

AN ANALYSIS OF THE COPHYSA-GROUP OF *TRAMEA* HAGEN, WITH DESCRIPTIONS OF TWO NEW SPECIES (ANISOPTERA: LIBELLULIDAE)

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The group consists of 4 species, characterized by the presence of 2 oblique pale lateral stripes on the thorax, viz. *T. cophysa* Hagen, *T. calverti* Muttkowski (designated lectotype ♂: San José del Cabo, Mexico, X-1893; Philadelphia Academy), *T. rustica* sp. n. (holotype ♂: Jusepin, Monagas, Venezuela, 6-VIII-1966; Facultad de Agronomía, Aragua), and *T. minuta* sp. n. (holotype ♂: Río Guaniamo, Bolívar, Venezuela, 25/28-V-1979; Facultad de Agronomía, Aragua). A key to the adults is provided, along with bibliographic notes, figures and detailed descriptions of all 4 species.

INTRODUCTION

In the last hundred years there has been much confusion as to what should be understood under "*Tramea cophysa*". In several publications (cf. below) specimens of the "cophysa-group" have been assigned to other species, representing entirely different taxa, e.g. to *binotata* (Ramb.), *basalis* (Burm.), or *longicauda* Brauer. On the other hand, KIRBY (1889) described *Tramea darwini* from the Galápagos Islands, apparently without noting its close relationship with *cophysa* Hag. Yet it was soon recognized that there was a considerable heterogeneity within "*Tramea cophysa*", depending on the origin of the specimens examined, and even among specimens from the same locality. In his monumental work on the Libellulines of the World, RIS (1913) divided "*Tramea cophysa*" into three groups, viz. the forms *a*, *b* and *c*, which differ from one another chiefly in shape and colour of the basal spot in hind wing. In his "Nachträge"

of the same work, RIS (1919) opinated that forms *a* and *c* may be distinct species; later (1928), he concluded that they are so indeed, but did not introduce any new name.

We wish to express our thanks to the following persons at European and North American Universities, Museums and other institutions, for the help conceded to the second author, enabling him to examine the specimens of the "cophysa-group" preserved in these collections: M. D.E. KIMMINS (British Museum, Natural History), Prof. L. BRUNDIN (Museum Stockholm), Dr. E. FRANZ (Natur-Museum Senckenberg, Fränkfurt), Dr H. DIETRICH (Department of Entomology, Cornell University, Ithaca), Dr E. MAYR and Dr P.J. DARLINGTON (Museum of Comparative Zoology, Harvard University), Dr T.H. HUBBELL and Dr I. CANTRALL (Museum of Zoology, University of Michigan), Dr H.J. GRANT (†) (Philadelphia Academy of Sciences), Dr M.J. WESTFALL (Department of Zoology, University of Florida), and Dr O.S. FLINT (United States National Museum, Washington, D.C.).

The study of this material, together with that in the second author's own collection, now deposited at the Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, in Maracay (seen also by the first author), brought us to the conclusion, that the "cophysa-group" of *Tramea* consists of at least four good species. These are easily distinguishable from one another, chiefly by the length of the superior anal appendages, extension and colour of the basal spot in hind wing, coloration of frons and abdomen, shape of vulvar lamina, as well as by other features. Two of the four species forming the "cophysa-group" already bear a valid name. The other two species are described here as new. Contrary to RIS (1913), we do not think that the nomenclature presents any problem. It must be said that the type of one known species, e.g. *Tramea cophysa* Hag., could not be examined. The correspondent original description, and the re-description by RIS (1913), are, however, sufficiently clear as to discard any possible misuse of the specific name *cophysa*.

The only constant characteristic common to all four species, and peculiar to the "cophysa-group", are two oblique pale lateral bands on the synthorax. These stripes may vary, depending on age, sex or other factors, but are, nevertheless, always present. Only post-mortem changes sometimes make these stripes disappear, partly or entirely.

In the following we give a detailed description of all four species in the "cophysa-group", along with a list of bibliographic references and synonyms. This list can not be thought to be complete, for in many cases it is impossible to know with certainty which of the four species an author had in mind. It gets still more problematic where it refers to specimens from northern South America, where the distribution of the four species and of similar species of other groups coincide.

The figures of the wings here presented, have been prepared by Prof. Emil BRÖCKL,

Instituto de Zoología Tropical, U.C.V., Caracas; all other drawings were made by the first author with the help of a camera lucida.

Abbreviations used

- BMNH = British Museum of Natural History
 C = a collector's private collection
 CORN = Cornell University collection
 IZA = collection of the Instituto de Zoología Agrícola, Facultad de Agronomía, U.C.V., Maracay
 MCZ = Museum of Comparative Zoology
 MI = University of Michigan collection
 MST = Museum Stockholm
 SENCK = Natur-Museum Senckenberg, Frankfurt
 UF = University of Florida collection
 USNM = U.S. National Museum
 — = actual whereabouts of a specimen unknown

TRAMEA COPHYSA HAGEN, 1867

Figures 4, 7, 12, 16, 20

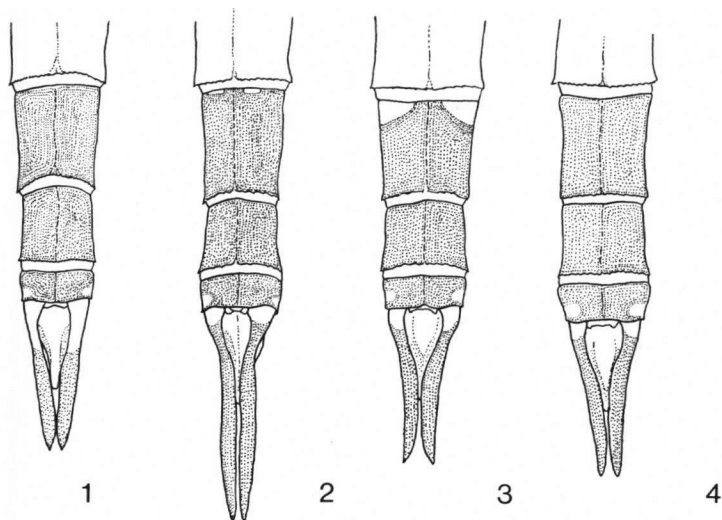
1867 *Tramea cophysa* HAGEN (Type Locality: Brazil); — 1877 *Tramea* sp. MAC-LACHLAN (Galapagos Is.); — 1889 *Tramea darwini* KIRBY (Galapagos Is.); — 1901 *Tramea darwini* CURRIE (Galapagos Is.); — 1909 *Tramea subbinotata* CALVERT (Brazil); Ibid. *Tramea binotata* (Paraguay: Sapucaí); — 1909 *Tramea cophysa* FOERSTER (Argentina: Esperanza de Santa Fé); — 1910 *Tramea cophysa* FOERSTER (Argentina: Río Las Garzas); Ibid. *Tramea brasiliana* (Brazil: Porto Cachoeiro, Santa Leopoldina/Espiritu Santo); — 1913a *Tramea cophysa* form *c* RIS (Argentina: Corrientes; Chaco de Santiago); — 1913b *Tramea cophysa* form *b* RIS (Galapagos Is.); Ibid. *Tramea cophysa* form *c* (Brazil: São João del Rey; Santa Cruz/Rio Grande do Sul; Argentina: Corrientes, Chaco de Santiago/Corrientes; Venezuela; Paraguay: Sapucaí); — 1919 *Tramea cophysa* form *c* RIS (Guyana: Georgetown); — 1922 *Tramea basalis*, CAMPOS (Galapagos Is.); — 1928 *Tramea cophysa* form *c* RIS (Bolivia: Fortín Esteros); — 1929 *Tramea cophysa* form *c* LONGFIELD (Brazil: Mato Grosso); — 1947 *Tramea cophysa darwini* CALVERT (Galapagos Is.: Hood, Albemarle, San Cristóbal and Floreana); — 1961 *Tramea cophysa darwini* ASAHINA (Galapagos Is.); — 1964 *Tramea cophysa* form *b* GLOGER (Galapagos Is.); Ibid. *Tramea cophysa* form *c* Argentina: San Isidro/Buenos Aires, Playadito/Corrientes, Mascasin/Rioja; Bolivia: Roboré; — 1977 *Tramea cophysa*, PAULSON (Argentina; Paraguay, Brazil).

Material examined (55 ♂, 53 ♀). — Argentina: Formosa/Formosa, 1 ♀, 14.XII.1917; 1 ♀, 15.XII.1917, both Jörgensen (SENCK: 27715+54); Palo Santo/Formosa, 1 ♂, -.XI.1953, Walz (7699) (—); Corrientes, 2 ♂ (BMNH); Paraná/Entre Ríos, 1 ♀, Dusen (MST); Chaco de Santiago/Santiago del Estero, 2 ♂, Wagner (MST); Villa Ana, F.C.S.F., 1 ♀, -.IX.1924, Hayward (BMNH); ? Baseil, 1 ♂, (MST); Río Las Garzas, 1 ♂ (MI); San Cristóbal, 1 ♂, 2 ♀, 19.II.1920, J.C. Bradley (MI); — Bolivia: Todos Santos, Chacare/Cochabamba, 3 ♂, 3 ♀; 1 ♀, R. Steinbach; Amboro, Ichilo/Santa Cruz, 1 ♂,

16.III.1960, R. Steinbach; Buena Vista, Ichilo/Sta. Cruz, 1 ♂, 1 ♀ (all UF); — Brazil: Cuyabá/Mato Grosso, 2 ♀, 11.V.1927; 2 ♀, 18.V.1927; Urucúm, Corumbá/Mato Grosso, 3 ♀, 23 and 29.IV.1927, all Longfield (BMNH); Rio Branco, 2 ♀, 5 and 7.VII.19-?, Roman (MST); Salto das Sete Quedas/Paraná, 1 ♂, 9.II.1957, D. Lacombe (MI); Porto Cachoeiro, Santa Leopoldina/Espiritu Santo, 1 ♂ (identified by Förster as "*brasiliiana*") (MI); Rio de Janeiro, 1 ♀, 8.IX.1922, J.H. Williamson (MI); Itatiaya/Rio de Janeiro, 700 m, 2 ♂, 2 ♀, 16.III.1926 (27747+8, 27754+8); 1 ♂, 3 ♀, 7.IV.1926 (27746+50+52+53); 4 ♀, 12.IV.1926 (27754—7); 1 ♂, 14.IV.1926 (27745), all Zikan (SENCK); Cachoeira/Rio Grande do Sul, 1 ♂, 29.III.1923; 1 ♂, 11.II.1924, both W.F. Henniger (UF); Pelotas/Rio Grande do Sul, 1 ♂, 21.III.1953; 1 ♀, 4.IV.1954; 1 ♂, 4.V.1956; 2 ♀, 4.XII.1956; 1 ♂, 1.IV.1957; 1 ♂, 2.IV.1957; 1 ♂, 18.I.1958; 1 ♂, 1.IV.1958; 2 ♂, 2.IV.1958, all Biezanko (UF); 1 ♂, 13.I.1958 (IZA: 13700); 1 ♂, 8.I.1958; 2 ♂, 1.II.1958, all Biezanko (—); Cauna, 1 ♂, -III.1945; Corupa, 1 ♂, 1 ♀, -III.1946; Pinhal, 1 ♂, -I.1948, all A. Maller (UF); Nova Teutonia/Santa Catarina, 1 ♀, 17.IV.1945; 2 ♂, 27.IV.1945, all F. Plaumann (MI); Rio Vermelho/Sta. Catarina, 1 ♂, -XI.1944; 2 ♀, -I.1945, all A. Maller (UF); "Brazil", 1 ♂ (with red label "Typus 12486"; right front wing and apex of abdomen, missing); 1 ♀, Heyer (identified by Calvert as "*subbinotata*", Ann. Carn. Mus.: 259) (both MCZ); — Ecuador: Isla de la Plata/Manabi, 1 ♂, 4.V.1946, L. Gómez Alonzo (MI); Galapagos Is.: Albemarle, 1 ♀, 6.VIII.1955; Charles, 1 ♀ (both PHIL); — Guyana: Georgetown, 1 ♂, Williamson (SENCK: 27714); 1 ♂, 1 ♀, E.B. Williamson (♂ identified by Ris as "*cophysa* form c, or n. sp."); 2 ♂ (all MI); — Paraguay: Sapucaí/Paraguari, 2 ♂, 2 ♀, 3.XI.1902, Foster (BMNH); 1 ♀, 3.XI.1903, W.T. Foster (identified by Calvert as "*binotata*", Ann. Carn. Mus.: 259) (USNM); 1 ♀, 2.XII.1905 (MI); Villeta, 1 ♂, 1 ♀, 10.X.1956, E.S. Brown (MI); — Peru: Hacienda Tumán, Chiclayo, 1 ♂, 20.V.1969, Risco (IZA: 13718); — Uruguay: Isla Rica, Río Uruguay, San Gregorio/Artigas, 1 ♂, 21.III.1959, San Martín (IZA 13725); Montevideo, 1 ♀ (MST); — Venezuela: El Tigre/Anzoátegui, 1 ♂, 28.VII.1962 (9519) (—); Canaima/Bolívar, 1 ♀, 21.II.1958 (IZA: 6106), both Rácenis; Valencia, 1 ♂, -1911, Zobrys (SENCK: 27723); Calabozo/Guárico, 2 ♂, 17.VII.1960 (8552+3) (—); Corozo Pando/Gu., 1 ♀, 2.VIII.1955 (3515) (—); El Sombrero/Gu., 1 ♂, 22.VII.1954 (3514) (—), all Rácenis; Espino/Gu., 1 ♀, 10.VII.1954 (3516) (—); 1 ♀, 15.VII.1954 (7700) (—), both Klisans; Valle de la Pascua/Gu., 1 ♀, 9.VIII.1957; La Toscana/Monagas, 1 ♀, 14.X.1965, both F. Fernández & C.J. Rosales (IZA).

Tramea cophysa HAGEN, 1867, was originally described from "Brazil". After FOERSTER's (1910) opinion the origin of Hagen's type specimen may be southern Brazil. The center of distribution of this species seems, in fact, to be southern South America. Although *T. calverti* has been cited recently from Argentina (PAULSON, 1977). *T. cophysa* is the only species of the group occurring regularly in southern Brazil, Uruguay and Argentina, where it is very common. Farther north, *T. cophysa* becomes rather scarce, albeit entering the Guyanas and Venezuela, and the Galapagos Archipelago, in the west.

Male. — Labium yellow, with a black median lobe and a diffuse dark median stripe along innerside of lateral lobes; labrum black in the middle, with orange lateral angles; a black stripe across postclypeus; between it and the anterior edge of frons, an orange interspace. Upper part of frons entirely metallic violet, sharply defined anteriorly by the edge of frons; vertex



Figs 1-4. Male anal appendages: (1) *Tramea minuta* sp. n., holotype; — (2) *T. rustica* sp. n., paratype 13981; — (3) *T. calverti* Muttkowski (Venezuela, D.F., Los Venados, Avila, 1400 m); — (4) *T. cophysa* Hagen (Perú, Chiclayo, Hacienda Tumnán).

violet on top and anterior surface, but brown at its posterior base. Occipital triangle dark brown. Thorax brown with two oblique pale lateral bands, the first one running from the central mesepimeron to the upper end of metepisternum, the second stripe covering the metepimeron. Both stripes are separated from ventral parts of thorax by a black spot. Abdomen reddish brown, ventrally dark brown to black; the three apical segments dorsally entirely black. The superior anal appendages are longer than segments 9 + 10 together, but shorter than 8 + 9. Genital hamules on the second abdominal segment upright and straight on their distal half, much higher than posterior lobe. Legs black, the basal part of femora rusty. Wings almost hyaline; venation predominantly black. Reddish are: costa (to beyond nodus), subcosta, R + M and Rs (until nodus), and CuP (until triangle), in most specimens. Pterostigma rusty to brown. Front wing without a basal spot. In hind wing the basal spot is dark brown to blackish. There is no trace of a golden aureole around basal spot. Distally, the basal spot does not cross CuA. Costal and subcostal interspaces hyaline, radial interspace dark only near root. The basal spot runs straight backwards to anal angle. Membranula pale brown, followed anally by a hyaline, or light brown stripe along wing margin, in most specimens. Veins in basal spot brown.

Measurements. — Abdomen (without appendages) 27-30 mm; anal appendages 3.3-3.6 mm; hind wing (without root) 38-41 mm; costal edge of pterostigma in front wing 2.8-3 mm, in hind

wing 2-2.5 mm. Antenodal and postnodal cross-veins 10:11-11:10/13:7-7:12 in fore and hind wings respectively. Minor variations occur.

Female. — Very similar to male, but often with pale markings on segments 8-10, laterally. The metallic colour of frons is reduced to a rather broad posterior band; top of vertex orange; postclypeus without a dark cross-band. The basal spot in hind wing is very variable in size, but never reaches wing margin at anal angle. Some females have their wings suffused with very pale brown. The anal appendages are longer than segments 9 + 10 together, but shorter than 8 + 9. The vulvar lamina reaches to four fifths the length of segment 9, in lateral view, its excision being rather narrow.

Remarks. — In many continental females the basal spot in the hind wing is greatly reduced in size, being little longer than the membranula. FOERSTER (1909) observes: "Die braune Makel im Hinterflügel reicht bei den argentinischen Stücken (♀♀) nur 1-2 Zellen über die Membranula hinaus,...". KIRBY's (1889) description of *Tramea darwini* from the Galapagos Islands is based on five females with an extremely reduced basal spot in the hind wing. Later, however, CURRIE (1901) and again ASAHINA (1961, with figs), point out that the variability of this feature in *darwini* is as high as was known from continental *cophysa*. CALVERT (1906, p. 303) refers to *darwini* under *cophysa*?: "I cannot separate it [Currie's specimens of *darwini*] from some examples from Ecuador." GLOGER (1964) compares the penes of Galapagoan *darwini* with argentinian and bolivian *cophysa*, without finding any differences, adding: "Auch andere Charakteristika, wie die bis auf den basalen Fleck fast völlig hyalinen Flügel, die immer vorhandenen Thoraxstreifen, Schwarzfärbungen des Abdomens, lassen beide Formen sehr ähnlich erscheinen" (p. 5). Meanwhile ASAHINA (1961), perhaps following CALVERT (1947), treats *darwini* as a race of *cophysa*, RIS (1913b) gave it provisionally the status of a form (*b*) of that species, but not without adding: "Die Exemplare [Kirby's at BMNH], die ich gesehen habe, [sind] so schlecht erhalten, dass eine genauere Charakterisierung nicht möglich ist" (p. 988). Had he seen more material, he certainly would have joined form *b* with form *c*, which corresponds well with HAGEN's (1867) original description, and should be regarded, therefore, as the "true" *Tramea cophysa*.

TRAMEA RUSTICA SP. N.

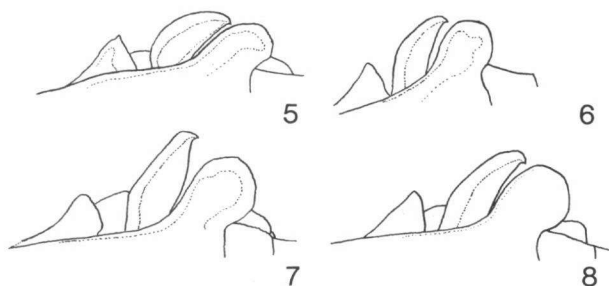
Figures 2, 5, 10, 14, 18

1906 *Tramea cophysa* ? CALVERT (in part: Venezuela; Panamá; Colombia: Bonda/Magdalena; Brazil), p. 302; — 1948 *Tramea cophysa* form *a* CALVERT (Guyana: Kartabo).

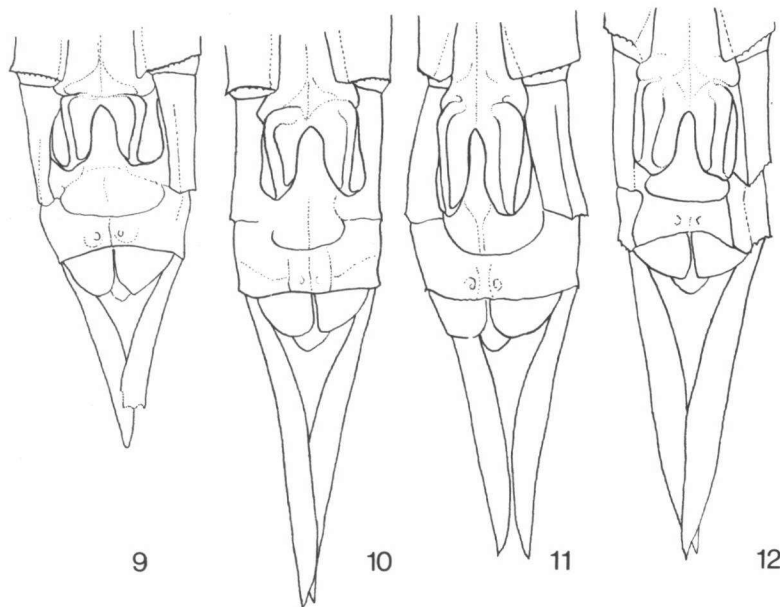
Holotype male: Venezuela, Monagas, Jusepín, 6.VIII.1966, F. Fernández Y. & C.J. Rosales coll. The specimen is deposited under No. 13697, at the Instituto de Zoología Agrícola, Facultad de agronomía, Universidad Central de Venezuela, Maracay.

Material examined (31 ♂, 29 ♀ including holotype, allotype and paratypes). — **Paratypes:** Bolivia: Buena Vista/Sara, 1 ♂, -X.1913, J. Steinbach (IZA: 13703); Reyes/Beni, 1 ♂, 1 ♀, 2-20.XII.1956; Rurrenabaque/Beni, 1 ♀, -X.1956, all L. Peña (MI); — Brazil: Manáus/Amazonas, 2 ♀, 8.VI.1922; Abunã/Mato Grosso, 1 ♂, 10.III.1922; 1 ♀, 20.III.1922, Porto Velho/Rondônia, 1 ♂, 1 ♀, 25.I.1922; 1 ♂, 28.I.1922, all J.H. Williamson (MI); — Paraguay: Villa Rica, 1 ♀, 9.XI.1938 (IZA: 13717); — Surinam: Para, Boven, Zanderij Id., 1 ♀, 27.IV.1927 (CORN); — Venezuela: Los Venados, Avila, 1400 m, 1 ♂, 13.X.1958, Rosales & Gelbes; Rancho Grande/Aragua, 1 ♂, 30.VI.1953, Requena (3520); Caicara/Bolívar, 2 ♂, 1 ♀, 4.I.1957, Rácenis (2242+4+5); El Callao/Bo., 1 ♀, 19.VII.1966, Campos (12243); 38 km S of El Dorado/Bo., 1 ♀, 5.VIII.1961 (9229); 1 ♀, 30.VII.1962 (9517); Quasipati/Bo., 3 ♂, 4.VIII.1960 (8557-9); La Laja/Bo., 300 m, 1 ♀, 3.VIII.1961 (9230); Miamo/Bo., 1 ♂, 3.VIII.1960 (8556), all Rácenis; Río Santo Domingo/Cojedes, 1 ♂, 24.VII.1975, F. Fernández Y.; Calabozo/Guárico, 2 ♂, 16.VII.1960, Rácenis (8560+1); El Chuto/Gu., 1 ♀, 20.IV.1970, F. Mago (13718); Corozo Pando/GU., 1 ♀, 7.V.1952 (3531); 1 ♂, 1 ♀, 2.VIII.1955 (3517+23), all Rácenis; Espino/Gu., 2 ♂, -VII.1952, Zusne (3521+2); 2 ♀, 15.VII.1954 (3532+3); 1 ♀, 26.VII.1954 (3530); 2 ♀, 1.VIII.1954 (3525+7); 1 ♂, 2 ♀, 2.VIII.1954 (3519+24+28), all Klisans; 1 ♂, 1 ♀, 26.XII.1954 (3518+29); 1 ♂, 1 ♀, 27.XII.1954 (6833, 3526), all Rácenis; La Pica/Monagas, 1 ♂, 3.X.1965, F. Fernández Y. & C.J. Rosales (13696); Tonoro/Mo., 2 ♂, 13.VII.1964, Rácenis (10304, 10298); La Aparición/Portuguesa, 1 ♀, 29.VIII.1955, Jordan (6830) (all Venezuelan specimens in IZA). — **Other known specimens:** Venezuela: Guasdalito/Apure, 1 ♂, 25.VI.1970; Camarata/Bolívar, 1 ♂, 1 ♀, 7.VII.1971; Uruyén/Bo., 1 ♂, 4.VII.1971; 1 ♂, 6.VII.1971, all Lorenzoni (C); Bejuma/Carabobo, 2 ♂, 1 ♀, 10.IX.1964, A. Fernández & A. T. P. (IZA); "Venezuela", 1 ♀, Appun (abdomen missing) (MCZ); "presumably brazilian": 1 ♂ (B.C.A., p. 302, ninth line from below; left hind wing missing) (PHIL).

Male (holotype). — Labium yellow, except for the black median lobe and a diffuse brown median stripe; labrum black, lateral angles orange. A dark diffuse band across postclypeus, separated from anterior edge of frons by an orange interspace; rest of face yellow. Entire upper part of frons metallic violet, sharply limited by the anterior edge of frons; vertex on top and frontally metallic violet, becoming brown posteriorly towards the eye suture. Occipital triangle brown. Synthorax reddish brown, with two pale lateral bands across mesepimeron and metepimeron respectively, both separated from the ventral parts of thorax by a black spot. Abdomen bright red, the three terminal segments black; a minute red spotlet at anterior margin of segment 8, on each side of the mediodorsal carina. Underparts of abdomen almost black. Anal appendages dark brown, red at base; the superiors as long as segments 8 + 9 + 10 together. Anterior edge of genital hamule at the second abdominal segment regularly curved backwards, approaching a semi-circle; the hamule being somewhat higher than the posterior lobe. Legs black, femora basally brown. Wings with a yellow tinge



Figs. 5-8. Male secondary genitalia, right lateral view: (5) *Tramea rustica* sp. n., paratype 3518; — (6) *T. minuta* sp. n., paratype 13986; — (7) *T. cophysa* Hagen (Brazil, Rio Grande do Sul, Pelotas); — (8) *T. calverti* Muttkowski (Venezuela, Falcón, Sanare).



Figs. 9-12. Female vulvar lamina: (9) *Tramea minuta* sp. n., paratype 3534; — (10) *T. rustica* sp. n., paratype 3532; — (11) *T. calverti* Muttkowski (Venezuela, Aragua, El Limón); — (12) *T. cophysa* Hagen (Venezuela, Monagas, La Toscana).

near the apices; pterostigma orange; venation in basal and anterior parts of wings, red. Front wings with an ochraceous basal spot, reaching to more than half-way from root to CuA, and filling the first two cells of anal space. Basal spot in hind wing large, reddish-brown, sharply defined against

hyaline part of wing. Distally, it extends to beyond first antenodal and invades triangle at both proximal angles. Veins within basal spot red. Backwards, the basal spot reaches hind margin of wing, forming in the basal part of anal loop a characteristic jagged pattern: in the space A_1 - A_2 the basal spot remains distant from the "heel" for four to five cells, letting those cells hyaline, including the "heel-cell"; in the space A_2 - A_3 , however, the brown colour covers all but one or two cells before the "heel". The whitish membranula is followed anally by a very small, pale area in the basal spot. Sub-costal interspace of hind wing between root and first antenodal dark.

Measurements. — Abdomen (excluding appendages) 29 mm; superior anal appendages 4.8 mm; hind wing 39 mm, costal edge of pterostigma in front wing 3 mm, in hind wing 2 mm. Antenodal and postnodal cross-veins 11:13-13:12/12:7-7:12 in front and hind wings respectively.

Female (allotype). — Venezuela, Calabozo/Guárico, 11.VIII.1979, De Marmels leg. (IZA: 13686).

The metallic colour of upper frons is reduced to a broad posterior band. The vertex' frontal surface is violet, but its upper part, the anterior half of frons and the occipital triangle are pale orange. Wings as in male, but basal spot in hind wing separated from posterior margin of wing by a hyaline space of 2 mm. Anal appendages as long as segments 8 + 9 together. The vulvar lamina more than two thirds the length of segment 9, as seen in lateral view, broadly excised in the middle; this excision being definitely broader and less deep than in *T. calverti* (cf. below). Colour pattern of thorax and abdomen as in male, but segment 8 dorsally completely black; ventral side of abdomen white pruinose.

The paratype males are very similar to holotype. A few specimens have the wings, either more intensely suffused with yellow, or entirely hyaline. Some males have a slightly smaller basal spot in the hind wing, touching, but not invading, the triangle, or have a less clearly pronounced "jag" in the anal loop just before the "heel". Half of the males examined have the eighth segment completely black dorsally; in those cases, where red markings are present, these are minute and completely unlike the spot described in *T. calverti* (see below). — The paratype females resemble the allotype.

Remarks. — In teneral *T. rustica* sp.n., the basal spot in the hind wing resembles rather that of *T. cophysa*. — *Tramea rustica* sp. n. can be seen flying in company of *Tramea calverti* Muttkowski, *Pantala flavescens* Fabr. and *Miathyria marcella* Sel.

TRAMEA CALVERTI MUTTKOWSKI, 1910

Figures 3, 8, 11, 15, 19

1895 *Tramea longicauda* ? var., CALVERT (Mexico: San José del Cabo/Baja

California); — 1896 *Tramea basalis*, CARPENTER (Jamaica); — 1897 *Tramea basalis*, KIRBY (Brazil: Santarém Manaus, Mosqueiro, Pará, Fernando Noronha); — 1899 *Tramea longicauda* ? var. CALVERT (same as in 1895); — 1906 *Tramea cophysa* ? CALVERT (in part: Mexico: D.F., Guadalupe, Veracruz, Teapa/Tabasco; Guatemala: Los Amates, Gualán; Colombia: Bonda/Magdalena, Turbo; Venezuela: Mérida, "Venezuela"; Surinam; Ecuador: Durán, El Salado, Babahoyo, Guayaquil; Brazil: Rio Grande do Sul; Haiti: Samana); Ibid. *Tramea insularis* (in part?: Belize, Haiti: Samana); — 1909 *Tramea longicauda* ? var. CALVERT (Brazil: Sete Lagoas/Minas Gerais, Rio Grande do Sul, Cuyabá, Corumbá; Bolivia: Piedra Blanca); — 1910 *Tramea calverti* MUTTKOWSKI (nomen novum for *longicauda* ? var., CALVERT, 1895); — 1913 *Tramea cophysa* form *a* RIS (Panama; "Venezuela", Valencia; Trinidad; French Guyana: Cayenne; Brazil: Santarém, Pará, Minas Gerais, Santos, Rio de Janeiro, Rio Vermelho/Bahia; Cuba; Surinam; Guyana: Esequibo; Mexico: Ocotlán; Colombia: Villavicencio, Sosomoco/eastern Cordillera, 800 m; Ecuador: Guayaquil); — 1916 *Tramea cophysa* form *a* RIS (Colombia: Sosomoco, Villavicencio); — 1919 *Tramea cophysa*, CALVERT (Guatemala: Cayuga); — 1919 *Tramea cophysa* form *a* RIS (Guatemala: Gualán, Los Amates; Guyana: Georgetown; Surinam: Voorburg; Trinidad: Baracon, Chaguanas); — 1922 *Tramea longicauda* ? var. CAMPOS (Ecuador: Batán); — 1929 *Tramea cophysa* form *a* LONGFIELD (Brazil: Mato Grosso); — 1932 *Tramea cophysa* form *a* GEIJSKES (Trinidad); — 1943 *Tramea cophysa* WHITEHOUSE (Jamaica); 1946 *Tramea cophysa* form *a* GEIJSKES (Tobago: Scarborough); — 1948 *Tramea cophysa* form *a* CALVERT (French Guyana: Cayenne); — 1953 *Tramea cophysa* RACENIS (Venezuela); — 1954 *Tramea cophysa* SOUKUP (Perú: Moyobamba); — 1955 *Tramea cophysa* NEEDHAM & WESTFALL (U.S.A.: Tennessee?, Texas; — Mexico: Baja California; Cuba; Haiti; Jamaica); — 1958 *Tramea calverti* RACENIS (Venezuela: El Limón/Aragua, Maracay, Rancho Grande/Ar., El Pilar/Bolívar); — 1968 *Tramea cophysa* PAULSON (San Andrés Is.); — 1971 *Tramea cophysa* form *a* GEIJSKES (French Guyana: Cayenne); — 1977 *Tramea calverti* PAULSON (Argentina; Brazil; Colombia).

Designation lectotype (male): Mexico, San José del Cabo, -X.1893; deposited in the Philadelphia Academy of Sciences.

Material examined (257 ♂, 227 ♀, including the lectotype). — Barbados: Bridge-town, 1 ♀, 30.III.1927 (CORN); "Barbados", 1 ♂, 28.IX.1903 (PHIL); 1 ♂, 14.IX.1918, H. Morrison (USNM); 2 ♂, 1 ♀ (MCZ); — Belize: Punta Gorda, 1 ♂, -V.1933; 12 ♂, 2 ♀, -VI.1933; 3 ♂, -VII.1933, all J.J. White (MI); "Belize", 1 ♀, 9.I.1905, E.B. Williamson (MI); — Bolivia: Todos Santos, Chapare/Cochabamba, 1 ♂, 21.III.1960; Buena Vista, Ichilo/Santa Cruz, 1 ♂, 1 ♀; "Bolivia", 1 ♂, 22.X.1959 (all UF); Chiquitos, Roboré, 300 m, 2 ♀, 26.XII.1953, W. Forster (Bayerische Staatssammlung, München); — Brazil: Ega, Rio Tefé/Amazonas, 1 ♀, IV. 1922; 1 ♂, 1 ♀, -1922; 1 ♀, all Fassi (SENCK: 27735—8); Manaus/Am., 1 ♀, 8.VI.-, E.B. Williamson (MCZ); 1 ♂, 1 ♀, 18.VI.1922; 1 ♂, 29.VI.1922, all J.H. Williamson (MI); 2 ♂, 5 ♀, H.B. Merrill (USNM); Santa Isabel/Am., 1 ♀, 7.VII.1922, J.H. Williamson (MI); Rio Vermelho/Bahia, 2 ♂, 13.X.1890, Ris/? (SENCK: 27716+7); Vila Murtinho/Guaporé, 1 ♀, 6.VI.1922, J.H. Williamson (MI); Pará, 1 ♀ (MCZ, ex coll. Selys); 1 ♂, 1 ♀, 21.I.1901, Hageman (27740+1); Altamira, Rio Xingu/Pará, 5 ♂, Fassi (27725—9) (all SENCK); Bragança/Pará, 2 ♀, H.B. Merrill (USNM); Ponte Novo, Rio Xingu/Pará, 1 ♂, -I.1921 (27739); Itaituba, Rio Tapajos/Pará, 1 ♂, -II.1922 (27721);

Santarém/Pará, 1 ♂, -III.1922 (27722), all Fassl (SENCK); Itatiaya/Rio de Janeiro, 1 ♀, 16.III.1926; 2 ♀, 7.IV.1926, all Zikan (SENCK: 27749+51+60); Rio Grande do Sul, 1 ♀, H. v. Ihering (PHIL); Cachoeira/Rio Grande do Sul, 1 ♂, 15.XI.1923, 1 ♀, 31.I.1924, all W.F. Henniger (UF); Porto Velho/Rondônia, 1 ♀, 2.III.1922, J.H. Williamson (MI); Juquia/São Paulo, 1 ♂, 26.II.1941, J.R. Bailey (MI); São Paulo, 1 ♂, Hammar (CORN); Cauna/Santa Catarina, 1 ♀, -III.1945; Corupa/Sta. Catarina, 1 ♂, -II.1947, both A. Maller (UF); Asumpção, Rio Madeira, 1 ♀, 20.I.1922; Bom Futuro, Rio Madeira, 1 ♂, 1 ♀, 18.I.1922; Pôrto Artur, Rio Madeira, 1 ♀, 17.I.1922, all J.H. Williamson (MI); "Amazon Basin", 1 ♂, 22.I.1920, H.S. Parish (MI); "Baj... B..., Brazil", 1 ♂ (MCZ, ex Mus. Berol.); "Brazil", 1 ♂, Parish (CORN); — Cayman Is.: Red Bay, Grand Cayman, 6 ♂, 5 ♀, 5-7.X.1963, C.R. Warren (UF); — Colombia: Andagoya, 3 ♀, 22.IV.1918, M.A. Carriker (MI); Bonda/Magdalena, 1 ♀, -VII.-; 1 ♂, 1 ♀, -VIII.- (PHIL); Bolívar, 1 ♂, 25.XII.1916; Santa Marta, 1 ♂, 13.XII.1916; 5 ♂, 9 ♀, 14.XII.1916; 1 ♂, 1 ♀, 16.XII.1916; 3 ♂, 2 ♀, 18.XII.1916; 1 ♀, 28.XII.1916; 1 ♀, 3.I.1917; Maraquita, 1 ♂, 4.II.1917, all J.H. & E.B. Williamson (MI); Tosomoco, 1 ♀, -III.1911; Villavicencio, 1 ♀, -I.1911, both Fassl (IZA, ex SENCK: 27724+33); Turbo, 1 ♂, Mack (MCZ); "Colombia", 1 ♂ (MI); 2 ♀ (CORN); — Costa Rica: Vigia/Guanacaste, 1 ♀, 12.VII.1963; 1 ♀, 9.VIII.1964; 1 ♀, 10.VIII.1964; Carretera Panamericana/Guanacaste, 1 ♀, 12.VII.1964; Buenos Aires/Puntarenas, 1 ♂, 1 ♀, 7.VIII.1963; Villa Neilly, 1 ♂, 7.VIII.1963, all F.G. Thompson (UF); Cuba: La Habana, 1 ♀, 8.IX.1914 (MCZ); Paso Real, 1 ♂, 17.IV.1923, Hine (MI); — Dominican Republic: Santo Domingo, 1 ♀, 15.XI.1947, H. Allaud (USNM); — Ecuador: Bucay/Guayas, 3 ♀ (UF); Guayaquil, 3 ♂ (MCZ); 2 ♂, 1 ♀ (PHIL); 2 ♂, 1 ♀ (MI); 2 ♂ (SENCK: 27742+3), all F. Campos; Cojimies/Manabi, 1 ♀, 25.V.1946; 1 ♂, 1 ♀, -IV.1949, all W. Clarke-MacIntyre (MI); Manta/Manabi, 1 ♀, 20.IV.1946, L. Gómez Alonzo (MI); Palmar/Manabi, 1 ♀, 7.IV.1941; 2 ♂, 8 ♀, 13.IV.1941; 1 ♂, 15.IV.1941, all D.B. Laddey (MI); Tena/Oriente, 1 ♂, -VIII.-, F. Campos (UF); Mangosisa/Santiago Zamora, 1 ♂, 1 ♀, L. Gómez Alonzo (MI); Babahoyo, 1 ♂, 2 ♀ (PHIL); 1 ♀ (USNM); Durán, 1 ♂, 1 ♀ (PHIL); 1 ♂ (USNM); El Salado, 1 ♂, 1 ♀ (PHIL); Puna Vieja, 2 ♂, 1 ♀ (UF); "Ecuador", 2 ♂ (CORN), all F. Campos; 2 ♂, A. Cartwright (USNM); — French Guyana: Cayenne, 1 ♀, -I.1904; 1 ♂, -II.1904, both W. Schaus (USNM); 2 ♂, -II.1917 (IZA: 13701+2); 1 ♂, W. Schaus (PHIL); — Guadeloupe: "Guadeloupe", 1 ♀, 29.VII.1903, F.D. My... (PHIL); — Guatemala: Los Amates/Izabal, 1 ♂, 19.I.1905; 1 ♀, 22.VI.1909 (both MI); 1 ♂, 22.VI.1909 (UF); Livingston/Izabal, 1 ♂, 20.II.1905; Gualán/Zacapa, 2 ♂, 1 ♀, 13.VI.1909; 1 ♂, 15.I.1905 (all MI); 1 ♂, 13.VI.1909 (IZA, ex SENCK: 27713); 1 ♀, 13.VI.1909 (SENCK: 27714); 1 ♀, 13.VI.1909; 1 ♂, 14.VI.1909 (both USNM), all E.B. Williamson; — Guyana: Georgetown, 1 ♀, 27.I.1912, Williamson & Rainey; 2 ♂, 1 ♀ (all MI); 1 ♂, Williamson (SENCK: 27718); — Haiti: Bizoton, 1 ♀, 12.XI.1934, E. Ducasse (MI); Damiens, 1 ♀, 28.VIII.1960; 3 ♂, 1 ♀, 9.IX.1960; Petionville/Ouest, 2 ♂, 25.VIII.1960; 1 ♂, 1 ♀, 31.VIII.1960, all Westfall & Drummond (UF); Port-au-Prince, 1 ♀, 29.X.1934; 1 ♀, 7.XI.1934, both E. Ducasse (MI); 4 ♂, 5 ♀, 31.VIII.1960; 5 ♂, 2 ♀, 9.IX.1960, all Westfall & Drummond (UF); Samana, 1 ♂ (MCZ); 1 ♂ (MI), both Frazar; "Haiti", 1 ♂, -II.1884, W. Cabot (MCZ); 1 ♀ (PHIL); — Honduras: La Ceiba, 1 ♂, 16.IX.1916, F.J. Dyer (USNM); Tela, 1 ♂, 14.III.1923, T.H. Hubbell (MI); — Mexico: San José del Cabo/Baja California, 1 ♂, -X.1893, G. Eisen (PHIL) (lectotype); Todos Santos/Baja California, 1 ♂, 21.X.1923, J.H. Williamson; Carmen/Campeche, 3 ♂, 9 ♀, 3.IX.1936; 2 ♂, 10 ♀, 4.IX.1936; 1 ♀, 5.IX.1936; 1 ♂, 11.IX.1936, all H.D. Thomas (MI); La Encarnación, Pital/Campeche, 2 ♂, J.T. Martin (MI); Ocotlán/Jalisco, 2 ♂, -I.1913, Rolle (IZA: 13710+4, ex SENCK: 27730+1); Teapa/Tabasco, 1 ♀, -II.-; 1 ♂, -III.-, both H.H. Smith (PHIL); Veracruz, 1 ♀, C.C. Adams; 1 ♀ (both PHIL); — Panama: Bahía Piñas/Darién, 1 ♂, 1 ♀, 10.IX.1961, D.R. Paulson (UF); Fort Clayton/Canal Zone, 1 ♂, 1.VIII.1951, F.S. Blanton (USNM); Pacora, 1 ♀, 26.VIII.1950, R.B. Cumming (UF); "Panamá", 1 ♂ (MCZ); — Peru: Satipo, 1 ♂, 8.XI.1940; 1 ♀, 27.XI.1940; 1 ♀, 15.XII.1940;

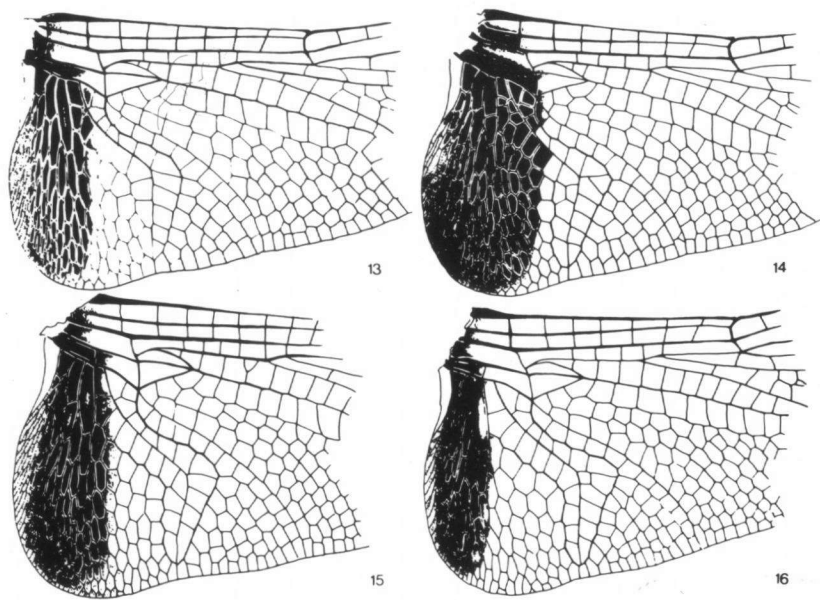
1 ♀, 19.XII.1940; 1 ♂, 2.I.1941; 1 ♂, -.III.1945; 1 ♂, -.IV.1945; 2 ♂, -.XII.1945, all P. Paprzycki (MI); Iquitos/Loreto, 1 ♂, 1 ♀, 3.I.1973, von Rosen (C); Mishuyacu, Maynas, Iquitos/Loreto, 1 ♀, 4.IV.1930 (SENCK: 27732); Yurimaguas/Loreto, 1 ♂, -.XI.1938 (MI), both G. Klug; Piura, "desierto", 1 ♂, 4.V.1971, J.B. Bechyne (IZA); Rioja/San Martín, 1 ♂, 11.IX.1936; 1 ♂, 17.IX.1936; 1 ♂, 1 ♀, 20.IX.1936, all F. Woytkowski (MI); — Santa Lucía: Denney, 1 ♀, 1.VIII.1963; Gros Islet, 1 ♂, 2.VIII.1963, both Flint (USNM); — Surinam: Moengo, Boven, Cottica, 1 ♀, 12.V.1927 (CORN); Paramaribo, 1 ♂, 3.IV.1927, D.C. Geijskes (UF); 1 ♀, 7.V.1927; 1 ♂, 30.V.1927 (both CORN); Voorburg, 1 ♂, 24.II.1912 (MI); "Surinam", 1 ♂ (MCZ); — Trinidad: Baracon, Chaguanas, 1 ♀, 7.III.1912, E.B. Williamson (MI); Carenose, 1 ♂, 14.VIII., Carriker (MCZ); Cedros, 1 ♂, 22.VIII.1921, A. Busck (USNM); — United States: Black Bayou/Texas, 1 ♂, 17.V.1907; 2 ♂, 18.V.1907 (all MI); 1 ♂, 18.V.1907 (USNM); 1 ♂, 21.V.1907 (IZA, ex SENCK: 27720); 2 ♂, 2 ♀, 21.V.1907; Mata Gorda/Texas, 1 ♂, 25.V.1907 (all MI), all E.B. Williamson; — Venezuela: San Juan de Manapiare/Amazonas, 1 ♀, 28.III.1958, García (Soc. La Salle, Caracas); Clarines/Anzoátegui, 1 ♂, 25.VIII., Dietz (IZA); La Ceiba/An., 1 ♀, 19.VIII.1962, Rácenis (—); Cagua/Aragua, 1 ♂, 14.XI.1957, Labrador; 1 ♂, 26.X.1963, P. Salinas; El Limón/Ar., 1 ♀, 25.IV.1953, M. Gelbes (all IZA); Maracay/Ar., 3 ♂, 2 ♀, Franz (IZA ex SENCK: 33108-11+13); 1 ♂, Franz (SENCK: 33112); 1 ♀, 12.XII.1950, F. Fernández; 1 ♂, 2 ♀, 12.IX.1953, Rácenis (—); Rancho Grande/Ar., 1100 m, 1 ♀, 30.VI.1953, Requena; 1 ♂, 16.VII.1955, R. González (both IZA); Suata/Ar., 2 ♂, 21.XI.1960, Taguiguay/Ar., 1 ♂, 21.XI.1960; Caicara/Bolívar, 1 ♀, 4.I.1957, all Rácenis (—); 180 km S of Caicara/Bo., 1 ♂, 28.III.1975, Lorenzoni (C); Ciudad Bolívar, 2 ♂, 10.IX.1952, Rácenis (—); Carretera Cd. Bolívar-Río Aro/Bo., 1 ♀, 14.IV.1969, A. Fernández (IZA); 38 km S of El Dorado/Bo., 1 ♂, 1 ♀, 5.VIII.1961, Rácenis (—); El Pilar/Bo., 1 ♀, 22.VIII.1954, F. Fernández (IZA); Guasipati/Bo., 1 ♀, 1.VIII.1960; 1 ♂, 4.VIII.1960, both Rácenis (—); El Baul/Cojedes, 1 ♀, 6.VIII.1980, A. Chacón (IZA); Galerías del Pao/Coj., 2 ♀, 17.VIII.1963; Tobeida/Delta Amacuro, 1 ♂, 2 ♀, 26.XII.1952; Avila/D.F., 1 ♀, 12.X.1952, all Rácenis (—); Caracas/D.F., 6 ♂, 1 ♀, 5.X.1954, Roze (—); 10 ♂, 6 ♀, 14.X.1958, Rácenis (—); Chichiriviche/D.F., 1 ♀, 27.X.1962, Ventrillon (—); Los Venados, Avila/D.F., 1400 m, 2 ♂, 4 ♀, 12.X.1958; 5 ♂, 5 ♀, 13.X.1958, all C.J. Rosales & M. Gelbes (IZA); Palma Sola/Falcón, 1 ♂, 8.III.1920, Williamson & Ditzler (MI); Sanare/Fa., 3 ♂, 1 ♀, 28.X.1978, Clavijo & Chacón (IZA); Tillerías/Fa., 1 ♂, 25-28.XI.1978, Exp. Inst. Zool. Agr. (IZA); Tucacas/Fa., 1 ♂, 2 ♀, 23.III.1920, Williamson & Ditzler (MI); Calabozo/Guárico, 1 ♂, 2 ♀, 16.VII.1960; 3 ♂, 17.VII.1960, all Rácenis (—); 1 ♂, 11.VIII.1979, De Marmels (IZA); Chaguaramas/Gu., 1 ♀, 23.VII.1954; 1 ♂, 7.VII.1960; Corozo Pando/Gu., 1 ♂, 7.V.1952; 1 ♂, 2.VII.1955, all Rácenis (—); Espino/Gu., 1 ♂, -.VII.1952, Zusne (—); 1 ♀, 15.VII.1954, Klisans (—); La Esperanza/Gu., 1 ♂, 9.VI.1967, Salcedo (IZA); Valle de la Pascua/Gu., 1 ♂, 2 ♀, 22.VII.1954, Rácenis (—); Puricaure/Lara, 1 ♂, 2 ♀, 13.VII.1975, Lorenzoni (C); Cua/Miranda, 1 ♂, 10.VI.1952; Curiepe/Mi., 1 ♀, 9.IX.1953; Higuerote/Mi., 1 ♂, 28.X.1952; Los Cerros/Mi., 2 ♂, 1 ♀, 27.X.1952; Ocumare del Tuy/Mi., 1 ♀, 12.X.1954; Puerto Tuy/Mi., 2 ♂, 1 ♀, 21.IX.1954; Río Chico/Mi., 2 ♀, 13.VII.1952; 2 ♂, 2.XI.1959; 3 ♂, 8.XI.1959, all Rácenis (—); Barrancas/Monagas, 1 ♀, 14.XII.1952, Fernández (—); El Guácharo/Mo., 1 ♀, 10.IX.1971, Lorenzoni (C); Macanao, Margarita Is./Nueva Esparta, 1 ♀, 1.IX.1953, Roze (—); Tortuga Is./N. Esparta, 1 ♂, 22.VI.1956, Medina & Atilano (—); La Aparición/Portuguesa, 1 ♂, 19.IV.1975, Lorenzoni (C); Cumaná/Sucre, 2 ♂, 29.VIII.1951, Rácenis (—); Puerto de Hierro/Su., 1 ♂, 1 ♀, 18.XII.1956; 1 ♂, 27.XII.1956, all Roze (—); El Guayabo/Táchira, 1 ♀, 3.IV.1920; La Fría/Ta., 2 ♀, 15.IV.1920; 3 ♀, 18.IV.1920, all Williamson & Ditzler (MI); 1 ♂, 18.IV.1920, Williamson & Ditzler (UF); 1 ♂, 17.IV.1971; Aroa/Yaracuy, 1 ♂, 7.XI.1971, both Lorenzoni (C); La Hoya/Ya., 100 m, 1 ♀, 28-30.VI.1973, F. Fernández e.a. (IZA); Burro Negro/Zulia, 1 ♂, 1 ♀, 3.VII.1971, Lorenzoni (C); Kasmera/Zu., 1 ♂, 21.XII.1962, Salinas & Pérez; Lagunillas/Zu., 2 ♀, 5.IX.1968, A. Fernández (all IZA); Los Pedales/Zu., 1 ♂,

20.VII.1971, Lorenzoni (C); Maracaibo/Zu., 1 ♀, 30.IV.1920, Williamson & Ditzler (MI); Puerto Mara/Zu., 1 ♀, 29.VIII.1971; Tia Juana/Zu., 1 ♂, 19.VI.1971; 4 ♀, 20.VI.1971; 1 ♂, 22.VI.1971, all Lorenzoni (C).

The type locality of *Tramea calverti* MUTTKOWSKI, 1910, is Mexico, San José del Cabo/Baja California. — In 1895, CALVERT has given a detailed description and two figures of two males from San José del Cabo, Baja California, Mexico, which he referred provisionally to *Tramea longicauda* Brauer, as a variety. He added, however: "These two males may not belong to *longicauda*...", for he had noted the shorter anal appendages in his males, and the different coloration of body and basal spot in hind wing. Later (1899), he had the opportunity to study Brauer's male type, at Vienna, observing further differences, but concluding: "I still retain this provisional name for the two males from Baja California". Finally, in 1906 (BCI): "If it were not for the absence of the yellow pleural stripes, I would refer these specimens [*longicauda* ? var.] to *cophysa*. I have pointed out the differences from the type of *longicauda*, but do not care to inflict another specific name on this genus." In 1919, CALVERT writes on p. 75: "The October male [taken at Cayuga, Guatemala] is of the "*longicauda*, var. ?" of the Biologia, page 303, which, following Dr. Ris, I place here" (under *cophysa*). RIS 1913b, p. 988) subdivides "*T. cophysa*" into forms *a*, *b* and *c*, without, however, naming them. In passing (p. 993), he synonymizes BRAUER's (1867) *longicauda*, after examining the type, with *binotata* Ramb.

Based on CALVERT's (1895) description of *longicauda* ? var., we can easily refer *longicauda* ? var. to Ris' form *a*. Consequently, MUTTKOWSKI's (1910) name "*calverti*", nomen novum for *longicauda* ? var. Calvert, has to be applied to RIS' (1913b) "form *a*" of *Tramea cophysa*, being now *Tramea calverti* Muttkowski. Although no lectotype was designated by Muttkowski it is evident that one of the two *longicauda* ? var. males from San José del Cabo, Baja California (CALVERT, 1895) should serve as such. In fact, the second author of the present work has seen one of the specimens in question, at the Philadelphia Academy collection; dates: ♂ San José del Cabo, -X.1893, G. Eisen. It corresponds perfectly with Ris' "form *a*". This male is now designated lectotype of *Tramea calverti* Muttkowski, 1910. (cf. above).

Male. — Labium yellow, median lobe black; labrum orange, its free margin black-bordered in center; face yellow to orange. Upper part of frons metallic violet only on posterior half, rest of frons dark red until anterior edge, the transition from violet to red very diffuse. Top of vertex red, its anterior surface violet; occipital triangle orange. Colour pattern of thorax as in *T. rustica*, with two oblique pale lateral bands. Abdomen bright red, darker on ventral side. Segment 8 with a conspicuous semicircular to triangular, red dorsobasal spot on each side of the median carina; rest of



Figs. 13-16. Basal spot of hind wing in male (left hind wing, transposed): (13) *Tramea minuta* sp. n., paratype 13716; — (14) *T. rustica* sp. n., paratype 3517; — (15) *T. calverti* Muttkowski (Venezuela, Miranda, Río Chico); — (16) *T. cophysa* Hagen (Brazil, Rio Grande do Sul, Pelotas).

segment 8 and the whole of segments 9 and 10, black. As rare exceptions, there exist specimens with the red spot on segment 8 enlarged or reduced, or completely absent. Superior anal appendages much shorter than segments 8 + 9 together. Genital hamules of the second abdominal segment slightly to definitely higher than posterior lobe, in shape intermediate between the straight and upright hamule in *cophysa* and the more rounded one in *rustica*.

Wings normally yellow tinged; pterostigma orange; venation red in basal and anterior parts of wings. Basal spot in front wing pale ochraceous, extending to half-way from root to CuA, and filling the first two cells in anal space. In the hind wing the basal spot is of golden brown colour and reaches distally to the origin of A_2 , but never to the base of the triangle. The veins in the basal spot are normally yellow, often reddish. Subcostal interspace in hind wing between root and first An, pale ochraceous, rarely predominantly dark. From A_2 the basal spot runs down to the wing margin, or close to it. The paler area behind the whitish membranula extends much more backwards along the anal margin than in *rustica*, in most specimens.

Normally, the whole basal spot is enclosed by a diffuse ochraceous aureole, which is completely absent in *cophysa* and *rustica*. This aureole causes the blurred aspect of the basal spot's outline.

Measurements. — Abdomen 27-29 mm; superior anal appendages 2.9-3.4 mm; hind wing 39-42 mm; costal edge of pterostigma in fore wing 3 mm, in hind wing 2 mm. Antenodal and postnodal cross-veins 10:13-12:10/13:7-8:13, in front and hind wings respectively; minor individual variations occur.

Female. — Colour pattern of body and wings as in male, but the basal spot in hind wing normally does not reach posterior border of wing. Metallic posterior band of upper frons narrower than in male; face yellowish, never red. A female (IZA: 13721) from Gualán, Guatemala, has the basal spot in the hind wing greatly reduced in length, to approximately two and a half times the length of membranula. Only slightly larger is the same spot in a female (IZA: 13720) from Villavicencio, Colombia. Anal appendages as long as segment 8, or as 9 + 10 together. Length of vulvar lamina four fifths the length of, or as long as segment 9, as seen from lateral view. Females with shorter vulvar lamina may occur. The excision is deep and rather narrow. Abdomen 28-31 mm; hind wing 40-43 mm.

Of the 52 specimens, males and females (IZA), examined, 41 (78.8%) have only 1 cross-vein between the superior and inferior sector of the arculus above triangle, in both hind wings. 8 specimens, 4 ♂ and 4 ♀ (15.4%), have in one hind wing 1, in the other 2 cross-veins. 3 specimens, 1 ♂ and 2 ♀ (5.8%), have 2 cross-veins in both hind wings (cf. *T. minuta* for comparison).

Remarks. — *Tramea calverti* is the most common and widespread species of the "cophysa-group", ranging from the southern United States to Rio de Janeiro and the Antilles. It has migratory habits. Every year in October, thousands of individuals arrive at the Venezuelan coasts, apparently coming from some Caribbean islands, or from Central America. A great majority cross the costal Cordillera on their way South, where they can be found at considerable heights (e.g. Silla de Caracas, Avila, at more than 2000 m). Afterwards, they disperse into the "llanos" (plains). This migratory phenomenon lasts for several weeks. Two especially intense migrations have been observed in 1952 and 1958.

TRAMEA MINUTA SP. N.

Figures 1, 6, 9, 13, 17

1906 *Tramea cophysa* ? CALVERT (in part: Brazil, Chapada), p. 302.

Male (holotype). — Venezuela, Bolívar, Río Guaniamo N 6°45' O 66°01', 160 m, 25-28.V.1979, A. & J. Chacón and G. Yépez leg. The specimen is deposited at the Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay (Nr. 13980).

Material examined (4 ♂, 9 ♀, including holotype and allotype). — Paratypes: Brazil: Chapada, 1 ♂, 1 ♀, H.H. Smith (PHIL); Manaus/Amazonas, 2 ♀, 8.VI.1922 (13984+5); 1 ♂, 12.VI.1922 (13986); 1 ♂, 29.VI.1922 (13716), all J.H.W. & J.W.S.; São Paulo de Olivença/Amazonas, 1 ♀, 23.III.- (with a label "Carn. Mus., Acc. 7324") (13983); Abunã/Mato Grosso, 1 ♀, 6.III.1922, J.H.W. & J.W.S. (13715), all IZA; — Venezuela: Calabozo/Guárico, 1 ♀, 17.VII.1960 (8685); Espino/Gu., 1 ♀, 26.XII.1954 (3534), both Rácenis; Tamanaco/Amazonas, 1 ♀, 1.IV.1958 (13987), all IZA.

Male (holotype). — Labium yellow, median lobe and median stripe, dark; labrum orange, its free margin broad black; face yellow to orange; upper parts of frons bright orange, except a very narrow black posterior band. In top view, the vertex does completely overlie this band anteriorly. Vertex orange above, but with its anterior surface basally black; occipital triangle orange. Thorax with the typical pattern of the "cophysa-group". Abdomen red, the three terminal segments entirely black. Ventral surface of abdomen predominantly black. Anal appendages longer than segments 9 + 10 together, but much shorter than segments 8 + 9. Genital hamule of second abdominal segment almost exactly as high as posterior lobe, shape similar as in *T. calverti*. Wings hyaline, venation of basal and anterior parts of wings, red. Pterostigma orange. A small ochraceous basal spot in front wing, not reaching to beyond the second cell in anal field. Shape and colour of basal spot in hind wing much as in *calverti*, but the brown colour touches triangle at both proximal angles. The subcostal interspace between root and first cross-vein, dark ochraceous. The basal spot runs down from base of triangle until very close to wing margin. The paler area behind the whitish membranula extends backwards along anal margin of wing till close to anal angle. The whole basal spot is enclosed by an ochraceous aureole, providing it with an ill-defined distal border, much as in *calverti*.

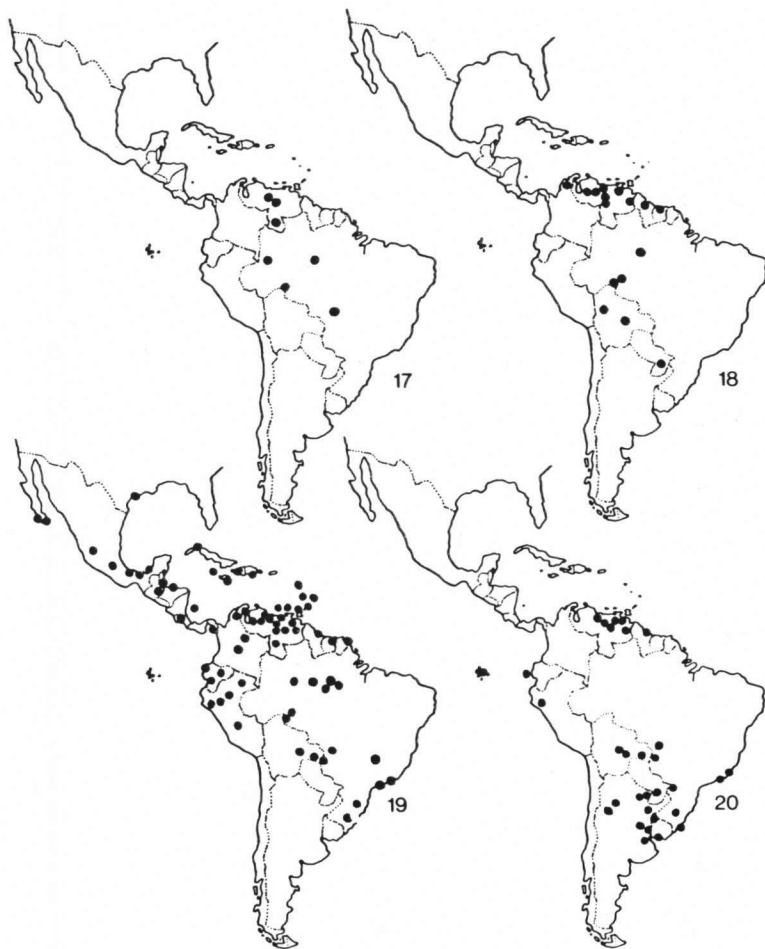
Measurements: abdomen 26 mm; superior anal appendages 3.1 mm; hind wing 37 mm; costal edge of pterostigma in front wing 2.7 mm, in hind wing 2 mm. Antenodal and postnodal cross-veins 11:12-12:10/12:7-7:13, in fore and hind wings, respectively.

The paratype males resemble the holotype, but are slightly smaller. In male "13716" the basal spot in hind wing does not reach to base of triangle, and the subcostal space in fore wing is not conspicuously dark near root. Length of abdomen 25 mm; hind wing 36 mm; pterostigma in front wing 2.8 mm; antenodal and postnodal cross-veins 9:12-12:9/11:7-7:11. In male "13986": abdomen 25 mm; superior anal appendages 3 mm; hind wing 33 mm; pterostigma in front wing 2.6 mm, in hind wing 1.9 mm.

Female (allotype). — Monagas, Jusepín, 28.X.1965, F. Fernández & C.J. Rosales leg. (IZA: 13982).

Colour pattern much as in male, but basal spot in hind wing does not reach posterior border of wing. Anal appendages as long as segment 8, or 9 + 10 together. Segment 8 dorsally completely black. Vulvar lamina

short, three fourths the length of segment 8, as seen in lateral view, broadly excised in the middle. — Some paratype females have the dark posterior band of upper frons slightly broader than the males. In five females the basal spot in the hind wing is of a paler colour, and the ochraceous aureole around it more extense. The vulvar lamina in a few females is shorter than in the allotype. Size is variable: Abdomen 24-28 mm (average 26); hind wing 33-39 mm (35.5). Of the 11 specimens, males and females (IZA), examined, 8 (86%) have 2 cross-veins between superior and inferior sector



Figs. 17-20. Distribution of the four species of *Tramea*, forming the "cophysa-group": (17) *T. minuta* sp. n.; — (18) *T. rustica* sp. n.; - (19) *T. calverti* Muttkowski; - (20) *T. cophysa* Hagen.

of arculus above triangle, in both hind wings. 3 specimens 1 ♂, 2 ♀ (14%), have 2 cross-veins in one hind wing, but only 1 in the other (cf. *calverti*, for comparison).

KEY TO THE SPECIES OF THE "TRAMEA COPHYSA-GROUP"

- 1 Two oblique pale lateral bands on the thorax "*cophysa*-group" 3
 - No trace of such bands 2
- 2 The pale lateral bands may have faded, due to post-mortem changes 3
 - No post-mortem changes Not referable to the "*cophysa*-group"
- 3 Normally no trace of a basal spot in front wing. Basal spot in hind wing dark brown to blackish, and small, reaching distally to CuA or less. Upper frons in male entirely metallic violet until anterior edge, sharply defined by it, in female reduced to a posterior broad band *cophysa* Hagen
 - An ochraceous basal spot in front wing almost always present. Basal spot in hind wing reddish brown or golden brown, with or without a yellow aureole enclosing it, reaching distally to beyond CuA; colour of upper frons in male variable. 4
- 4 Superior anal appendages from as long as (♀) to much longer (♂) than segments 8 + 9 together. Basal spot in hind wing large, with its distal margin serrate, reaching or invading triangle, but without a yellow aureole enclosing it. Dorsum of segment 8 all black; if red basal markings are present, then these are minute or ill-defined; frons in male entirely metallic violet on top until anterior edge, sharply defined by it *rustica* sp. n.
 - Superior anal appendages shorter than segments 8 + 9 together. Basal spot in hind wing normally enclosed by a yellow aureole, at least near anal angle, its distal margin not serrate. In the male the metallic violet colour of upper frons confined to a narrow posterior band, or, at least, to the posterior half, in which case it is ill-defined anteriorly, getting yellow or orange (purplish in living adult males) towards anterior edge. 5
- 5 Segment 8 dorsally with a conspicuous semicircular to triangular red basal spot on each side of the mediodorsal carina (rarely absent); length of abdomen (app. excl.) in male 27-29 mm, in female 28-31 mm, hind wing 39-42 mm and 40-43 mm, respectively; normally only one cross-vein between the two sectors of arculus above triangle, in hind wing. In the male the metallic violet band of upper frons broad, but ill-defined anteriorly, getting yellow or orange (purplish in living adult males) towards frontal edge. In female this band narrower. The vulvar lamina normally four fifths the length of, or as long as segment 9 (as seen in lateral view), the excision deep and rather narrow *calverti* Muttkowski
 - Segment 8 dorsally entirely black; length of abdomen (app. excl.) in male 25-26 mm, in female 24-28 mm, hind wing 33-37 mm and 33-39 mm, respectively; normally two cross-veins between the two sectors of arculus above triangle in hind wing. In the male the metallic violet band of upper frons is reduced to an extremely narrow posterior line. In female this band slightly broader. The vulvar lamina short, normally three fifths to three fourths the length of segment 9 (as seen in lateral view), the excision rather broad ... *minuta* sp.n.

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