *T. tarricina duenna* | Guatemala: Escuintla, Zapote | BMNH | 6812 |
| *T. tarricina duenna* | Guatemala: Alta Verapaz, Polochic valley | BMNH | Slide 025 |
| *T. tarricina parola* | Colombia (W): Caldas, Manizales | BMNH | 6814 |
| *T. tarricina tagarma* | Peru (E): Junín, Río Colorado | BMNH | 6816 |
| *T. harmonia hippothous* | Guatemala: Alta Verapaz, Cubilguitz | BMNH | Slide 024 |
| *T. harmonia furina* | Colombia (C): "Interior of Colombia" | BMNH | Slide 020 |
| *T. harmonia furina* (?) | Colombia (W): Valle del Cauca, Río Dagua | BMNH | 6819 |
| *T. harmonia manabiana* | Ecuador (W): Los Ríos, Santa Ana María, Quevedo | BMNH | 6820 |
| *T. harmonia megara* | Trinidad: no locality data | BMNH | 6622 |
| *T. harmonia hermias* | Ecuador (E): Napo, Chichicorrumi | KWJH | TITH-2 |
| *T. pacifica concordia* | Panama: Darién, Cana (HT) | MUSM | |
| *T. pacifica euphonia* | Colombia (W): Antioquia, Valdivia (PT) | BMNH | 7048 |
| *T. pacifica pacifica* | Ecuador (W): Esmeraldas, Río Chuchuví (HT) | MECN | TITH-3 |
| *T. pacifica pacifica* | Ecuador (W): Esmeraldas, Río Chuchuví (PT) | KWJH | 7046 |
| Female | | | |
| *T. tarricina duenna* | Mexico: Veracruz, Orizaba | BMNH | 6813 |
| *T. tarricina parola* | Colombia: Risaralda, Pereira | BMNH | 6815 |
| *T. tarricina tagarma* | Peru (E): Junín, Río Colorado | BMNH | 6817 |
| *T. harmonia hippothous* | Belize: Toledo, Punta Gorda | BMNH | 6818 |
| *T. harmonia megara* | Trinidad: no locality data | BMNH | 6623 |
| *T. harmonia hermias* | Ecuador (E): no locality data | KWJH | TITH-1 |
| *T. pacifica pacifica* | Ecuador: Carchi, Lita, ridge east of Río Baboso (AT) | BMNH | 7047 |

patch of black androconial scales underlying distal half of distal hair pencil, extending from base of vein Rs approximately halfway along vein towards margin (7 mm), in posterior half of cell Rs-Sc+R1 and anterior half of cell M1-Rs. *Ventral surface* (Fig. 1A): ground color black. Forewing with bright yellow markings reflecting those on dorsal surface; cubital vein basal of vein Cu2 broadly lined with pale reddish brown scales; paired white submarginal spots distal of yellow submarginal markings in cells Cu2-Cu1 to R5-R4; scales absent in a broad patch filling basal half of cell 2A-Cu2, just extending into cell posterior of vein 2A. Hindwing with same markings as dorsal surface; additional orange costal band, yellow at base, extending from wing base and terminating in a yellow postdiscal spot in cell Rs-Sc+R1, between vein Sc+R1 and costa; paired white submarginal spots distal of yellow submarginal markings in cells Cu2-Cu1 to M1-Rs; three similar white submarginal spots in cell 2A-Cu2 and one in cell 3A-2A. *Venation* (Fig. 4A): typical of genus except base of hindwing vein Rs positioned more basally and Sc+R1 not recurved in distal half. *Body*: eyes brown with sparse, short setae; labial palpi white with black ventro-lateral outer and medial inner stripes of dense black scales and hairs; antennae dark brown; frons black with white spot ventral of antennal sockets, white spot dorsally behind eyes; patagia with long reddish brown hair-like scales; tegula with dark brown

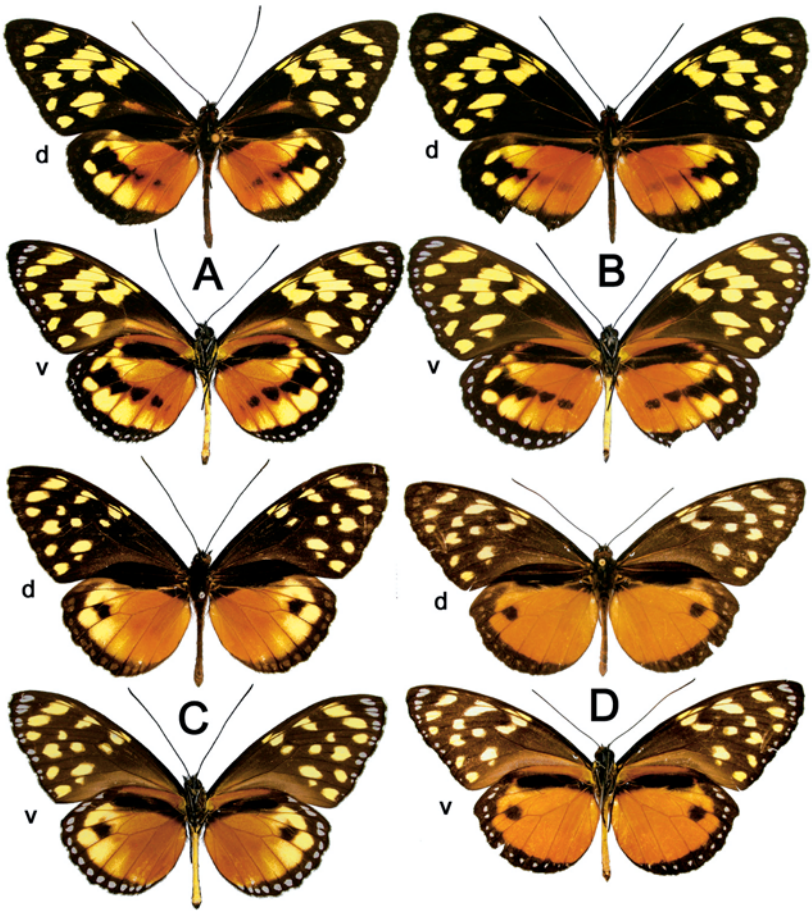


Fig. 1. *Tithorea pacifica* n. sp., d = dorsal surface, v = ventral surface: A. *T. pacifica pacifica*, male, PT; B. *T. pacifica pacifica*, female, AT; C. *T. pacifica euphonia*, n. ssp., male, HT; D. *T. pacifica concordia*, n. ssp., male, HT.

scales and long dark brown hairs, becoming reddish brown at dorsal edge, ventral lobe white; thorax dorsally black with pale yellowish white dorsal midline and sparse, long reddish brown lateral hairs; thorax ventrally black with pale yellowish stripes just posterior of where legs fold; legs black with white ventral scaling on femur of mid and hindleg, white scaling on outer edge of foreleg when folded; abdomen dorsally dark brown with lateral reddish brown scaling at base of basal two segments and in soft pleural tissue between tergites and sternites; abdomen ventrally pale yellow. *Abdomen and genitalia* (Fig. 5A–C, G–H, P–R): similar to both congeners except ventral edge of valva distinctly indented near apex and dorsal tip extended (Fig. 5A), similar to *T. tarricina*; anterior tip of saccus slightly indented basally;

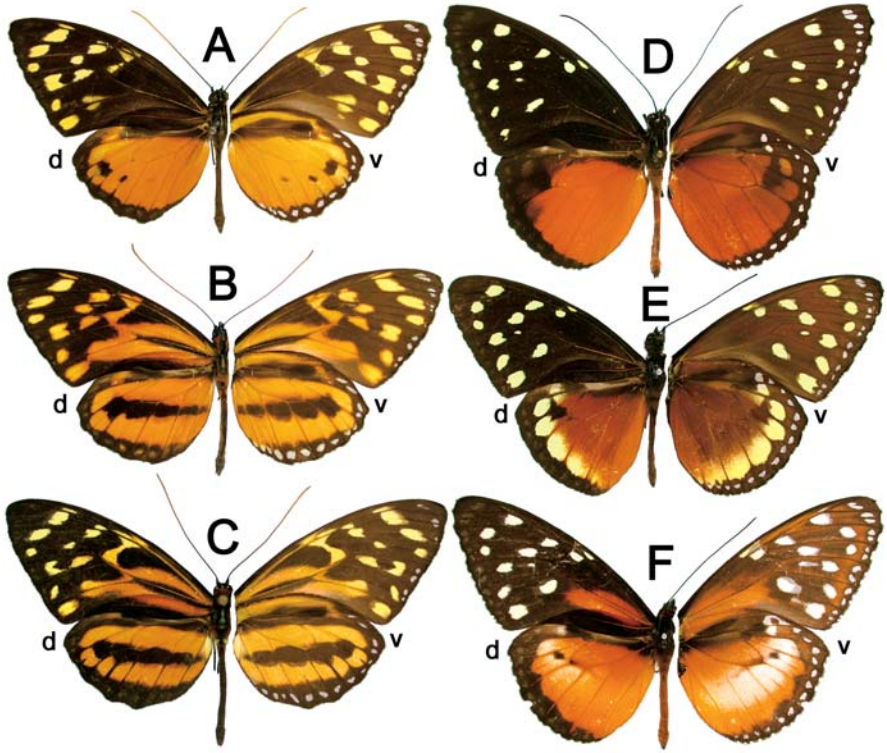


Fig. 2. Male *Tithorea harmonia* and *T. tarricina*, d = dorsal surface, v = ventral surface: A. *T. harmonia irene*, Panama, Chiriquí (BMNH); B. *T. harmonia furina*, Colombia, Valle de Cauca, Río Dagua (BMNH); C. *T. harmonia manabiana*, Ecuador, Manabí, Palmarcito (KWJH); D. *T. tarricina pinthias*, Panama, Chiriquí (BMNH); E. *T. tarricina parola*, Colombia, "Caucathal" (BMNH) (ST); F. *T. tarricina tagarma*, Peru, Junín, La Merced (BMNH).

appendices angulares heavily sclerotized and rounded; aedeagus slightly double curved (Fig, 5H), with inner and outer patch of tiny, spine-like cornuti, inner patch only slightly bifid distally (Fig. 5G).

*Female* (Figs. 1B, 6A–E): Forewing length 41 mm. Similar to male except as follows. Forewing slightly more rounded and anal margin straighter; hindwing slightly more elongate. *Dorsal surface* (Fig. 1B): reddish brown spot in forewing cell 2A-Cu2 absent. *Androconial structures*: absent. *Venation*: base of vein Rs much more distal than in male, near to base of vein M1. *Abdomen and genitalia* (Fig. 6A–E): similar to both congeners except eighth sternite plates extending ventrally from terminal spiracle present (Fig. 6B; present also in *T. harmonia* (Fig. 6G), but absent in *T. tarricina* (Fig. 6L)) and touching basal edge of terminal tergite (not touching in *T. harmonia*).

**Types.** Holotype, male, ECUADOR, **Esmeraldas**, km 12.5 Lita – San Lorenzo road, Río Chuchuví, 0°53.1′N, 78°30.9′W, 850 m, 15,16.vii.1999, K.R. Willmott, (MECN). Allotype,

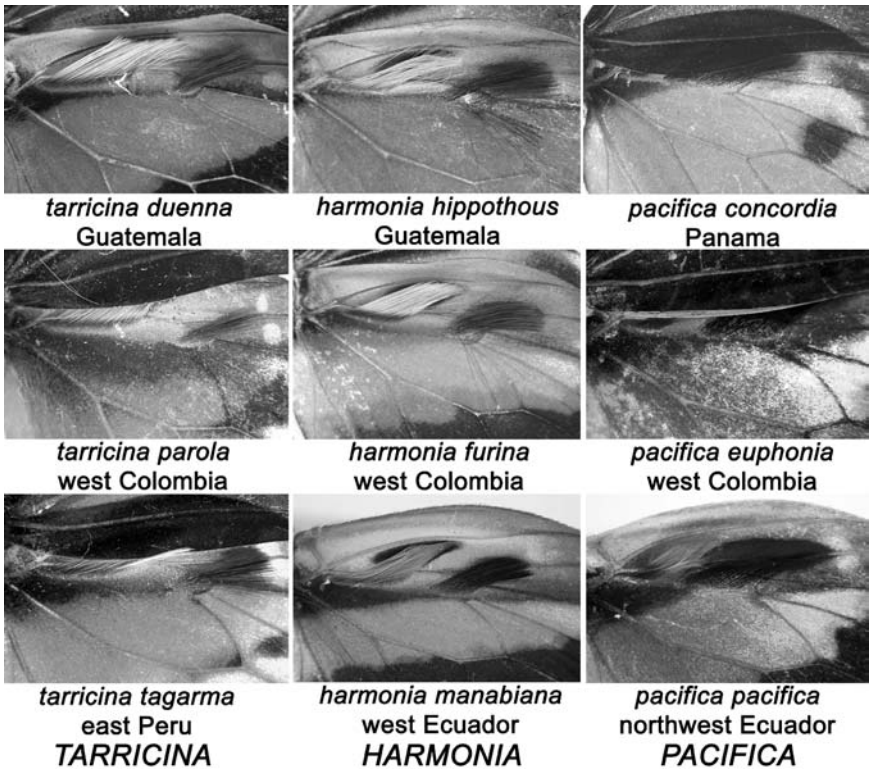


Fig. 3. Hindwing androconia. *T. tarricina duenna*, Guatemala, Río Polochic (BMNH); *T. t. parola*, Colombia, Botero (BMNH); *T. t. tagarma*, Peru, La Merced (BMNH); *T. harmonia hippothous*, Guatemala, Cubilguitz (BMNH); *T. h. furina*, Colombia, "Interior" (BMNH); *T. h. manabiana*, Ecuador, Santa Ana María (BMNH); *T. pacifica concordia*, HT; *T. p. euphonia*, PT; *T. p. pacifica*, HT.

female: ECUADOR, **Carchi**, Lita, ridge east of Río Baboso, 0°53.25′N, 78°26.35′W, 900 m, 6.vii.1998, K.R. Willmott, (BMNH). Paratypes: ECUADOR, **Carchi**: 12 males, Lita [Río Chuchuví – Vitale, pers. comm.], iii.1999, I. Aldas, (FV); 1 male, same data as HT (KWJH); 1 male, same data as HT (USNM); 1 male, same data as HT except 20.vii.2002, J. Christie, E. McLoughlin, F. Ryan, A. Zakrisson, (BMNH); 1 male, same data as HT except 750 m, 27.vii.2003, J. Christie, E. McLoughlin, F. Ryan, A. Zakrisson (MECN); 1 male, same data as HT except 14.xi.1999, P. Boyer (PB). **Esmeraldas**: 3 males, [km 20 Lita–San Lorenzo road], Alto Tambo, [0°54.74′N, 78°32.83′W], 700 m, v.1999, E. Aldaz (PB); 2 males, [km 17 Lita–San Lorenzo road], El Encanto, [0°53.59′N, 78°32.22′W], "700 m" [850 m], viii.1999, E. Aldaz (PB). COLOMBIA, **Nariño**: 1 female, [Río] Yaculá, [1°29′N, 78°05′W], 500 m, 5.v.1927, 108/49, E. Krüger (MZPAN); 1 male, same data as preceding, except 15.iii.1927 and no "108/49" (MZPAN).

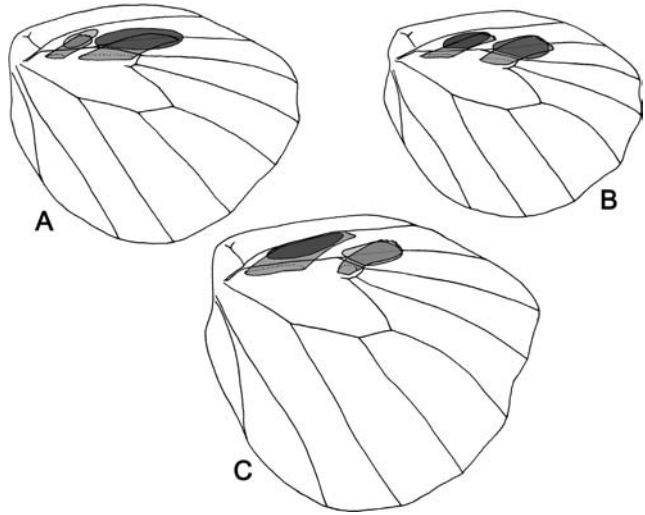


Fig. 4. Male hindwing venation. A. *T. pacifica pacifica* (HT); B. *T. harmonia hippothous* (Guatemala, BMNH); C, *T. tarricina duenna* (Guatemala, BMNH).

**Etymology.** The name is an adjective derived from the Latin *pacificus*, "peaceful", alluding to the known range of this species along the Pacific coast of Panama and South America (Fig. 7), as well as its relationship to the peacefully named *Tithorea harmonia*.

**Discussion.** This species consistently differs from both congeners in a number of characters (Table 2), but most obviously in the configuration of the male dorsal hindwing androconial structures (Fig. 3,4). The distal androconial "hair pencil" in the male is markedly wider than in either congener, being just over three times the width of the basal hair pencil, compared with equal in size (*T. harmonia*) or about one third the width (*T. tarricina*). Each hair pencil is underlain by a patch of androconial scales: the basal patch in *T. tarricina* and *T. harmonia* is dark brown and consists of long, rectangular scales homologous to the blackish androconial scales of *Elzunia* Bryk, 1937. In *T. pacifica*, this patch is reduced in size and pale buff in colour. The distal patch consists of thin, elongate androconial scales that are different in shape to those of the basal patch and occur in all *Tithorea* but not in *Elzunia*. These scales are pale greyish in colour and merge almost imperceptibly with surrounding scales in *T. tarricina*, slightly darker and distinct from surrounding scales in *T. harmonia*, and blackish, forming a well defined and much longer patch in *T. pacifica*. The enlarged distal hair pencil in *T. pacifica* is also associated with a basal shift in the position of the base of vein Rs in comparison with the other two species (Fig. 4). It may also be correlated with the more heavily bowed anal margin of the male forewing in *T. pacifica*, and possibly the straighter vein Sc+R1, which is slightly decurved in *T. harmonia* but also straight in *T. tarricina*.

The male and female genitalia also both show diagnostic characters (Table 2). In the male genitalia (Fig. 5), the shape of the valva is consistent and distinct between the three species. *Tithorea tarricina* has the distal tip curved strongly dorsally (Fig. 5F), *T. pacifica* has the tip

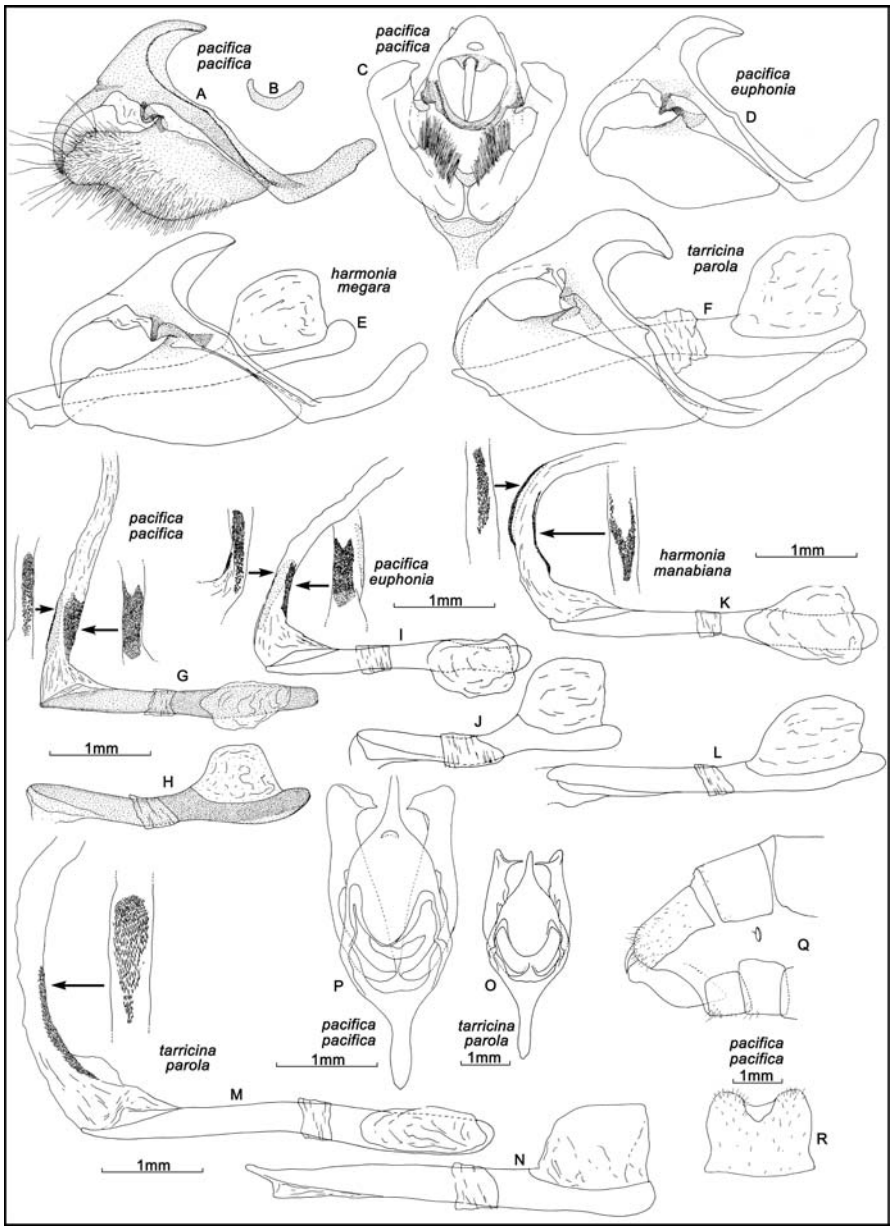


Fig. 5. Male abdomen and genitalia. *T. pacifica pacifica* (PT): A. lateral view; B. juxta; C. ventral view. *T. pacifica euphonia* (PT): D. lateral view. *T. harmonia megara* (Trinidad, BMNH): E. lateral view. *T. tarricina parola* (Colombia, BMNH): F. lateral view. *T. pacifica pacifica* (PT): G. aedeagus, dorsal view, with perpendicular views of cornuti; H. lateral view. *T. pacifica euphonia* (PT): I. aedeagus, dorsal

less strongly curved but with the ventral edge noticeably indented (Fig. 5A), and *T. harmonia* has the tip not curved and the ventral edge smoothly curving (Fig. 5E). The inwardly projecting plates at the tip of the valvae are very thin in *T. tarricina* (Fig. 5O), but blunt and broad in *T. harmonia* and *T. pacifica* (Fig. 5P). The aedeagus of *T. tarricina* (Fig. 5N) and *T. harmonia* (Fig. 5L) is straight or slightly curved in lateral view, whereas in *T. pacifica* (Fig. 5H) it is subtly but distinctly double curved. The sclerotized cornuti on the outer surface of the vesica differ in each species. The outer band of cornuti is similar in *T. harmonia* (Fig. 5K) and *T. pacifica* (Fig. 5G), but absent in *T. tarricina* (Fig. 5M). The inner cornuti are present in *T. tarricina* (Fig. 5M) forming a smoothly rounded ''teardrop'' shape, while in *T. pacifica* (Fig. 5G) this shape is slightly bifid distally, and in *T. harmonia* (Fig. 5K) much more bifid, producing two thin distal ''arms''. In the female genitalia (Fig. 6), the eighth sternite plates that extend ventrally from near the terminal spiracle towards the ostium bursae are absent in *T. tarricina* (Fig. 6L), present in *T. harmonia* but not touching the terminal tergite (Fig. 6G), and present in *T. pacifica* but touching the terminal tergite (Fig. 6B). Variation in this character in *T. pacifica* could not be assessed as we have examined only a single female, but little variation was observed in *T. harmonia*.

*Tithorea pacifica* shares with *T. harmonia* the absence of claws on the fifth tarsal segment of the female foreleg, in contrast to *T. tarricina* (and the related genus *Elzunia*) in which these are present.

The male forewing (Fig. 1) is more elongate than in *T. tarricina*, with a larger angle between the anal and distal margins in *T. pacifica*, while the hindwing is less elongate than in *T. harmonia*.

In color pattern, *T. pacifica* is consistently distinguished from *T. tarricina* by the yellow marking at the end of the forewing discal cell extending right across the cell, as in *T. harmonia*, instead of being confined to the anterior half of the cell (Figs. 1–2). The orange costal band on the ventral hindwing entirely fills the area between vein Sc+R1 and the costa, as in *T. tarricina*, whereas in *T. harmonia* this band is narrower, leaving a black border along the entire costa. The tegula in *T. tarricina* has a distinct yellow spot in the centre that is lacking in *T. pacifica* and *T. harmonia*, while *T. harmonia* occasionally has a pale spot extending from the inner basal edge towards the centre. Other less consistent characters include the extension of the postdiscal band on the ventral hindwing into cell M2-M1 as a distinct spot at the posterior edge of the cell, as in *T. tarricina*, whereas this spot is either small or absent in *T. harmonia*; the white submarginal spots on the ventral forewing in cell M3-M2 are distinct in *T. pacifica* and *T. tarricina*, but reduced or absent in cell M3-M2 in *T. harmonia*.

We have examined photographs, supplied by Tomasz Pyrcz, of three Colombian specimens of *T. p. pacifica* in the MZPAN, collected by Krüger. Evidently, Krüger had recognized the taxon as distinct and also intended to name it ''pacifica'' (T. Pyrcz, pers. comm.), but the name was never published. One of the female specimens (excluded from the type series) is slightly intermediate in wing pattern to *T. p. euphonia*: the hindwing has the black postdiscal band

←

view, with perpendicular views of cornuti; J. lateral view. *T. harmonia manabiana* (BMNH): K. aedeagus, dorsal view, with perpendicular views of cornuti; L. lateral view. *T. tarricina parola* (BMNH): M. aedeagus, dorsal view, with perpendicular views of cornuti; N. lateral view; O. dorsal view of genitalia. *T. pacifica pacifica* (PT): P. dorsal view of genitalia; Q. lateral view of posterior tip abdomen; R. terminal tergite, dorsal view.

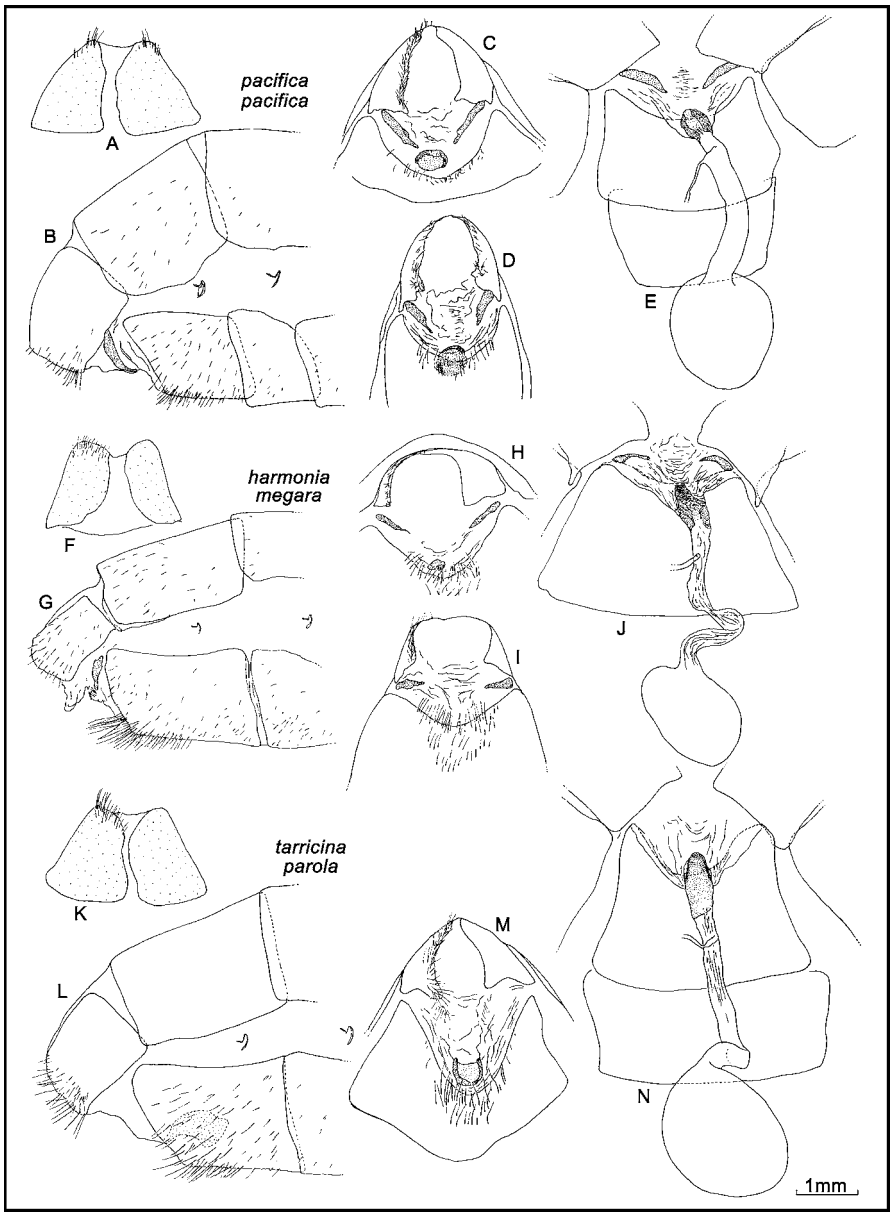


Fig. 6. Female abdomen and genitalia. Dorsal view of terminal tergite (A,F,K), posterior tip of abdomen in lateral (B,G,L), posterior (C,H) and ventral (D,I,M) views, dorsal view of genitalia (E,J,N). *T. pacifica pacifica* (AT): A–E. *T. harmonia megara* (Trinidad, BMNH): F–J. *T. tarricina parola* (Colombia, BMNH): K–N.

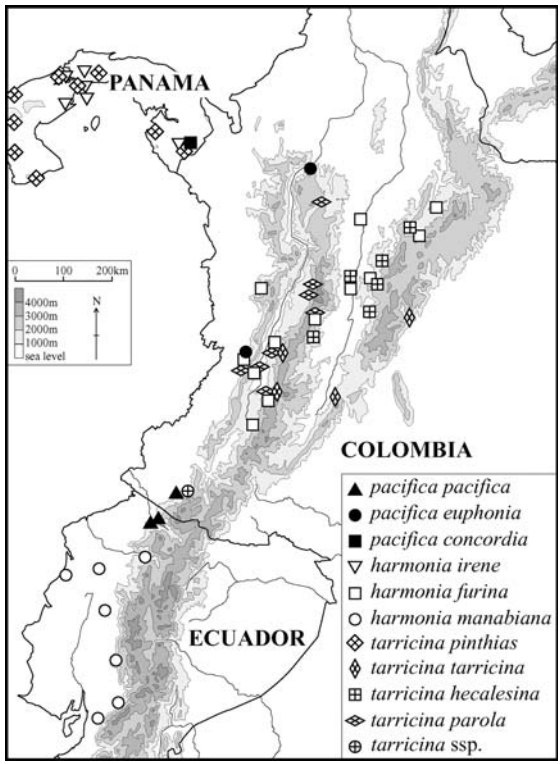


Fig. 7. Map showing collection localities of *Tithorea* taxa west of the Andes in eastern Panama, Colombia and Ecuador.

reduced to a spot in cell M3-M2, similar to that taxon, while the forewing is typical of the nominate subspecies.

**Tithorea pacifica euphonia** new subspecies
Figs. 1C, 3, 5D, I–J, 7

**Description.** *Male* (Figs. 1C, 3, 5D, I–J): Forewing length 40 mm. Wingshape as in nominate subspecies. *Dorsal surface* (Fig. 1C): as in nominate subspecies except as follows. Forewing with discal and postdiscal yellow markings reduced in size: discal cell-end spot broken into two spots at anterior and posterior edges of discal cell; postdiscal patch in cells M3-R5 split into isolated spots in cells Cu1-M3 and M3-M2, and adjacent spots in cells M2-M1 and M1-R5; postdiscal marking in cells Cu2-Cu1 and 2A-Cu2 reduced to isolated spots; basal half of wing entirely black, no red-brown scaling in cell 2A-Cu2 or along cubital vein. Hindwing with discal and postdiscal bands fused entirely, except for a quadrate black block in cell M3-M2; red-orange coloring more extensive, reaching the distal edge of the yellow postdiscal markings in cell Cu1-M3. *Androconial structures* (Fig. 3): as in nominate

Table 2. Comparison of characters differentiating *Tithorea* species - those in bold represent probable apomorphies.

| Character | *T. tarricina* | *T. harmonia* | *T. pacifica* |
|---|---|---|---|
| EXTERNAL (Figs. 1–4) | | | |
| Forewing shape | **Triangular** | Elongate | Elongate |
| Hindwing shape | **Rounded** | Elongate | Sub-rounded |
| Yellow marking at distal end DFW discal cell | **Confined to anterior half of cell** | Present in anterior and posterior halves of cell | Present in anterior and posterior halves of cell |
| Yellow postdiscal marking in anterior half of DFW cell 2A-Cu2 | **Absent** | Present | Present |
| Orange-yellow costal band on VHW | Fills area between vein Sc+R1 and costa | **Narrower, leaving a black costal border** | Fills area between vein Sc+R1 and costa |
| Postdiscal band on VHW in cell M2-M1 | Distinct spot | **Some scales or absent** | Distinct spot |
| White submarginal spots on VFW in cell M3-M2 | Distinct | **Reduced or absent** | Distinct |
| Yellow central spot on tegula | **Present** | Absent | Absent |
| Distal hair pencil of male DHW | **1/3 width of basal hair pencil (1 mm)** | **Equal in width to basal hair pencil (2 mm)** | **3 times width of basal hair pencil (4.5 mm)** |
| Basal androconial scale patch of male DHW | Dark brown | Dark brown | **Pale buff** |
| Distal androconial patch of male DHW | Pale greyish, indistinct | Pale brown, more distinct | **Dark brown, very distinct** |
| Position of base of vein Rs on male hindwing | Near base vein M1 | Shifted basal of vein M1 | **ca. midway between base and end of discal cell** |
| MALE GENITALIA (Fig. 5) | | | |
| Distal half of valva | **Slightly indented, tip curved markedly dorsally** | Smoothly convex, tip not curved dorsally | **Indented, tip curved dorsally** |
| Inwardly projecting plates near tip male genitalic valvae | **Thin, flat** | Broad, blunt | Broad, blunt |
| Appendices angulares | Pointed | Pointed | **Rounded** |
| Aedeagus | Straight | Slightly curved | **Slightly double curved** |

Table 2. Continued.

| Character | *T. tarricina* | *T. harmonia* | *T. pacifica* |
|---|---|---|---|
| Inner band of cornuti on vesica | A teardrop shaped patch, rounded distally | **A thin band producing two thin, elongate arms distally** | A broad patch slightly bifid distally |
| Outer band of cornuti on vesica | **Absent** | A rectangular strip | A rectangular strip |
| FEMALE GENITALIA (Fig. 6) | | | |
| Eighth sternite | **Absent** | Present, not touching basal edge of terminal tergite | Present, touching basal edge of terminal tergite |
| OTHER | | | |
| Pair of claws on fifth tarsal joint of female foreleg | Present | **Absent** | **Absent** |

subspecies. *Ventral surface* (Fig. 1C): as in nominate subspecies except as follows: all dorsal differences are reflected on ventral surface; white submarginal spots on both wings more pronounced, extending as a pair of dots into cell 2A-Cu2 on forewing and as a single white spot in cell Rs-Sc+R1. *Venation*, *Body* and *Genitalia* (Fig. 5D, I–J): as in nominate subspecies.

*Female*: unknown.

**Types.** Holotype, male, COLOMBIA, **Valle de Cauca**, Río Dagua [ca. 3°36′N, 76°39′W], 19.iv.1918, ex. Krüger 5.iii.1929, Levick Bequest 1941-83 (BMNH). Paratypes: COLOMBIA, **Antioquia**: 1 male, Valdivia [ca. 7°09′N, 75°27′W], 1897 (Pratt), ex. Grose-Smith 1910, Joicey Bequest 1934-120 (BMNH).

**Etymology.** The name is a latinized adjective derived from the Greek *euphonos*, meaning "sweet-voiced".

**Tithorea pacifica concordia** new subspecies
Figs. 1D, 3, 7

**Description.** *Male* (Figs. 1D, 3): Forewing length 41 mm. Wingshape as in nominate subspecies. *Dorsal surface* (Fig. 1D): as in nominate subspecies except as follows: Forewing with all discal and postdiscal markings reduced, as in *T. p. euphonia*, but differing from that taxon in discal cell-end markings being slightly larger, almost touching, marking in cell M2-M1 being larger and spot in cell 2A-Cu2 almost absent; yellow subapical spots are slightly reduced in size compared to nominate subspecies and *T. p. euphonia*; basal half of wing lacking red-brown scaling, as in *T. p. euphonia*. Hindwing markings similar in shape and position to *T. p. euphonia*, but entirely red-brown with only the barest hint of postdiscal yellow in cell M2-M1. *Androconial structures* (Fig. 3): as in nominate subspecies. *Ventral surface* (Fig. 1D): as in *T. p. euphonia* except postdiscal yellow in hindwing cell M2-M1 slightly more extensive and entering cell M1-Rs. *Venation*, *Body* and *Genitalia*: as in nominate subspecies.

*Female*: Forewing length 41 mm. Similar to male except as follows. Forewing slightly more rounded and anal margin straighter; hindwing slightly more elongate. *Dorsal surface*: forewing with yellow postdiscal mark in cell Cu2-Cu1 about twice width of mark in male; hindwing with black postdiscal spot in cell M3-M2 almost absent, obscured by reddish-orange scaling. *Androconial structures*: absent. *Venation*, *abdomen* and *genitalia*: not examined.

**Types.** Holotype, male, PANAMA, **Darién**, Cana, Cerro Pirre, 7°56′N, 77°43′W, 1,200 m, 17.iv.1983, G.B. Small (MUSM). Allotype, female, PANAMA, **Darién**, Cana, [7°56′N, 77°43′W], 850 m, 27.vii.1981, G.B. Small, (USNM).

**Etymology.** The name is a noun in apposition, derived from the Latin *concordia*, meaning "harmony" or "agreement".

## DISCUSSION

*Tithorea* is very closely related to *Elzunia* (Fox, 1956), differing principally in the configuration of the male hindwing hair pencil (in particular, *Elzunia* lacks the distal hair pencil), the hindwing venation (3d is slightly shorter in *Tithorea*) and certain colour pattern elements (the postdiscal forewing markings in cells 2A-Cu2 and Cu2-Cu1 are displaced distally in *Tithorea*). Although a cladistic analysis is lacking, it seems likely that *Tithorea* is monophyletic, based on the second male DHW hair pencil and distinctive associated

androconial scales. This new species is placed in *Tithorea* on the basis of these characters and other characters shared with *T. harmonia* (see Table 2). Putative generic differences in the presence or absence of hairs on the eyes (Fox, 1956) are non-existent.

Most of the characters that distinguish *T. harmonia* and *T. pacifica* from *T. tarricina* (Table 2) appear to be autapomorphies for *T. tarricina* (pers. obs.), but *T. harmonia* is probably the sister species of *T. pacifica*. Among *Elzunia* and *Tithorea* these two species share the absence of claws on the fifth tarsal segment of the female foreleg, a more elongate hindwing shape, enlarged male distal hair pencil and more uneven submarginal markings on the ventral forewing, with that in cell Cu1-M3 more displaced basally.

All recent records of *Tithorea pacifica* are from 750–1,200 m (historical specimens are recorded from 500 m) in very wet premontane rainforest from extreme eastern Panama to extreme northwestern Ecuador (Fig. 7). This range is broadly sympatric with both *T. harmonia* and *T. tarricina*, though the three species seem rarely, if ever, to be micro-sympatric (Fig. 7). The holotype of *T. pacifica concordia* was collected at 1,200 m on Cerro Pirre, while *T. tarricina pinthias* Godman & Salvin, 1878 is known from the same locality at 1,000 m (one male, one female in the USNM, J. Hall, pers. comm.), and *T. harmonia irene* (Drury, 1782) from 350–600 m (several specimens in the USNM and the MUSM). In the BMNH a single female specimen of *T. tarricina parola* Godman & Salvin, 1898, labelled "Dagua" from Krüger's collection via the Levick Bequest, may have been captured by the same collector as the holotype of *T. p. euphonia*. There are three male specimens of *T. harmonia furina* Godman & Salvin, 1898 (or a perhaps distinct, undescribed subspecies), in the BMNH also labelled Río Dagua, indicating possible sympatry with *T. pacifica euphonia*. *Tithorea tarricina* is otherwise almost unknown from most of the Pacific slope of the Colombian Cordillera Occidental, though a single specimen of an apparently undescribed taxon is known from Nariño province (F. Vitale, pers. comm.), where *T. pacifica pacifica* also occurs. Neither *T. tarricina* nor *T. harmonia* is yet recorded from extreme northwestern Ecuador, where nominate *T. pacifica* occurs, but *T. harmonia manabiana* Fox, 1956, is not uncommon in moist forests just to the south, from Pichincha province southwards (Fox, 1956; Willmott and Hall, in prep.; Fig. 7).

In summary, *T. pacifica* seems to occur partially with *T. harmonia* in parts of its range, but generally to replace that species in wetter forest habitats and/or at slightly higher elevations. Micro-sympatry with one or both of the other *Tithorea* species is suggested by the similar mimetic wing patterns of potentially co-occurring taxa, namely *T. pacifica euphonia* (Fig. 1C) and *T. tarricina parola* (Fig. 2E), and *T. pacifica concordia* (Fig. 1D), *T. harmonia irene* (Fig. 2A) and *T. tarricina pinthias* (Fig. 2D).

Field observations for *T. pacifica* exist only for the nominate subspecies, but can be presumed to apply to the other two known subspecies based on their rarity in collections. In northwestern Ecuador *T. pacifica* occurs only in very wet premontane rainforest, where it is sympatric with other scarce Chocó endemic species, such as *Prepona werneri* Hering & Hopp, 1925, *Memphis nenia* (H. Druce, 1877), *Adelpha rothschildi* Fruhstorfer, 1913, *A. levona* Steinhauser & L. Miller, 1977 and *A. lamasi* Willmott & Hall, 1999 (Willmott and Hall, in prep.; Willmott, 2003). It appears to be both highly local and seasonal. The majority of known specimens have been collected inside primary forest on steep slopes above the Río Chuchuví. All these specimens are males that have been attracted to rotting carrion baits in the middle of the day, in canopy traps (Christie, pers. comm.) or light gaps (pers. obs.). Attraction to this type of bait is common in the Ithomiinae only in *Tithorea* and *Elzunia* (Hall and Willmott, 2000). Other known localities consist of selectively logged forest on similar or flat

terrain. The only known female was collected flying along a wide (5 m) trail along a steep slope through primary forest in the early morning. These observations all suggest that the species is typically confined to the canopy. Specimens have been collected only in the wettest months of the year (March to July) when butterfly abundance is highest (pers. obs.), but several individuals may be observed in a single day. Nothing is known of the immature stages or foodplants, though the latter can be presumed to be in the Apocynaceae (Drummond and Brown, 1987).

ACKNOWLEDGMENTS

We thank Fabio Vitale, Pierre Boyer and Tomasz Pyrcz for specimen data for *T. pacifica pacifica*, and Fabio Vitale for helpful information on Colombian *Tithorea*. Jason Hall also provided critical comments on the manuscript, as well as important information and photographs of *Tithorea* specimens in the USNM. We thank the curators who have given us access to collections in their care, especially Phil Ackery (BMNH) and Robert Robbins (USNM). KRW thanks The National Geographic Society (Research and Exploration Grant #5751-96) and The Leverhulme Trust (Standard Research Project Grant F/00696/C) for funding field work in Ecuador and museum research in the UK, respectively. Permits for field study in Ecuador were obtained from the Ministerio del Ambiente through the MECN, with the particular help of Germania Estévez, María de los Angeles Simbaña and Gabriela Montoya.

LITERATURE CITED

Brown, K. S., Jr. 1977. Centros de evolução, refúgios quaternários e conservação de patrimônios genéticos na região neotropical: padrões de diferenciação em Ithomiinae (Lepidoptera: Nymphalidae). Acta Amaz. 7(1): 75–137.

Comstock, J. H. and J. G. Needham. 1918. The wings of insects. Am. Nat. 32: 253–257.

DeVries, P. J. 1987. The Butterflies of Costa Rica and their Natural History. Papilionidae, Pieridae, Nymphalidae. Princeton, Princeton University Press. xxii + 327 pp.

Doubleday, E. 1847. The Genera of Diurnal Lepidoptera: Comprising their Generic Characters, a Notice of their Habits and Transformations, and a Catalogue of the Species of each Genus, 1: 99–100. London, Longman, Brown, Green & Longmans.

Drummond, B. A. and K. S. Brown, Jr. 1987. Ithomiinae (Lepidoptera: Nymphalidae): summary of known larval food plants. Ann. Missouri Bot. Garden 74(2): 341–358.

Fox, R. M. 1956. A monograph of the Ithomiidae (Lepidoptera). Part I. Bull. Amer. Mus. Nat. Hist. 111(1): 1–76.

Godman, F. D. 1901. Biologia Centrali-Americana. Insecta. Lepidoptera-Rhopalocera, 2: 640–641. London, Dulau & Co., Bernard Quaritch.

Haensch, R. 1909. 3. Familie: Danaidae, pp. 119–121, pl. 32 *in* A. Seitz (ed.), Die Gross-Schmetterlinge der Erde 5. Stuttgart, Alfred Kernen.

Hall, J. P. W. and K. R. Willmott. 1995. Two new species of *Mesene* from western Ecuador (Lepidoptera: Riodinidae). Trop. Lepid. 6(2): 110–112.

Hall, J. P. W. and K. R. Willmott. 2000. Patterns of feeding behaviour in adult male riodinid butterflies and their relationship to morphology and ecology. Biol. J. Linn. Soc. 69: 1–23.

Klots, A. B. 1956. Lepidoptera, pp. 115–130 *in* S. L. Tuxen (ed.), Taxonomists' Glossary of Genitalia in Insects. Copenhagen, Munkssgard.

Lamas, G. 2004. Ithomiinae. *In* J. B. Heppner (ed.), Atlas of Neotropical Lepidoptera. Checklist. Part 4A. Hesperioidea—Papilionoidea. Gainesville, Association for Tropical Lepidoptera/Scientific Publishers (in press).

Willmott, K. R. 2003. The Genus *Adelpha*: its Systematics, Biology and Biogeography (Lepidoptera: Nymphalidae: Limenitidini). Gainesville, Scientific Publishers. viii + 322 pp.

Willmott, K. R. and J. P. W. Hall. 1994. Four new species of Riodinidae (Lepidoptera) from western Ecuador. Trop. Lepid. 5(2): 87–91.

Willmott, K. R. and J. P. W. Hall. 1999. Taxonomic notes on Ecuadorian *Adelpha* with the description of two new species and seven new subspecies (Lepidoptera: Nymphalidae: Limenitidinae). Trop. Lepid. 10(1): 1–17.

Received 14 August 2003; accepted 10 March 2004.