

UNIVERSITY OF MICHIGAN
MUSEUM OF ZOOLOGY

Miscellaneous Publications No. 21

A Revision of the Libelluline Genus
Perithemis (Odonata)

BY
DR. F. RIS
RHEINAU, SWITZERLAND

ANN ARBOR, MICHIGAN
PUBLISHED BY THE UNIVERSITY

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FREDERICK M. GAIGE,
Director of the Museum of Zoology,
University of Michigan.

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A REVISION OF THE LIBELLULINE GENUS
PERITHEMIS (ODONATA)

BY DR. F. RIS

INTRODUCTION

For the opportunity of preparing the present paper, I am indebted to my good friend Mr. E. B. Williamson of Bluffton, Indiana. The studies were begun with an examination of Mr. Williamson's extensive lots of specimens of *Perithemis* collected in Colombia, 1916-1917, and in Venezuela, 1920 (20, 26, 27). During these expeditions special attention was given to *Perithemis*, since it was an established fact that our knowledge of the genus was unsatisfactory and more and carefully collected material was required in order to get a better insight into the taxonomic value and specific rights of many of the described forms. These Colombian and Venezuelan specimens (Lots 1 and 2, respectively) were received by me in 1921 and form, together with a lot of specimens from Guatemala, British Guiana, and Trinidad (24), also collected by Mr. Williamson and dealt with in my Libellulinae monograph (18), by far the largest number of specimens of *Perithemis* ever seen by me. The Colombian and Venezuelan specimens collected by experts, and distinguished in the field as belonging to four different species (*domitia*, *mooma*, *electra*, and *lais* of the present paper), settled the question of specific rights as far as the geographic regions covered by the Williamson expeditions were concerned. In fact, of these entire lots, the position of not a single specimen was doubtful when the collection was studied. Nomenclatorial difficulties made me delay the publication, and this delay resulted, after all, usefully, since it gave time for Mr. Williamson to send over a series of other important lots: Lot 3, from Peru, Colonia del Perené (J. H. Williamson, April, 1920); Lot 4, from Florida (*idem*, March and April, 1921) (22, 23); Lot 5, from Brazil, States of Amazonas and Matto Grosso (*idem*, and Capt. John W. Strohm, January to August, 1922) (25); Lot 6, from Mexico (J. H. Williamson, September to November, 1923).

To include all this material the following revision of the entire genus was found desirable. Only such specimens will be considered and enumerated here as are available for comparison. Therefore, of the material once studied for the Libellulinae monograph (18), only specimens still present in the writer's own collection are discussed here, others are mentioned incidentally, where special reasons make it desirable.

Besides the six lots above characterized, all forwarded by Mr. Williamson and belonging to him, there are included some minor series kindly

loaned by the Museum of Zoology, University of Michigan, the American Museum of Natural History in New York, Cornell University (all through Mr. Williamson), the Ohio State University in Columbus (through Mr. J. S. Hine), and by Mr. B. Elwood Montgomery of Poseyville, Indiana, from his own collection. In my collection there are specimens of various origin as mentioned in *Lib.* (18), and, hitherto undescribed, a small but interesting collection from the Amazons consigned by the late Mr. A. H. Fassl in 1920-1922.

For valuable help in finally settling nomenclatorial questions, I am greatly indebted to my friend Mr. K. J. Morton of Edinburgh, who took the trouble to get information on Kirby's specimens of *domitia*, *mooma*, and *pocahontas*. Mr. Stelfox of the Dublin Museum of Science and Arts (Ard-Mhusaeum na h-Eiréann, Natural History Division) most kindly replied to Mr. Morton and sent for him and our publication the splendid photographs reproduced (figs. 43-46). I wish to express here my heartiest thanks to Mr. Stelfox for the great service he has done me.

HISTORICAL

The history of the genus *Perithemis* in odonatological literature is characterized by two different views on the various forms. Calvert in the *Biologia Centrali Americana* (16) may be considered as the principal exponent of a view that embraces the greater number of forms under a single species and attempts to give definitions of "forms" under this head. Kirby, in various papers (8, 9, 10, 13), describes the forms known to him as distinct species. The writer, after an earlier adhesion to the single species view (17), in *Lib.* (18) followed Kirby, with some hesitation, somewhat conditionally and just as much for convenience and easier reference as out of full conviction. When he follows now the same line without hesitation and unconditionally, his opinion has largely been settled by the study of the Williamson lot of specimens and also, be it said incidentally, by having drifted slowly but steadily from his position as a lumpener to that of a splitter.

The unsettled condition of taxonomy within the genus *Perithemis* is largely responsible for the uncertainty of nomenclature of such a well known dragonfly as the North American *P. tenera* and the application of the old name *domitia* to a variety of forms, including *tenera*. It is hoped that the solution here proposed will be found acceptable and the new classification therefore prove to be a useful starting point for further investigation which is as much needed here as anywhere in taxonomic entomology.

Instead of dwelling on details of the genus' history, which would be out of proportion with the aims of the present paper, an enumeration of

all the names given to species or forms of the genus, in chronological order, will probably be found useful and also sufficient for the purpose. In this enumeration the names as proposed in the later part of this paper will be anticipated. The identification will be justified afterwards under the head of each species. There more historical details will also be given; uniting them here under a general chapter would either involve unnecessary repetitions or the omission of such details in the place where they might be otherwise expected.

SPECIFIC AND VARIETAL NAMES

Given to Forms of Perithemis:

| | |
|---|--|
| <i>domitia</i> Drury 1773 (1), Kirby 1889 (9) | - <i>domitia</i> |
| <i>lais</i> Perty 1834 (2), Kirby 1889 (8) | - <i>lais</i> |
| <i>tenera</i> Say 1839 (4) | - <i>tenera</i> female |
| <i>tenuicincta</i> Say 1839 (4) | - <i>tenera</i> male |
| <i>chlora</i> Rambur 1842 (5) | - <i>tenera</i> |
| <i>metella</i> Selys 1857 (6) | - <i>domitia</i> |
| <i>icteroptera</i> Selys 1857 (6) | - <i>icteroptera</i> |
| <i>iris</i> Hagen 1861 (7) | - <i>domitia</i> |
| <i>intensa</i> Kirby 1889 (8) | - <i>intensa</i> |
| <i>thais</i> Kirby 1889 (8) | - <i>thais</i> |
| <i>bella</i> Kirby 1889 (8) | - <i>bella</i> |
| <i>mooma</i> Kirby 1889 (9) | - <i>mooma</i> |
| <i>pocahontas</i> Kirby 1889 (9) | - <i>domitia</i> female variety |
| <i>austeni</i> Kirby 1897 (10) | - <i>bella</i> variety |
| <i>intensa</i> variety <i>californica</i> Martin 1900 (14) | - <i>intensa</i> |
| <i>seminole</i> Calvert 1907 (11) | - <i>seminole</i> |
| <i>cloe</i> Calvert 1907 (11) | - <i>mooma</i> female variety |
| <i>octozantha</i> Ris 1910 (18) | - <i>mooma</i> female variety |
| <i>waltheri</i> Ris 1910 (18) | - <i>waltheri</i> |
| <i>naias</i> Ris 1910 (18) | - <i>lais</i> |
| <i>cornelia</i> Ris 1910, 1919 (18) | - <i>cornelia</i> plus <i>electra</i> plus <i>domitia</i> |
| <i>electra</i> Ris (present paper) | - nov. spec. |

Twelve different species are recognized in the following text. Specific distinctness appears doubtful in but one case: *waltheri* versus *icteroptera*; *waltheri* might well be a luxuriant tropical form of the same species which is represented by the smaller and less intensely colored *icteroptera* of the region of Buenos Aires. But since no new material of *waltheri* has come to hand and the original series could not again be confronted, I prefer to let the matter stand as it is. Some doubt might also exist about the position of *seminole* versus *tenera*; but since no real intermediates are now

before me, and with regard to the peculiar position of the Floridan fauna, I believe that the rights of *seminole* are more solidly established than those of *waltheri*. All the other forms I believe to be "good species" in the Linnean sense, and also I believe that now, in none of them as given here, is there more than one species included, as *domitia* and *cornelia* still were in *Lib.* (18).

There appear to be four natural groups of species: 1. *tenera*, *seminole*, *intensa*, *mooma*; 2. *domitia*, *bella*; 3. *electra*, *cornelia*, *thais*, *lais*; 4. *waltheri*, *icteroptera*.

No species are known to me that could be doubtfully referred to *Perithemis*. A couple of females from Porto Velho and Pará respectively that once appeared to be such to Mr. Williamson and myself, I now consider as undoubted *Oligocladas*, probably the as yet undescribed female of *O. amphinome*. The error, as far as I am concerned myself, now appears as a curious case of autosuggestion, easily corrected by re-examination of the specimens after a considerable length of time.

Recognizing a species as such by an expert eye does not always mean easy definition and description. In *Perithemis*, as already said in the introductory remarks, only the sight of a large series of exactly collected and labelled specimens gave convincing evidence. To reduce this evidence into the form of descriptions and keys was very conscientiously attempted, and it is hoped that the following part will prove convincing to the student.

The key for *Perithemis* in *Lib.* was established on the proportions of length to breadth of hind wing as the first distinction. Although this is not a bad antithesis, it is abandoned here for neural characters as first-line guides. These, indeed, are individually variable in *Perithemis* as in most other dragonflies, and perhaps a little more so. Nevertheless, extensive tabulations proved that they might advantageously be used for a key as well as for specific distinctions. Colors and markings of wings in males and especially in females are of importance. As a new feature in the following keys and descriptions will be found the colors and markings of thorax and abdomen and in some cases the colors of feet. Sexual specific characters of males or females, so important and useful in many species of Libellulinae, are practically absent in *Perithemis*. This is one of the reasons why the correct recognition of species was here so long delayed. It is a curious fact that the same observation, of sexual distinctions lacking between species, is to be made on three other not nearly allied Libelluline genera with intensely colored and characteristically marked wings: *Celi-themis*, *Rhyothemis*, *Neurothemis*.

The penes of the various forms were examined, following the well known studies of Dr. Kennedy. If we present here the results of this study, it

is chiefly because we want to demonstrate what was found in this new field of observation. The differences between the various species are exceedingly slight; but, as far as they go, they are in line with the other characters found distinctive. It is considered convenient to present these facts united here in the introductory part instead of under the single species.

Figures 1 to 18 represent our preparations of penes.

- Fig. 1 *tenera*, Indiana.
- Fig. 2 *tenera*, Raleigh, North Carolina.
- Fig. 3 *seminole*, Labelle, Florida.
- Fig. 4 *intensa*, Acaponeta, Mexico.
- Fig. 5 *mooma*, Bejuma, Venezuela.
- Fig. 6 *mooma*, Perené, Peru.
- Fig. 7 *mooma*, Abuná, Brazil.
- Fig. 8 *mooma*, Bom Jesus de Itabapoana, Brazil.
- Fig. 9 *domitia*, Palma Sola, Venezuela.
- Fig. 10 *bella*, Santarem, Brazil.
- Fig. 11 *electra*, Palma Sola, Venezuela.
- Fig. 12 *electra*, Perené, Peru.
- Fig. 13 *cornelia*, Abuná, Brazil.
- Fig. 14 *thais*, Porto Velho, Brazil.
- Fig. 15 *lais*, Puerto Berrio, Colombia.
- Fig. 16 *lais*, Belem, Brazil.
- Fig. 17 *waltheri*, Misiones, Argentina.
- Fig. 18 *icteroptera*, Buenos Aires, Argentina.

All drawings were made by camera lucida from preparations obtained by caustic potash maceration. They are drawn exactly on the same scale and therefore the relative size of organs and parts may be immediately determined from the drawings. Permanent mounts in balsam were not found satisfactory, since the relative dimensions of parts (penis versus vesicula) or positions of same (curve of distal part of penis) would not permit the arrangement of regularly covered preparations disposed in one of the cardinal planes, frontal or longitudinal as it were, such as are required for good camera drawings. In temporary mounts, using hollow slides, good lateral views could always be obtained and immediately drawn. But the shape of the organ did not permit getting regular frontal or ventral views; they might have been given in freehand drawing, for which my artistic faculties are not sufficient. Nevertheless, the lateral views may be found to render, as characteristically as might be expected, the organs of each species. The drawings are by technical necessity somewhat diagrammatic; the distal limit in lateral view of the terminal joint appears sharper than it really is, chitinization diminishing gradually towards the distal border, the extreme limit of which, at the beginning of invagination of the glans part, is very thin and may only be distinguished by using a

narrow diaphragm. What appears as a tooth on the convex (dorsal in the outstretched organ) side of the terminal joint in the drawings, is not really a tooth, but the side view of a more strongly chitinized ridge, which runs into the interior of the organ. The interior (glans) parts were not drawn; as invaginated tubular organs always are, they are of very difficult definition, also individually variable according to the degree of invagination. Such parts of the glans as were casually protruded or evaginated beyond the limit of the terminal joint were drawn. They are always very thin, transparent, and feebly chitinized lobes, covered with minute denticles or short bristles, folded in various ways. More strongly chitinized is a double, longitudinal band which has relations to the ridge that appears as an external tooth in side view. These bands, being interior, were not drawn. Complete evagination of the glans could not be obtained in macerations. It might perhaps in fresh specimens; but as the matter stands, this part is not available for diagnostic or comparative purposes. Water, glycerine, and oil of cloves were tested as media for mounting preparations for drawing. Oil of cloves was found markedly the best and finally adopted.

All organs are drawn from the right side and show: 1. The vesicle, rather strongly chitinized, bearing a tuft of long, soft hairs; size not much different in most species, but quite unproportionately large in *lais*, the smallest species of all. 2. The basal joint, strongly chitinized on the convex (dorsal) side; differences in the aspect between various species being chiefly due to slight differences in the position to the optic axis; on the concave (ventral) side there is a thin, narrowly folded, transparent membrane. 3. The intermediate membrane, which occupies the height of the convexity; no stronger chitinization, the form depending entirely on the individual position of the mount. 4. The terminal or distal joint, as described above; strongly chitinized in the basal, feebly in the distal part; rather characteristic for single species in size and outline. 5. The invaginated or glans part, as mentioned above; casually and variably projecting parts, lobes, and lobules, drawn as they were individually found, cannot now be considered as of diagnostic value.

KEY TO SPECIES OF *Perithemis*

As an introductory remark the division into broad-winged and narrow-winged species, as adopted in *Lib.*, may here be repeated. Numerous specimens have been measured again and the proportions of length (base to apex) to breadth (vertically from costa to point of anal border correspond-

ing to apex of loop) of hind wings calculated. The proportions thus obtained are as follows:

- A. Broad-winged series; *cornelia* 2.09 to 2.46, *thais* 2.14 to 2.46, *lais* 2.20 to 2.50, *electra* 2.21 to 2.62, *domitia* 2.26 to 2.92, *icteroptera* 2.32 to 2.53, *waltheri* 2.32 to 2.77.
- B. Narrow-winged series; *bella* 2.43 to 2.83, *intensa* 2.46 to 2.83, *tenera* 2.50 to 2.86, *seminole* 2.50 to 3.00, *mooma* 2.52 to 3.08.

Although overlapping to a degree, the two series still appear to be definable by the new measurements.

The new key here presented is based primarily on venational details. Crossed or free triangles (t) in front and hind wing and subtriangle (ti) in front wing; number of antecubitals (Anq) in front wing; number of cells running through from M_4 to Cu_1 in hind wing (one cell almost regularly present between posterior two-thirds of distal side of triangle and Cu_1 , not being counted)—all these were tabulated in the entire series of specimens under consideration. The results of these tabulations (a rather tedious piece of work) are given under each species. A tabulation of the origin of $Mspl$ in the front and hind wings was also made for the greater part of the series; the results were not satisfactory, since the facts are often difficult to ascertain, irregularities being very frequent; this tabulation therefore was left in manuscript and is not reproduced here. The tabulations clearly show that the venational characters in question may safely be adopted for a key. Exceptions exist, indeed, on every single point, sometimes exceedingly rare, sometimes more frequent, very often asymmetrical (so indicated in the original tabulations, but not repeated in the extracts here shown, as not being of sufficient taxonomic importance). Of course just a single specimen bearing such an exception might mislead in the key; but a judicious naturalist will always remember that no existing key is mathematically exact, and I trust that with at least a small series in hand and some preliminary knowledge of the caprices of dragonfly venation, such a judicious observer will not miss his way in the following key. Therefore the characters are here given without the exceptions being mentioned; these can be found exactly calculated under the head of each species. The summary indication in the key of the provenience of each species will, I trust, also be found useful and acceptable. A dichotomous key prevents a natural classification of species, desirable as this would be.

- 1. All triangles and subtriangles free 2
- 1'. At least one of triangles and subtriangles crossed 5
- 2. (1) Thorax with a sharply defined pattern of whitish or greenish yellow and golden brown bands. Smallest species. Wings relatively short and broad. Abdomen very short. Typical pattern of wings, two narrow, curved brown bands, the proximal one across the triangles, the distal one

- from origin of bridge to end of Cu_2 in front wing, to apex of loop in hind wing; on golden yellow ground in male, on hyaline ground in female. Two to three cells in hind wing running through from M_4 to Cu_1 . Colombia, Guianas, Amazonas *lais*
- 2'. Dorsum of thorax dark purplish brown, with or without dull greenish, somewhat diffuse, ante-humeral bands. Sides unicolorous, or with dull greenish bands on purplish brown. Larger species. Wings comparatively narrower. Abdomen longer. Feet wholly light ochraceous yellow with blackish spines. Two (three, one) cells in hind wing running through from M_4 to Cu_13
3. (2') Sides of thorax light ochreous brown, unmarked or only diffusely clouded above the metastigma. Male wings golden yellow, venation and pterostigma red, very exceptionally some dark spots at the triangles. Female highly polymorphous; wings hyaline with golden yellow, golden yellow and brown, or brown to blackish markings; proximal ones at the triangles; distal ones mostly developed as transverse bands with the middle of the band or spot at the nodus or very slightly distal or distinctly proximal thereto. Proximal and distal bands often confluent, in the costal stripe alone, or more broadly, or even entirely. Antilles, Mexico, Central America, Colombia, Venezuela, Guianas, Trinidad, Upper Amazon, Matto Grosso, Atlantic Brazil, Paraguay, Argentina.....*mooma*
- 3'. Sides of thorax, like dorsum, dark purplish brown with two dull greenish, entire, interrupted, or dorsally abridged bands on the mesepimeron and metepimeron. Male wings deep golden yellow with a strong tendency to blackish markings at the triangles. Female wings hyaline with yellow, yellow and blackish, or blackish markings different in position from those of 34
4. (3') Male with dark markings of wings usually present, comparatively large, not rarely in hind wing a curved band from t to anal border. Female with dark distal band in both wings very broad, in front wing from nodus to pterostigma, in hind wing ending distally at the nodus in the costal area, a few cells more distally at the anal border, proximally often confluent with a triangular blackish spot or band. Anal border of front wing rather broadly, of hind wing narrowly, blackish to apex of wing. In both sexes light bands of thoracic sides obscured in dorsal half, their ventral ends contrasting as round greenish spots. No light antehumeral bands. Florida*seminole*
- 4'. Male with dark spots of wings about equally present or absent; when present limited to small spots at the triangles and the extreme base of hind wing. Female with dark distal band moderately broad, in identical position in front wing and hind wing, with its proximal border at the nodus; yellow with brownish center, brownish to blackish with broad yellow borders, or blackish with narrow yellow borders; proximal and distal markings only exceptionally confluent; when so, then mostly in hind wing alone; generally no blackish border on anal margin of wings. In both sexes light bands of thoracic sides generally not or but slightly clouded in dorsal half; not rarely a third diffuse light band above the metastigma. Mostly distinct light antehumeral bands. United States. *tenera*

5. (1') Males with subtriangles in front wing two- or three-celled, females with same triangles free. Abdomen of both sexes robust, of females markedly spindle-shaped. Feet obscure, except extensor side of tibiae, which are light ochraceous yellow. Wings of male rich golden yellow, front wing distally to 2-3 cells proximal to nodus and in a proximally bent line to anal border, in costal field to pterostigma (varieties and different conditions of maturity) with lighter yellow. Wings of female hyaline: in front wing yellow, yellow and brown, or brown ray to nodus in sc, 2-3 cells more distally in c; in hind wing a large discal spot from t to 1-2 cells proximal to pterostigma; yellow, yellow with large blackish center, or blackish with yellow border. Lower Amazon.....*bella*
- 5'. Venation similar in both sexes.....6
6. (5') Triangles in both wings free, subtriangles in front wing two-celled. Wings broad. Abdomen narrow with parallel borders.....7
- 6'. Triangles crossed at least in hind wing, subtriangle in front wing two- to three-celled.....8
7. (6) Feet dark brown, except the flexor side of first femora and the extensor side of all tibiae, which are light ochraceous yellow. Thoracic dorsum purplish brown with slightly diffuse greenish antehumeral stripes, sides dull olive green with diffuse, often uncomplete brownish bands at metastigma and posterior lateral suture. Abdomen each side with a complete brownish black longitudinal band from segments 4 to 9. Male wings light and somewhat dull yellow with strongly contrasting dark red venation; or richer golden yellow with venation equally contrasting; often a diffuse clearing between the triangular and nodal regions; very rarely a trace of dark spots in the triangular region where as a rule only the yellow ground color is somewhat deepened; pterostigma comparatively long and narrow, deep dark red. Female polymorphous: yellow markings alone, always including the wing bases, or dark brown elements within such yellow; often yellow to blackish ray in costal field to half-way between nodus and pterostigma; mostly the apex of hind wing brown. Antilles, Mexico, Central America, Colombia, Venezuela, Trinidad.
- domitia*
- 7'. Feet light ochraceous yellow, unicolorous. Thorax very light golden brown, sides slightly greenish, no dark markings. Abdomen with basal segments almost unmarked, segments 7 to 9 each side with a narrow oblique dark stripe. Male wings rich and pure golden yellow, venation the same color to the pterostigma (Perené) or, in extreme cases, to the apex, this cleared apical area only showing blackish venation; no dark wing markings. Female (very few known) isochromatic; color slightly duller than in male, less dull distal to the triangle; venation slightly more contrasting than in the male. Panama, Colombia, Venezuela, Trinidad, Upper Amazons.....*electra*
8. (6') Triangle in front wing free, in hind wing usually crossed; subtriangle in front wing two- (three-) celled. Both sexes with dark markings: spots, or incomplete or complete transverse bands.....9
- 8'. Triangle in front wing and hind wing and subtriangle in front wing crossed.....10
9. (8) Abdomen in males with narrow oblique dark stripes on segments 4 to 9, in females with more developed dark longitudinal bands. Male wings rich golden yellow; dark markings at triangles and distal to nodus mostly

- narrow, interrupted, brownish bands or reduced to spots. Female with dark markings somewhat richer on lighter yellow ground color; base of front wing hyaline with yellow costal ray; apex of hind wing hyaline with dark anal border (two females only known). Upper Amazons, Solimoes*cornelia*
- 9'. Abdomen in males and females with complete blackish longitudinal bands. Wings of both sexes light and somewhat dull to rich golden yellow, with sharply defined blackish transverse bands: distal and most complete one at the nodus, proximal and often incomplete or interrupted one in the triangular region of both front wing and hind wing. Female little different from the male. Both sexes in varieties with ground color of wings partly hyaline. Guianas, Trinidad, Amazons*thais*
10. (8') Male wings pure and rich golden yellow, venation the same color; many specimens with blackish spots at the triangles. Female wings hyaline with transverse bands in the *tenera* position (4'), yellow, yellow with dark center, dark brown with yellow border, or wholly dark: the distal band with the proximal border at nodus. Wing proportion slightly narrower than 10'. Mexico, Sonoran region of the United States.....*intensa*
- 10'. Wing color approximately similar in male and female: richer or paler and duller with venation yellow to blackish; usually paler between the triangular and nodal regions. Some of the specimens with variable and diffuse brown, never very dark, spots in the triangular and nodal regions. Wing comparatively broad.....11
11. (10') Very large form. Wings rich golden yellow; both sexes usually with well developed brownish spots in the triangular and nodal regions. Southern Atlantic Brazil, Misiones.....*waltheri*
- 11'. Smaller form. Color of wings lighter and somewhat dull, dark venation more contrasting. Dark spots in the triangular and nodal regions smaller and more diffuse or altogether absent. Buenos Aires.....*icteroptera*

DESCRIPTIONS OF SPECIES

1. *Perithemis tenera* (Say 1839)

(Figs. 1, 2, 19, 20, 21, 22)

Material examined: 75 males, 29 females. INDIANA: Bluffton, July 14, 1901, 1 female; Goose Lake, September 7, 1898, 1 female; Shriner Lake, August 4, 1900, 1 male; Winona Lake, July 6, 1901, 1 male (E. B. Williamson, collector, in Coll. Ris); Vincennes, gravel-pit, July 8, 11, 13, 22, and August 2, 3, 1924, 12 males and 6 females; no locality, August 26, 1924, 1 male; Decker Road, Knox County, 1 male; pond, Ewart Farm, Gibson County, 1 male; Foote's Lake, Gibson County, June 12, 1925, 4 males; Big Creek, 10 miles south of New Harmony (Say's locality), August 19, 1925, 2 males (Collected by and in Coll. B. E. Montgomery). MARYLAND: Baltimore, July, 1891, 1 female (Collected by and in Coll. Ris). NORTH CAROLINA: Raleigh, June 27, July 18, 23, August 25, 27, 29, September 1, 2, 3, 8, 10, 11, 1914, 16 males and 8 females (C. S. Brimley, collector, in Coll. Ris). LOUISIANA: Eagle Lake, Madison Parish, June 21, 29, July 4,

11, 18, August 12, 1925, 17 males and 5 females; Lake Bruin, Tensas Parish, July 26, August 8, 1925, 4 males and 4 females; Alligator Bayou, Madison Parish, May 20, 21, 1925, 3 males and 1 female; Roundaway Bayou, Tallulah, June 28, July 2, 25, 1925, 3 males; cotton field near Bayou, Tallulah, June 19, July 15, 1925, 2 females; Lakes, 7 to 8 miles southwest of Tallulah, August 16, 1925, 4 males; Bear Lake, Madison Parish, July 18, 1925, 1 male; small pool by roadside, 5 miles east of Tallulah, August 2, 1925, 2 males (Collected by and in Coll. B. E. Montgomery). TEXAS: Williams Lake, Matagorda County, May 26, 1907, 2 males (E. B. Williamson, collector, in Coll. Ris).

Male (adult, colors well preserved, New Harmony, Indiana). Labium and labrum dull light yellow. Anteclypeus and postclypeus pale dull greenish yellow. Frons dull light orange. Vesicle brown. Thoracic dorsum rich golden brown; dull light green antehumeral stripes, less than one third the breadth of mesepisternum, little above one half of the height, nearer to median than to humeral suture. Sides dark golden brown with dull greenish, dorsally clouded bands on posterior three fourths of mesepimeron and most of metepimeron; above metastigma on metepisternum a small, diffuse, and clouded greenish spot. Ventral side light brown, Feet wholly light ochraceous brown with blackish spines. Abdomen, segments 3 to 4 very slightly constricted, the end slightly spindle-shaped, dull brown, carinae narrowly black; segments 3 to 8 a narrow, dark brown, oblique line, ascending from middle of anterior border to dorsal end of posterior border where the lines of both sides meet to form a dark middorsal, terminal spot. Ventral side dull brown.

Wings rich and deep golden yellow; pterostigma and venation red. The majority of specimens (as in the case of both males from New Harmony) without dark spots. A minority with a dark, brown to blackish, minute to rather conspicuous spot at base of sc, m, and cu in hind wing, distal angle of t in hind wing and more rarely also in front wing.

Female (Indiana). Head and thorax as in male. Abdomen robust and decidedly spindle-shaped (colors not in good condition). Feet very light ochraceous brown.

Wings as described in key: hyaline, distal colored bands beginning at nodus or at most one cell proximal thereto, varying from only two cells breadth to two thirds the distance from nodus to pterostigma; when blackish, then conspicuously bordered with yellow. Proximal marking minimally blackish spots at distal angle of t in front wing and hind wing and in base of sc, m, and cu in hind wing; maximally in front wing a band across one half of the wing, in hind wing a curved band to nearly the anal angle. In most specimens a light yellow cloud covers the space between

proximal and distal markings. Pterostigma dark reddish brown dorsally, golden brown ventrally.

Louisiana: in males the unmarked yellow wings are still more predominant than in the Indiana series, maximal marking not larger than very small blackish spots at the typical points (in this series no gradation towards *seminole*). The series of females remains within the limits of the *tenera* pattern as described, except one specimen (Lake Bruin), where in hind wing the middle of the broad and centrally somewhat cleared band is at the nodus. Two specimens have the proximal and distal bands broadly fused on costal border in hind wing, one specimen narrowly in front wing, broadly in hind wing. Yellow borders of bands narrower than in Indiana series, in three specimens almost vanished (in all these points a gradation towards *mooma* is evident).

Males: abdomen 12.5, hind wing 16, pterostigma 2; abd. 13, hw. 17, pt. 2 (New Harmony, small specimens); abd. 14, hw. 17.5, pt. 2; abd. 15, hw. 18, pt. 2 (Vincennes, average medium size); abd. 13, hw. 17.6, pt. 2 to 2.5 (Raleigh); abd. 13, hw. 17, pt. 2 (Louisiana). Females: abd. 14, hw. 18, pt. 2; abd. 14, hw. 19, pt. 2 (Indiana); abd. 13, hw. 17.5, pt. 2 (Raleigh); abd. 11.5, hw. 15.5, pt. 1.5 to 2 (Louisiana).

Venational characters

Anq. 6 1/2-120, 7 1/2-19; 5 2/2-3; 6-2; 6 2/2-5; 6 3/2-5 (males): 6 1/2-41; 7 1/2-6; 5 1/2-1; 5 2/2-1; 6-1; 6 2/2-2 (females).

t in front wing free, 152; t in hind wing free, 150; two-celled, 2; ti in front wing free, 149; two-celled, 1; three-celled, 2 (males): t in front wing free, 52; t in hind wing free, 52; ti in front wing free, 52 (females).

Cells from M_4 to Cu_1 in hind wing none, 4; one, 32; two, 102; three, 13 (males): none, 1; one, 7; two, 31; three, 13 (females).

Calvert (16) gives as the area of distribution for *tenera*: UNITED STATES: Massachusetts, Michigan, and North Dakota, to Georgia, Tennessee, and Texas. I cannot find any Canadian records. No *Perithemis* appears to exist in the United States west of the Rocky Mountains.

The original descriptions of *tenera* and *tenuicincta* (4) are not accessible to me. I follow Hagen and the subsequent authors in their identification. Burmeister (3), see under *domitia*. Rambur (5) describes under the new name *chlora* a male with brown spots "de la collection Serville et indiqué de Philadelphie." Hagen (7) enumerates under the head of *P. domitia*: var. 1 *tenuicincta* Say No. 21 (male), *tenera* Say No. 20 (female), thus establishing absolute priority for the name *tenera*; *chlora* Ramb. (and *metella* Selys, which see under *domitia*), var. 2 *iris* (which see under *domitia*). The short diagnosis of the species as a whole evidently covers

tenera; so does the diagnosis of var. 1: "sides of the thorax fuscous, two interrupted yellow lines each side, all the wings of the male with a basal fuscous point. Indiana, Pennsylvania, Massachusetts, New York, Louisiana" (plus Mexican localities which must belong to another species). Hagen's name (7) for *tenera* in our sense is thus *domitia*, var. 1. Later authors may be omitted here. There can be no doubt that all records of *Perithemis* from the United States except Florida (*seminole*) and the Sonoran states (*intensa*) belong to *tenera*. The name *domitia*, still much in use for such specimens, should be abandoned. Evidently the entire limits of variability, especially of wing pattern in females, are not shown in our own comparatively small series. Interesting photographs of female wings are given by Kennedy (19); there are in this series some extremes not represented in our material.

Larva and life history are known of this species (Needham, *New York State Mus. Bull.* 47—1901). The larva is of the *Sympetrum* type with "head wider than long, widest across the rounded eyes, which are at the middle of its length." The habits of the adults are, as far as field notes are available, similar over the whole series. They are inhabitants of lakes, ponds, pools, ditches, and creeks in open or only scantily wooded country, and are decidedly thermophilous.

2. *Perithemis seminole* (Calvert 1907)

(Figs. 3, 23, 24, 25, 26, 64, 65)

Material examined: 49 males, 21 females. FLORIDA: Fort Myers, March 4, 11, 12, 15, 19, 1921, 9 males; Labelle, March 21, 22, 24, 26, 27, 1921, 26 males and 16 females; Moore Haven, March 29, 30, 1921, 5 males and 2 females; Palmdale, April 4, 6, 1921, 1 male and 2 females; canals from Moore Haven to Palm Beach, April 9, 1921, 1 male; Enterprise, April 15, 16, 1921, 4 females (J. H. Williamson, collector, in Coll. Williamson); Salt Lake, near St. Petersburg, April 2, 1908, and Waterworks pond, St. Petersburg, April 3, 1913, 5 males and 2 females (in Coll. Williamson); St. Petersburg, April 9, 1914, 1 female; Gulfport, October, 1914, 2 males and 2 females (A. G. Reynolds, collector, in Coll. Ris).

Male (adult, colors well preserved). Labium, labrum, and frons anteriorly dull ochraceous to orange. Anteclypeus and postclypeus ochraceous to light greenish. Frons laterally and above and vesicle dull greenish gray, apex of vesicle yellowish. Thoracic dorsum dark ferruginous brown, unmarked; sides of same ground color with two light greenish yellow bands on posterior two thirds of mesepimeron and posterior three fourths of metepimeron; the bands in their dorsal half somewhat clouded and diffuse, in very mature specimens almost vanishing, so that only two round,

sharply contrasting light greenish yellow spots remain at lower end of mesepimeron and metepimeron. Feet very light ochraceous with black spines. Abdomen rather robust, somewhat spindle-shaped by narrowing of segments 2-3 and widening of 4-6. Dull reddish brown with black carinae. In some of the specimens each side of segments 3-9 with a narrow, slightly diffuse, anteriorly incomplete longitudinal band near the middorsal carina, about one fourth as broad as the segment's half, dull reddish brown (such specimens showing a gradation towards the abdominal pattern of *domitia*). Ventral side dull reddish brown.

Wings deep and rich golden yellow, venation the same color, this color not quite so pure, as for instance, in *intensa*, with just a shade of brown. Pterostigma ferruginous to red. All specimens with at least a trace of dark spots at the typical triangular and basal places. The majority with larger to very large dark markings to cover the triangles entirely as well as a basal ray in sc, m, and cu joined to the triangular spot; in hind wing a curved band from t to anal angle. In some specimens also grayish clouds between nodus and pterostigma. Not rarely a feeble and diffuse clearing of yellow ground color between triangular and nodal regions.

Female. Thorax duller brown in color, light greenish bands and spots as in the male. Abdomen very robust, segments 1-3 distinctly narrowed, 4-9 broad and parallel-sided. Dull brown with black carinae. No pattern visible.

Wings hyaline with very large blackish or black and yellow markings as briefly described in key and better expressed by figs. 25, 26, 64, and 65 than by a lengthy description. Two different types of pattern are conspicuous, one with black markings with very narrow yellow borders, the other with yellow more extensively bordering and filling the black bands. Both types were photographed, but since yellow is intensified in photographs, the difference is much less striking in the figures than in nature. No specimens of *seminole* with yellow color alone, or with bands very much reduced (as in some *mooma*) have been seen.

Males: abdomen 13, hind wing 16 by 5.5, pterostigma 2; abd. 14.5, hw. 18 by 6, pt. 1.5 to 2. Females: abd. 13.5, hw. 18 by 6.5; pt. 2.5.

Venational characters

Anq. 6 1/2-73; 7 1/2-8; 6-1; 6 2/2-2 (males): 6 1/2-43; 7 1/2-12; 6 2/2-1 (females).

t in front wing free, 83; two-celled, 1; t in hind wing free, 80; two-celled, 4; ti in front wing free, 82; two-celled, 4 (males): t in front wing free, 54; two-celled, 2; t in hind wing free, 51; two-celled, 5; ti in front wing free, 55; two-celled, 1 (females).

Cells from M_4 to Cu_1 in hind wing none, 1; one, 19; two, 65; three, 1 (males): none, 1; one, 18; two, 30; three, 7 (females).

No nomenclatorial difficulties exist about *seminole*. Calvert's original description (16) and my own one (18) are the only records thus far known to me. Its position as a distinct species appears as rather well established. Transitional forms of *tenera* towards *seminole* are not actually known, though they might exist in unexplored tracts of northern Florida or southern Georgia. It is remarkable that the position of distal dark bands in female *seminole* is the *tenera* position in the front wing, the *mooma* position in the hind wing.

3. *Perithemis intensa* (Kirby 1889)

(Figs. 4, 37, 38, 42)

Material examined: 55 males, 5 females. ARIZONA: Mesa, September 10, 1912, 2 males (B. J. Rainey, collector, in Coll. Ris). MEXICO: State of Sonora: Hermosillo, September 25, 1923, 5 males; Guaymas, September 29, 1923, 1 male and 1 female; State of Baja California: Los Parres, Palmarita water-hole, October 9, 1923, 7 males and 1 female; Purissima, San Vicenti water-hole, October 11, 12, 1923, 9 males; State of Nayarit: Acaponeta (sunny places), November 1, 3, 1923, 10 males and 1 female; Tepic, November 5, 7, 1923, 2 males and 1 female; State of Jalisco: San Diego Rancho, near Cocula (reservoir), November 13, 15, 16, 1923, 9 males and 1 female; Hacienda de San Marcos, near Villegas (pond), November 22, 23, 1923, 4 males; Guadalajara, November 27, 1923, 4 males (J. H. Williamson, collector, in Coll. Williamson); Guerrero, 2 males (Luck and Gehlen, dealers, in Coll. Ris).

Male (adult, colors well preserved). Labium, labrum, anteclypeus, postclypeus, and frons anteriorly very light yellow with a greenish shade. Frons laterally and above and vesicle light greenish gray, apex of vesicle yellowish. Thoracic dorsum light golden brown, latero-ventral half of each mesepisternum feebly and diffusely lighter, no distinct antehumeral bands. Sides dull light olive green, indistinct dark virgules in dorsal end of humeral and anterior lateral sutures. Feet very light ochraceous, tibiae externally more purely yellow, spines black. Abdomen comparatively robust, segments 2-3 slightly compressed, sides in dorsal view parallel, narrowed from segment 8 to apex. Dull ochraceous with finely black carinae and very small dark markings: segments 3-7 a point each side close to the middorsal line and to the terminal black carina; 8-9 this point prolonged antero-ventrally into a diffuse oblique line; sides of segments 1-3 greenish, like the sides of the thorax. Ventral side light ochraceous, unmarked.

Wings deep and fiery orange yellow, venation the same or a shade lighter. Pterostigma the same or slightly darker to ferruginous red.

Most specimens with a diffuse clearing between the triangular and nodal regions. Majority of specimens with a dark spot in each wing, in front wing in distal half of *ti* and adjacent part of space $M_{1-3}-M_4$; in hind wing in the same space and in the distal third to distal half of *t*, pale golden brown to deep brown and almost black.

Female. The small number of five specimens shows only part of the variability of the female pattern; all five specimens differ among themselves, although a common type is evident: a proximal and a distal band in the triangular and nodal regions, the nodal band beginning at the nodus, rarely a short distance proximally, and reaching generally to midway between nodus and pterostigma.

1. Bands golden yellow; the proximal one reaching to the base of the wing; the distal one to two cells proximal to the nodus and in the anal half of the hind wing, on its distal border, to the level of pterostigma; in both wings a blackish spot corresponding to a similar mark of the male (variety not figured in Calvert 16).

2. Bands golden yellow; proximal one to base; distal one in a narrow costal ray to the pterostigma; in hind wing anal half to level of pterostigma; blackish points at *t* larger than in 1, brownish diffuse spot at bridge in both wings (nearest to Fig. 11, Calvert 16).

3. Yellow bands similar to 2, but no distal extension in anal half of hind wing; in proximal band large blackish spot in front wing; curved blackish band in hind wing; in distal band nearly complete dark brown band from nodus to pterostigma (near Fig. 18, Calvert 16).

4. Dark brown bands similar to 3, but broader, with only very narrow and diffuse yellow borders (no exactly similar figure in Calvert 16).

5. Entire wings grayish yellow with deeper yellow borders to veins; proximal and distal brown bands almost equal, distal ones narrowed in middle of wing, irregularly indented (nearest to Fig. 14, Calvert 16).

Veins dark, except in yellow bands of varieties 1 to 3. Pterostigma darker and more dully ferruginous than in male. Abdomen very robust, only slightly fusiform by narrowing of segments 2-3 and widening of 4-5; more dully colored than in male; pattern as far as visible, similar.

Males: abdomen 15, hind wing 20 by 7.5, pterostigma 2; abd. 16, hw. 21 by 7.5, pt. 2 to 2.5; abd. 18, hw. 23 by 8, pt. 2.5. Females: abd. 15, hw. 20 by 7.5, pt. 2.5.

Venational characters

Anq. 6 1/2-9; 7 1/2-74; 8 1/2-15; 6 5/2-1; 7 2/2-5; 8-1; 8 2/2-1 (males): 6 1/2-1; 7 1/2-5; 8 1/2-1; 7 2/2-3 (females).

t in front wing free, 4; two-celled, 85; three-celled, 17; *t* in hind wing free, 7; two-celled, 93; three-celled, 6; *ti* in front wing free, 26; two-celled,

26; three-celled, 54 (males): t in front wing two-celled, 8; three-celled, 2; t in hind wing free, 1; two-celled, 8; three-celled, 1; ti in front wing free, 2; two-celled, 2; three-celled, 6; (females).

Cells M_4 to Cu_1 in hind wing, none. Cells at t in front wing, two, 6; three, 90; four, 10; cells at t in hind wing, two, 17; three, 86; four, 3 (males): cells at t in front wing, three, 6; four, 4; cells at t in hind wing, two, 2; three, 8 (females).

P. intensa in the sense here adopted is the *intensa* of the original description and of former authors. Calvert (12) discusses venational varieties in 21 males and 25 females from Tepic. He finds but once symmetrically free triangles in the hind wing (female), three times asymmetrically (2 males and 1 female), six times asymmetrically free triangle in front wing (1 male and 5 females). In 16 the same author gives a very interesting series of colored figures of wing patterns in females; it results that, notwithstanding the conspicuous variability, the *tenera* position of color bands remains remarkably the same throughout the series.

The statement may be ventured, that *intensa* is an offspring from the same stem, from which *tenera* came, modified by the particular condition of its hot and arid home. That Mr. J. H. Williamson has found it associated with *domitia* (q.v.) is a new and interesting fact.

R. Martin has described (14) a *P. intensa*, var. *californica* from one male "de la Basse Californie" collected by M. Diguët, Mus. Paris. In the fragmentary description I cannot find any character that would distinguish the specimen from regular *intensa*; the name is a pure synonym.

4. *Perithemis mooma* (Kirby 1889)

(Figs. 5, 6, 7, 8, 27, 28, 29, 30, 31, 32, 33, 34, 39, 40, 43)

Material examined: 271 males, 47 females. MEXICO: Misantla, in Vera Cruz, August, 1910, 2 males; Tabasco, October, 1910, 1 female (Gugelmann, collector, in Coll. Ris). GUATEMALA: Agua Caliente, June 1, 1909, 2 males; Amatitlan, June 9, 10, 1909, 5 males and 5 females; Gualan, Dep't Zacapa, June 13, 1909, 2 males (E. B. Williamson, collector, in Coll. Ris). PANAMA, CANAL ZONE: Rio Mazamba, December 6, 1916, 4 males. COLOMBIA: Santa Marta, December 14, 16, 18, 19, 1916, and January 3, 1917, 53 males and 7 females; Bolivar, December 23, 26, 1916, 10 males and 1 female; Rio Frio, January 5, 7, 8, 1917, 8 males and 4 females; Fundacion, January 10, 12, 13, 1917, 31 males and 10 females; Palermo, Rio Magdalena, January 19, 1917, 1 male and 1 female; Gamarra, January 27, 1917, 1 male; Cristalina, February 12, 1917, 1 male and 1 female. VENEZUELA: Bejuma, in Carabobo, February 13, 16, 18, 23, 1920, 33 males; Nirgua, in

Carabobo, February 25, 1920, 1 male; Palma Sola, in Falcon, March 4, 5, 8, 9, 10, 23, 1920, 11 males; El Guayabo, in Zulia, April 20, 1920, 4 males and 1 female (collected by and in Coll. E. B. Williamson). TRINIDAD: Cunapo River, St. Joseph River and Diego Martin River, February 27, 28, 29, 1912, 4 males (E. B. Williamson, collector, in Coll. Ris). PERU: Campamiento, Colonia del Perené, June 7, 8, 9, 18, 19, 1923, 34 males and 2 females (J. H. Williamson, collector, in Coll. Williamson). BRAZIL: State of Matto Grosso; Abuná, March 6, 8, 9, 11, 14 (from ditches beside railroad track and at water tank, exposed to sun, some bushes along banks), March 19 (from swamps in open), March 23, 24, 25, 1922, 51 males and 2 females; Villa Murтинho, April 6, 1922, 3 males (J. H. Williamson, collector, in Coll. Williamson); Matto Grosso, 1 female (Zobry's, dealers, in Coll. Ris). State of Minas Geraes: Bello Horizonte, November 3, 2 males (In Coll. Cornell University). State of Rio de Janeiro: Porto Caterina de Sta. Leopoldina, 2 males (Dealers' material in Coll. Williamson); Rio de Janeiro, September 27, 1922, 1 male (J. H. Williamson, collector, in Coll. Williamson); Bom Jesus de Itabapoana, January 25, December 30, 1905, April 3, 1906, 3 males and 1 female (Zikán, collector, in Coll. Ris); State of Santa Caterina: Blumenau, 2 males (In Coll. Williamson). PARAGUAY: Trinidad, February 16, 1920, 1 male and 1 female (Joergensen, collector, in Coll. Ris). ARGENTINA: Posadas in Misiones, January 17, 1920, 3 females (J. C. Bradley, collector, in Coll. Williamson); March 6, 1909, 1 male; Chaco, April 4, 1918, 1 female; Buenos Aires, February 20, 1909, January 26, 1913, 2 females (Joergensen, collector, in Coll. Ris); San Isidro, near Buenos Aires, January, 1891, 6 females (collected and in Coll. Ris).

Colombia and Venezuela. These lots are formed of conspicuously small specimens.

Male (Santa Marta). Labium light whitish yellow. Labrum and frons anteriorly ochraceous. Anteclypeus, postclypeus, frons laterally and above, vesicle dull grayish brown. Thoracic dorsum dull reddish brown, broad, somewhat diffuse, dorsally narrowed antehumeral bands to two-thirds height, grayish olive green. Brown color of dorsum reaching just a little beyond the humeral suture, very gradually shading into color of side, which is grayish olive green, without markings, except sometimes a feeble cloud in dorsal end of second lateral suture. Legs light and somewhat dull ochraceous, extensor side of tibiae a shade more pure yellow, spines black. Abdomen: segments 1-2 a little widened in the dorsoventral, 5-7 in the lateral dimension; in dorsal view slightly fusiform. Dull ochraceous brown; incomplete and somewhat waved oblique longitudinal lines on sides of segments 4-9, on 4-7 not broader than one fourth of each side. Segment

10 blackish with posterior half of sides yellowish. Appendages dorsally yellowish. Ventral margin diffusely darker.

Wings rich and deep golden yellow, not rarely a weak and diffuse clearing from triangular to nodal region especially in hind wing. Venation and pterostigma red. No specimen of this large series has a trace of dark spots in the triangular region.

Female. Thoracic pattern as in male. Abdomen distinctly fusiform by narrowing of segment 2 to base of 4 and broadening of 5-7.

In this series the predominant wing pattern is one in which the wings are hyaline with a broad median transverse band, from t to two or three cells distal to nodus, golden yellow, with four centers of dark brown to blackish color of variable extent: spots at t and distal to nodus at bridge in front wing and hind wing; or such spots much enlarged; or the distal spot enlarged into a broad band the greater part of which extends proximal to nodus; or similar, but proximal and distal markings broadly confluent. Two specimens only are of a different type: one with bands only yellow and reduced in extent; one yellow from base to halfway between nodus and pterostigma, wherein is a clearing between base and t in front wing, on both sides of t in hind wing. The typical black-banded *mooma* is not represented in this series, which is, compared with the large number of males, evidently too small to represent the entire variability. Photographs do not sufficiently show the contrast between brown or blackish and yellow color, the yellow coming out comparatively too dark.

Males: abd. 12, hw. 14 by 5, pt. 1.5; abd. 13, hw. 16 by 6, pt. 1.5-2; abd. 14, hw. 17 by 6, pt. 1.5-2; abd. 15.5, hw. 18 by 6.5, pt. 2. Females: abd. 11.5, hw. 16 by 5.5, pt. 1.5; abd. 13, hw. 17 by 6, pt. 1.5; abd. 14, hw. 19 by 6.5, pt. 1.5-2; the smallest and smaller specimens are most numerous in the series.

Abuná and Villa Murtinho in Matto Grosso.

Male. The extremely small specimens are not represented in this series, but most specimens are still quite small and otherwise fully congruent to those from Colombia and Venezuela. A single male shows, feebly in the front wing, stronger in the hind wing, a minute and diffuse dark spot in the triangular region.

Of the females, one bears a proximal narrow golden yellow band at t, a distal broader one at the nodus with the nodus about one cell distal to its middle, the bands confluent in a costal stripe. One is typical *mooma* with two black bands, confluent in a costal stripe.

Males: abd. 14, hw. 17.5 by 6, pt. 1.5-2; abd. 14.5, hw. 18 by 6, pt. 1.5-2. Females: abd. 13.5, hw. 17.5 by 6, pt. 2; abd. 14, hw. 18.5 by 6.5, pt. 2.

Perené. A considerably larger and conspicuously more robust form, very closely similar to the form long known from Southern Atlantic Brazil. Males in color and proportions otherwise quite similar to Colombian form. Abd. 16, hw. 21 by 7, pt. 2-2.5; only one specimen is considerably smaller abd. 13, hw. 16 by 6, pt. 2. Both females belong to a form not represented in the Colombian-Venezuelan series: front wing yellow in costal half to nodus, with an extension across t and from nodus to end of pterostigma in the front wing, to nearly apex in hind wing. Abd. 14, hw. 20 by 6.5, pt. 2-2.5.

The form from Southern Atlantic Brazil is but poorly represented in present series. Mr. J. H. Williamson's single male from Rio Janeiro is quite typical for the form: thorax and abdomen as described above. Wings rich and deep golden yellow with venation and pterostigma red; no clearing and no trace of dark spots. Abd. 16.5, hw. 21 by 7, pt. 2-2.5. The specimens from Bello Horizonte, Sta. Leopoldina, and B. J. de Itabapoana are similar. I have also before me a remarkably homogeneous and similar series of males, probably from Espirito Santo, but they are not further dealt with, since the labelling is uncertain.

The three females from Posadas in Misiones are small specimens, with broad proximal and distal bands, separated by a narrow hyaline zone which does not extend through the costal stripe; distal bands are two and three cells distal, four cells proximal to the nodus; color of bands yellow with small dark spots at t and bridge; or with large dark spots at same place; or blackish with very narrow and diffuse yellow borders (very nearly typical *mooma*). Abd. 13, hw. 17 by 6, pt. 1.5-2.

My own specimens from Buenos Aires were misunderstood at time of capture (I had then very little knowledge of extra-European dragonflies). Their recognition gave some difficulties even afterwards, because all the males collected with them were *icteroptera*, and the *mooma* females, small as their number was, were quite a polymorphous lot. Unquestionable *mooma* males were afterwards captured by Mr. Joergensen at Buenos Aires. One of my Buenos Aires females is an abnormally veined specimen, the like of which I have not seen again (*Lib.* fig. 183). Two of the six specimens have only yellow bands, very near in shape and position, to the black typical *mooma* bands. Two other specimens show confluence of yellow pattern: one wholly yellow to the proximal end of the pterostigma in the front wing, to the distal end in hind wing, pale grayish shadows at distal end of t in all the wings (in this detail resembling *icteroptera*, but *mooma* in every other respect); the other one hyaline in the front wing except a yellow costal stripe extending half way from nodus to pterostigma, hyaline in the hind wing from middle of pterostigma to apex, subhyaline between

t and nodus, yellow at base. Two specimens are nearly typical *mooma* with costally confluent blackish bands. Abd. 14, hw. 21 by 7.5, pt. 2.5.

Venation (P = Perené, SA = South Atlantic).

Anq. 5 1/2-9, 6 1/2-382 plus 40 (P) plus 18 (SA), 7 1/2-11 plus 12 (SA), 3 6/2-1, 5 2/2-3, 5 3/2-1, 6-4, 6 2/2-7 (males): 5 1/2-2, 6 1/2-49 plus 16 (SA), 7 1/2-3 plus 6 (SA), 6 2/2-2 (SA), 7 2/2-1 (SA), 6 2/2-2 (SA), 8 1/2-1 (SA) females.

t in fw. free-514, two-celled-2 (one specimen, symmetrical, SA); t in hw. free-515; ti in fw. free-515 (males): t in fw. free-79, two-celled-1 (SA); t in hw. free-78, two-celled-2 (SA); ti in fw. free-78, two-celled-1 (SA), three-celled-1 (SA) (females).

Cells M_4 to Cu_1 : none-1 plus 3 (P) plus 2 (SA), one-28 plus 19 (P) plus 12 (SA), two-248 plus 12 (SA), three-76 plus 4 (SA) (males): none-3 (SA), one-1 plus 5 (SA), two-36 plus 17 (SA), three-17 plus 1 (SA) (females).

The species here described and named *mooma* is very nearly the *domitia* of *Lib.* (18). Only the Cuban specimens (with fig. 180) must be taken out of the series and transferred to *domitia* of the present paper. With this modification the whole text and figures of *Lib.* apply to present *mooma*. Fig. 181, a specimen from Trinidad, and fig. 182, another one from Venezuela, both in Mr. K. J. Morton's collection, are color modifications not represented in the series now studied; their venation strongly suggests *mooma*, and Mr. Morton writes that their legs are wholly light ochraceous; so *domitia* is out of the question and *mooma* practically certain. Figs. 184 and 185, specimens from Espirito Santo and Buenos Aires, represent the larger South Atlantic *mooma*; fig. 183 is the abnormally veined specimen already mentioned from the Buenos Aires series. The naming of female varieties, as tried in that text, was an attempt to deal with such forms and their names under the special conditions prevailing in the literature on *Perithemis*. It was, as I now believe, a mistake. The names of *iris* and *cloe* cannot be "saved" in this way; the original *pocahontas* is quite a different thing (see under *domitia*); *octoxantha* under this view has lost any right of existence. Figs. 636, 637, 638, and 639 of *mooma* males and females from Guatemala may be consulted in addition to the figures now given.

Calvert's *mooma* part of his collective *domitia* (16) is probably quite, or at least very nearly, the same as the present *mooma*. A most interesting series of colored figures of female wing patterns are given; on the whole they nearly represent the type of figs. 29-34, but with a number of patterns not represented in the material now before me. The same author's very short description (16, pp. 317-318) of two female specimens from Bahia,

referred to *cloe* Hagen, a *nomen nudum*, probably also applies to one of the numerous color varieties of *mooma*.

Fortunately the exact meaning of Kirby's name could be established beyond doubt by the beautiful photograph reproduced in fig. 43, for which we are indebted to the good help, through Mr. Morton, of Mr. Stelfox at Dublin Museum. The specimen exists in the Museum with a label "West Indies" (on specimen) and another one "*P. mooma* Kirby Jamaica" "Type." Perhaps it would be too particular to express doubts regarding the exact provenience of the specimen. Indeed it is the only Antillan specimen of *mooma* recorded to this time (Trinidad being more Venezuelan than Antillan). From Cuba we know only *domitia*, from Haiti and Jamaica also *domitia*, on the whole a rather small number of specimens. There remains certainly room for discovering *mooma* in Jamaica again as perhaps also in the other islands.

I believe the species as here established will stand criticism and also the light of new discoveries. The great area of distribution consists chiefly of a Gulf and a South Atlantic division. Both are most fortunately linked by the Williamson lots from Perené and Matto Grosso. It seems that the species does not exist on the Lower Amazons, where *bella* may have occupied its place. Much larger lots of females than those now available may in future give a better opportunity for studying the interesting color polymorphism of this sex. The varieties are evidently not the same in different parts of the large area, for instance in the Gulf and the South Atlantic region. A tendency towards patterns similar to *tenera* is more likely to be found in the Southern form than in the neighboring Gulf forms. But I do not remember having seen specimens of either sex that could not be attributed to their true lot even without a locality label; though the marked convergence of *tenera* and South Atlantic *mooma* must be admitted.

5. *Perithemis domitia* (Drury 1773, Kirby 1889)

(Figs. 9, 44, 45, 46, 47, 48, 49, 50, 51)

Material examined: 128 males, 16 females. ANTILLES: Cuba: Santiago, 3 males; Ciego de Mantero, May 19, 1913, 1 female; Pinar del Rio, September 9-24, 1913, 1 female (Coll. Am. Mus. N. H. New York); Paso Real, April 18, 19, 20, 1923, 2 males, 2 females (J. S. Hine, collector, in Coll. Ohio St. Univ., Columbus) San Domingo: Sanchez River, May 11-16, 22-27, 1915, 3 females (Coll. Am. Museum N. H. New York). MEXICO: State of Nayarit: Acaponeta, November 3, 1923 (shady spots in tiny creek), 9 males, 1 female (J. H. Williamson, collector, in Coll. Williamson). GUATEMALA: Sta. Lucia, January 31, 1905, 1 male; Morales, May 27, 1909, 2 males. (E. B. Williamson, collector, in Coll. Ris). HONDURAS: Tela, March 14,

1923 (marshy banks Tela River), 1 male (T. H. Hubbell, collector, in Coll. Univ. Michigan) PANAMA: March 3, 1908, 1 male (A. H. Fassel, collector, in Coll. Ris); CANAL ZONE: Rio Sardanilla, December 5, 1916, 2 males, 1 female (J. H. and E. B. Williamson, collectors, in Coll. Williamson). COLOMBIA: Arroyo Grande, December 10, 1916, 3 males, 3 females; Puerto Colombia, December 11, 1916 (small creek), 1 male; Sta. Marta, December 16, 18, 19, 1916, 28 males, 1 female; Bolivar, December 23, 1916, 5 males, 1 female; Rio Frio, January 4, 1917, 5 males; Mariquita, February 4, 1917, 1 male; Cristalina, February 13, 16, 17 (at pool at intake pipe), 1917, 3 males (J. H. and E. B. Williamson, collectors, in Coll. Williamson). VENEZUELA: San Esteban, in Carabobo, February 4, 5, 8, 1920, 9 males, 1 female; Palma Sola, in Falcon, March 4, 5, 8, 9, 10, 1920, 29 males, 1 female; Aroa, in Yaracuy, March 12, 13, 14, 1920, 7 males; Boqueron, in Yaracuy, March 16 (prefers more shade than yellow species = *electra*), 17, 1920, 8 males; Tucacas, in Falcon, March 24, 25, 1920, 3 males; Tachira, in Tachira, April 4, 5, 10, 1920, 4 males (J. H. Williamson and E. B. Williamson, collectors, in Coll. Williamson). TRINIDAD: Diego Martin River, February 29, 1912, 1 male (B. J. Rainey and L. A. and E. B. Williamson, collectors, in Coll. Ris).

Male. (Sta. Marta, adult, colors well preserved.) Labium dull light yellowish brown. Labrum dull yellow. Anteclypeus and postclypeus light greenish gray. Frons anteriorly light orange, laterally and above greenish gray, vesicle yellowish gray, darker at base. Thoracic dorsum dark reddish brown with a purplish shade; cuneiform, dorsally narrowed and slightly abridged antehumeral bands dull olivaceous green, about one third the breadth of each mesepisternum, a little nearer to the median than to the humeral suture. Sides dull olive green, the purplish color of dorsum narrowly passing the humeral suture; a similarly colored, somewhat diffuse, dorsally often incomplete, narrow band at metastigma, another one, ventrally incomplete, at second lateral suture. Sterna and coxae dull grayish green. Legs very dark brown to black, extensor side of tibiae sharply contrasting light ochraceous yellow. Abdomen narrow with sides nearly parallel, very little widened dorso-ventrally at base. Dull yellowish brown, basal segments with a greenish shade, carinae narrowly black; a blackish brown longitudinal band occupies about one half of the breadth of each side of 3-8; 10 and appendages blackish. Ventral side dull light brown.

Wings dull yellow with a grayish shade, color deepened in the costal stripe and the triangular region in the front wing, and, in addition, in the cubital space in the hind wing, less deepened in the postnodal part of both wings and at the anal angle of the hind wing. Venation very dark red,

conspicuously darker than the wing membrane. Pterostigma comparatively long and narrow, deep dark red.

Male varieties. One specimen from Palma Sola and one from Bolivar have a small brown spot in the front wing at the distal end of t, a somewhat larger one in the hind wing at the distal end of t and ht (supertriangle). One male from San Esteban has a brown point at the same places.

Two very old males from Cristalina have the wings from t distally deep and rich golden yellow, increasing distally, centers of cells clearer. More specimens show a tendency towards this modification, though the light and slightly grayish yellow color (as described above) exists in numerous undoubtedly mature specimens.

Male. Acaponeta. The specimens of this series show markedly the deeper and richer color just described for the two males from Cristalina; the red color of their venation and pterostigma is a shade lighter. Their wing color thus comes to resemble that of *mooma* males more than in the majority of Columbia-Venezuela specimens.

Female. (Palma Sola, adult.) Thorax of lighter brown color, purplish shade less evident. Longitudinal bands on abdomen lighter, dull reddish brown, paler laterally. Abdomen short, nearly cylindrical, segments 3-5 very little widened.

Wing colors in the continental series polymorphous, apparently independent of locality, so far as can be judged from the relatively small number of females in the collection.

1. Wings hyaline; yellow ray in costal and subcostal space one to four cells distal to the nodus; cubital and anal field diffusely yellow to the triangle and the hind margin in front wings, and to the triangle and A_3 in the hind wing; apex of the front wing narrowly and diffusely, of the hind wing more broadly and deeper, brown. (Palma Sola, Arroyo Grande, San Esteban.)

2. Yellow color across wing base in the front wing to the triangle, in the hind wing to distal end of the triangle; apex brown only in hind wing and more narrowly. (Sta. Marta.)

3. Similar to 1; in addition to the pattern of 1 a yellow diffuse transverse band of three to four cells breadth distal to the nodus; brown of apex as in 1. (Rio Sardanilla.)

4. Wing bases rich golden yellow to two cells distal from the triangle in the front wing, to the nodus in the hind wing, and in the costal stripe two cells in the front wing and four cells in the hind wing distal to the nodus. Brownish bands in the basal yellow at the triangle in the front wing and the hind wing, and at the nodus in the hind wing. (Acaponeta.)

Males: abd. 15.5, hw. 19 by 7, pt. 2.5; abd. 16, hw. 20 by 7.5, pt. 2.5; abd. 13.5, hw. 17.5 by 6, pt. 2; abd. 14.5, hw. 19 by 7, pt. 2-2.5; abd. 13,

hw. 17 by 6, pt. 2. Females: abd. 13, hw. 19 by 6.5, pt. 1.5-2; abd. 14, hw. 19.5 by 7, pt. 2.5; abd. 15, hw. 20 by 7, pt. 2.5.

The Antillan specimens, compared with the continental series, are somewhat smaller and with paler colors on the body, but otherwise quite similar.

In Cuban females a form is predominant with yellow color to the nodus or one or two cells distal in the front wing, and two to four cells distal in the hind wing, and to the pterostigma or nearly so in the costal space of both wings; apex brown only in the hind wing, maximally to level of pterostigma.

The three females from S. Domingo are alike: yellow in the front wing to the pterostigma or one or two cells more or less, in the hind wing the same or fully to the apex; apex brown in the hind wing alone, or also, but more narrowly, in the front wing. None of the Antillan females show dark markings in the manner of the typical *pocahontas* or the form 4 from Acaponeta.

Males: abd. 13.5, hw. 16.5 by 6.5, pt. 2; abd. 12.5, hw. 16 by 6, pt. 2; abd. 14, hw. 18, pt. 2.5. Females: abd. 13, hw. 17.5 by 7.5, pt. 2.5; abd. 15, hw. 19 by 8, pt. 2.5; abd. 13, hw. 19, pt. 2.5.

Venation:

Anq. 5 1/2-3; 6 1/2-174; 7 1/2-42; 5 2/2-3; 6 2/2-9; 6 3/2-1; 7-1 (males): 6 1/2-16; 7 1/2-3; 6 2/2-1 (females).

t in fw. free-234; t in hw. free-232; two-celled-3; ti in fw. free-29 (symmetrically in 5 specimens); two-celled-198; three-celled-7 (males): t in fw. free-20; t in hw. free-20; ti in fw. free-6 (symmetrically in 2 specimens); two-celled-14 (females).

Cells from M_4 to Cu_1 in hw. none-84; one-151 (males): none-4; one-16 (females).

Calvert (16) has very justly remarked that the exact meaning of Drury's *Libellula domitia* cannot be made out. We give here (fig. 51) a slightly enlarged (measures of the original figure length 26.5, expanse hw. 46.5 mm.) photographic copy of Drury's figure. From this it is evident, as Calvert has shown, that the figure is not reliable for neural details. The abdomen in the copy of Drury consulted (City Library at Bern), is painted brick red, the wings dusky chrome yellow. No traces of longitudinal bands are shown on the abdomen; the oblique stripes engraved on each abdominal segment may be merely conventional. Drury's text says: ". . . the thorax and abdomen are of a pale reddish brown, the former striped obliquely with green on its sides, the latter spotted with yellow on the top. The legs are of a dusky yellowish green (French text: jaunatre vertes obscurs). All the wings are of a brownish yellow, like stained glass, with a small dark streak (almost black) placed on the anterior edge of

each, near the tips. It was brought from Jamaica and is in the possession of Dr. Fothergill." Figure and text are ambiguous enough; the specimen may be or not be the species here discussed. In favor of the affirmative is its origin from Jamaica. The strength of this argument is possibly diminished by a statement which I found quite casually. In *Canad. Ent.* 58, p. 120 (1926) Mr. McDunnough in "Notes on the species of the genus *Xanthopyge* (Lep.)" writes under *X. sospeta*: "Drury's name was based on a female from Dr. Fothergill's collection, ostensibly from Jamaica. Rothschild and Jordan (1903, *Rev. Sphingidæ*, pp. 89, 327) have, however, shown that several of the species from this collection stated as occurring in Jamaica were in reality from New York." Let us hope that this mistake did not also occur in the case of *Libellula domitia*.

Like Calvert (16) I believe that Kirby's new definition of the species (9) establishes the valid name. That Kirby's definition means the species here discussed, more precisely its Antillan form, is proven beyond doubt by Mr. Stelfox's beautiful photographs of the specimens in the Dublin museum, that have served for this definition. The male (fig. 45) bears no label; the female (fig. 46) is labelled "59" "Antilles" "*Perithemis domitia* Dr. West Indies." The female illustrates the Cuban form as described above and also by Calvert (16), and in *Lib.* (18) p. 334 and fig. 180.

Mr. Stelfox's photograph (fig. 44) of Kirby's type of *P. pocahontas* (9) shows that this name is given to a female of the same species, similar in pattern though not identical with our female form 4 from Acaponeta (fig. 50). *Pocahontas* thus stands for a female of *domitia*, and falls into the synonymy if we do not accept such varietal names.

Calvert's (16) *domitia*, in its restricted sense, is the Antillan form of our species; he records specimens examined by himself from Cuba, Jamaica, and Haiti. Of continental material, at least part of the specimens named *iris* also belong here. The male from Sta. Lucia in Guatemala given me by Mr. Williamson bears the printed label *iris* of the Biologia material. But I cannot arrive at an exact conclusion as to how far the identity of Calvert's *iris* with our *domitia* goes.

In *Ris Lib.* (18) *domitia* from Cuba under *domitia* (now *mooma*, *vide ante*) is this species. All the other specimens then seen by me form part of *cornelia*, now recognized as a collective species. *Domitia* are the lots *cornelia c* from Guatemala and *e* from Trinidad (p. 1118).

Burmeister (3) gives a very short diagnosis of *L. domitia* with the statement: "In Nordamerika und Westindien in Sommers Sammlung." Calvert on Burmeister's types (11) writes: "'*Domitia* Drur. St. Cruz Smr' in Burmeister's hand. . . . One of these males has the internal triangle of

the front wings two-celled, the other male has it one-celled in front wings; the latter shows a clear, not yellowish, but ill-defined band on all the wings between the triangle and the nodus." At least the first one of these specimens very probably belongs to our species; its origin from Ste. Croix is the only record known to me of a *Perithemis* from the smaller Antilles.

Rambur (5) see under *icteroptera*.

Selys *In Sagra, Hist. Cuba* (6), describes Cuban males under the new name *metella* with the diagnosis: "flavescens, fasciis duabus virentibus in lateribus thoracis; abdomine brevi depressiusculo; alis rotundatis croceis nervis et pterostigmate elongato rufis triangulo interno alarum anticarum 2-3 cellulari. Cuba (collection Guérin-Méneville); Campeche." This definition, especially by the mention of crossed internal triangles, together with the occurrence of the form in Cuba, evidently applies to our species, though the thoracic pattern of two definite lateral bands applies better to *tenera*. Since no attempt is made to differentiate this *metella* from the original *domitia*, it seems to me that the latter name remains still valid down to its new definition by Kirby. But perhaps somebody may contest this opinion and provoke another example of the too many nomenclatorial amenities.

Hagen's (7) definition of his *domitia*, var. 2, *iris*, says: "sides of the thorax of the same color with the remainder of the body; the wings hyaline, subflavescens, the anterior margin yellow; posterior wings of the female with a fuscous nebula at the apex; seven antecubitals, five postcubitals; two discoidal areolets. Length 23 mm. Alar expanse 36 mm. Pterostigma 2 mm. Mexico, Alvarado; Brazil." Very probably this description refers to our *domitia*, continental form. For the male it is remarkably good, short as it is, and the fuscous apex of the wings in the female is also a striking character of this species. A Brazilian specimen, however, must be supposed as having been something else. Hagen's type of *iris* could not be identified in Mus. Comp. Zool. at Cambridge (teste Henshaw and Calvert 16). As to the validity of Hagen's name the same considerations are obvious, as for *metella*.

6. *Perithemis bella* (Kirby 1889)

(Figs. 10, 52, 53, 54, 55)

Material examined: 15 males, 12 females. BRAZIL: State of Pará: Santarem, May, 1920, 9 males, 7 females; Taperinha, near Santarem, April and June, 1920, 6 males, 5 females (A. H. Fassl, collector, in Coll. Ris).

Male (adult, colors well preserved). Labium pale dull yellow. Labrum and frons anteriorly light ochraceous. Anteclypeus, postclypeus,

frons laterally and above, and vesicle, light grayish green. Thoracic dorsum dull ferruginous with a purplish shade; broad, complete, dorsally narrowed, and, near the dorsal end, slightly constricted antehumeral bands dull pale green, nearer to the median than to the humeral suture. Sides dull light green, dark color of dorsum narrowly passing humeral suture, a ferruginous stripe in the dorsal half of the second lateral suture. Legs obscure, first femora blackish brown, second and third femora dark reddish brown on extensor side, gradually lightened on the flexor side; extensor side of tibiae lighter than femora; flexor side broadly black on first, narrowly and incompletely black on second and third tibia; spines black. Abdomen comparatively robust, broadest of all males of *Perithemis*, very slightly fusiform by narrowing of segments 1-2, widening of 4-5. Dull brown with black carinae; on 3-9 a blackish pattern. Postero-dorsal points on 3-4; on 5-8 ventrally incomplete oblique stripes from postero-dorsal towards antero-ventral end, one third to one half each segment's length; similar stripes complete on 9, little broader than the dorsal black carina.

Wings rich and pure golden yellow, the hind wing entirely, the front wing to the pterostigma in the costal space, to half-way between the triangle and nodus in the rest of the wing, the border line slanting towards the base. In very mature specimens (in all?) beyond the sharply limited basal yellow area a paler cloud reaches to the proximal end of the pterostigma, diffusely passing into the hyaline apex. Pterostigma ferruginous.

Female. Pattern of thorax as in male, colors more dull; antehumeral bands interrupted; a ventral band and a dorsal, somewhat clouded spot towards the alar sinus. Legs as in male, but second and third femora darker, blackish color of flexor side of second and third tibiae broader. Abdomen markedly fusiform, most so of all species of *Perithemis*, broadest at segment 5 (exact measures not obtainable, all specimens being somewhat crushed by packing). Pattern not well preserved; one may distinguish on 4-9 an oblique light stripe along the dark middorsal carina, which light stripe is bordered laterally by a dark spot that vanishes gradually into the brown ground color.

Wings hyaline; in the front wing a yellow to brownish black ray in the costal and subcostal space to beyond the nodus; in the hind wing a large discal spot between the nodus and the pterostigma is yellow, yellow with blackish center, or black with yellow borders. Pterostigma dull brown.

Males: abd. 14, hw. 17 by 7, pt. 1.5-2. Females: abd. 13, hw. 17 by 6.5, pt. 2.5.

Venation:

Anq. 6 1/2-29; 7 1/2-1 (males): 5 1/2-1; 6 1/2-22; 6 2/2-1 (females).

t in fw. free-14; two-celled-15; three-celled-1; t in hw. free-29; two-celled-1; ti in fw. three-celled-30 (males): t in fw. free-24; t in hw. free-24; ti in fw. free-23; two-celled-1 (females).

Cells from M_4 to Cu_1 in hw. none-1; one-28; two-1 (males): one-10; two-13; three-1 (females).

Kirby describes later (10) as a distinct species *P. austeni* from Manaos. The characters are: yellow color in the front wing of male distally to the pterostigma (as indicated in our two very mature specimens); discal yellow spot of female with but a trace of darker color in center (much like our specimen fig. 54). The small number of specimens known does not permit ascertaining if the differences are racial (in which case *austeni* would belong to the upper reaches of the river) or merely individual; certainly they are not specific. I should rather consider *austeni* as a synonym of *bella*.

In the introduction to his comprehensive paper on Libellulinae (8) Kirby specially mentions the indeed curious sexual difference of the interior triangle, three-celled in the male, free in the female of this species. He considers the case as unique. More cases of sexually different venation have since been found in Libellulinae: several species of *Macrothemis*, of *Brechmorhoga* (most striking in *nubecula*), of *Pseudomacromia*, of *Zygonyx*, and others.

7. *Perithemis electra*, new species

(Figs. 11, 12, 41, 58, 59)

Material examined: 247 males, 7 females. HONDURAS: Barranco, April 17, 1923, (on creek running through cane-hardwood-forest; flying around a pool) 1 male (T. H. Hubbell, collector, in Coll. Univ. of Michigan). COLOMBIA: Sta. Marta, December 16, 1916, (three sp. of *Perithemis* today—*mooma*, *domitia*, *electra*) 2 males; Don Jaca, December 17, 1916, 1 male; Rio Frio, January 4, 8, 1917, 57 males, 1 female; Fundacion, January 10, 1917, 1 male; El Banco, January 24, 1917, (along stream) 1 male; Puerto Berrio, January 31, February 8, 1917, 26 males; Cristalina, January 20, 1917, (along creek in bush below forest) 1 male, 1 female (J. H. and E. B. Williamson, collectors, in Coll. Williamson). SAUTATA, January 27, 1918, 2 males (M. A. Carriker, collector, in Coll. Williamson). VENEZUELA: San Esteban, in Carabobo, February 3, 1920, 1 male; Bejuma, in Carabobo, February 13, 1920, 2 males; La Morna to Bejuma, February 22, 1920, 1 male; San Felipe, March 2, 1920, 1 male; Palma Sola, in Falcon, March 4, 6, 9, 10, 1920, 77 males, 3 females (female oviposits on twigs, 1-2 inches above water); Boqueron, in Yaracuy, March 17, 1920, 5 males; Tucacas, in Falcon, March 25, 1920, 1 male; Tachira, in Tachira, April 4,

7, 1920, 2 males; La Fria, in Tachira, April 12, 14, 1920, 12 males, 1 female; El Guayabo, in Zulia, April 20, 22, 1920, 25 males; Encontrados, March 25, 1920, 1 male (W. H. Ditzler and J. H. and E. B. Williamson, collectors, in Coll. Williamson). TRINIDAD: Cumuto, March 10, 1912, 1 male (B. J. Rainey and L. A. and E. B. Williamson, collectors, in Coll. Ris). PERU: Campamiento, Colonia del Perené, June 7, 9, 18, 19, 1920, 22 males, 1 female (J. H. Williamson, collector, in Coll. Williamson). BRAZIL: State of Matto Grosso: Abuná, March 18, 1922, 1 male (J. H. Williamson, collector, in Coll. Williamson); Matto Grosso, 2 males (Zobry's, dealers, in Coll. Ris). Type male, Palma Sola, Venezuela, March 9, 1920; and allotype female, Tachira, Venezuela, April 14, 1920.

Male (Rio Frio, adult, colors well preserved). Labium whitish yellow. Labrum and frons anteriorly light ochraceous. Anteclypeus, postclypeus, frons laterally and above, pale greenish gray; vesicle the same at base, yellowish above. Thorax light yellowish brown with a grayish green shade, unmarked. Legs light ochraceous, femora with a feeble greenish shade, spines black. Abdomen narrow with parallel sides; basal segments very slightly widened dorsoventrally: light yellowish brown with a feeble shade of grayish green at the sides of basal segments; carinae narrowly blackish; on each side of 7-9 a narrow, obliquely longitudinal dull brownish dark stripe from the middle of the lateral to the posterior end of the dorsal carina; a very slight and diffuse indication of similar pattern on the more anterior segments; 10 light at sides, dark dorsally. Appendages light brown, distally obscured, their form is scarcely different from other species.

Wings uniformly light and very pure golden yellow (the color of a sunflower petal); venation the same color, gradually a little darkened from pterostigma to apex. Pterostigma short and comparatively broad, ferruginous, often on ventral side opaque ochraceous yellow.

Some specimens (possibly depending on the state of preservation) show more distinctly the lateral oblique stripes on segments 3-6, nearer to the middorsal carina on the anterior segments, maximum breadth about one third of each side. Only a small number of specimens, also in very good condition, have the abdominal pattern vanishing to mere traces on the terminal segments. Specimens with colors especially well preserved show best the light grayish green shade on the sides of the thorax and on segments 1-3. Not a single one of the numerous specimens shows on the wings any indication of dark markings or local clearing of the yellow color. The color varies somewhat, with increasing maturity to a deeper golden shade, and in some extremely old specimens there is some central clearing of cells.

Female. All specimens are andromorphous. Their extremely small number in both lots, Colombian and Venezuelan, is remarkable; perhaps

they are overlooked among the active similarly colored males. Colors of head, thorax, and abdomen as in the male. Abdomen more robust and comparatively shorter. Segments 3-5 very little enlarged dorsoventrally, still less laterally. Pattern like the least marked males: dark oblique stripes only well developed on segments 6-9, barely indicated more anteriorly.

Venation of wings dark to almost black, color of membrane somewhat lighter and more dull than in the male and not so uniform throughout: diffusely somewhat deeper in the costal stripe, from the pterostigma onward, in the anal field of the hind wing, and, in one specimen, in the entire hind wing. Pterostigma dull dark brown.

Males: abd. 15, hw. 19 by 8, pt. 1.5-2 (great majority of specimens); abd. 13, hw. 17 by 7, pt. 1.5-2; abd. 16, hw. 20 by 8.5, pt. 2. Females: abd. 13, hw. 18 by 7.5, pt. 2; abd. 16, hw. 21 by 8, pt. 2-2.5.

Perené. The series from Colonia del Perené is a little different from the Gulf lots; the specimens of the series are remarkably uniform.

Male. Shape of body and wings and their colors like the described typical group; only the dark pattern of abdomen is still more reduced, even confronted with the lightest colored specimens of the other series: blackish oblique lines on segments 8-9 incomplete and diffuse points or virgules only on 4-7.

Wings of the same rich and pure golden yellow with similar venation. This color, from two or three cells proximal to the pterostigma outwards, gradually lightens to a very pale grayish yellow, almost hyaline; in this zone the color of venation gradually darkens to almost black at apex. Pterostigma dark ferruginous.

Female. Andromorphous. Differs from the male in the same way as the female of the typical form. Color duller yellow, but more equally distributed over the wing than in typical form. The clearing of the apices is just indicated and their venation is just a shade darker.

Males: abd. 14, hw. 18 by 8, pt. 1.5-2 (most specimens); abd. 13.5, hw. 17 by 7.5, pt. 1.5-2; abd. 15, hw. 20 by 8.5, pt. 2. Female: abd. 16, hw. 21 by 9.5, pt. 2-2.5.

Venation (Perené = P):

Anq. 6 1/2-12; 7 1/2-275; 8 1/2-122; 9 1/2-1; 6 2/2-4; 6 3/2-1; 6 4/2-4; 7-1; 7 2/2-49; 7 3/2-5; 7 4/2-1; 8-1; 8 2/2-11; 8 4/2-1 (males): 7 1/2-6; 8 1/2-6 (females).

t in fw. free-471, two-celled-18, three-celled-1; t in hw. free-488, two-celled-2; ti in fw. free-12, two-celled-401 plus 4 (P), three-celled-30 plus 42 (P) (males): t in fw. free-12; t in hw. free-12; t in fw. two-celled-10, three-celled-2 (P) (females).

Cells from M_4 to Cu_1 in hw. none-63 plus 33 (P), one-356 plus 13 (P), two-22, three-1 (males) : none-1, one-7 plus 2 (P), two-2 (females).

In the light of the very large number of specimens in the Williamson lots, together with the observations made by Mr. Williamson in the field, this is a very distinct species. What has become of it in former descriptions and enumerations of *Perithemis* is difficult to make out, and I shall not try to guess.

In my own text in *Lib.* (18) its standing is as follows: in main text, p. 343, specimens registered under *cornelia* form *a* from Colombia, San Esteban, and Paramaribo are of this species. Two male specimens registered under *cornelia* form *b* from Costa Rica and Panama, the second one figured in supplement p. 1117, fig. 641, are very closely similar to, if not identical with the form above described from Perené. Perhaps these old specimens did not really come from Costa Rica and Panama, no dates nor names of collectors were given (see also below under *cornelia*). Specimens from Trinidad (see one male from Cumuto in present series), recorded p. 1117 under *cornelia* form *d*, are also the typical form of this species.

Notwithstanding some analogies [homochromatic females (possibly the only form of this sex), wing proportions, and some details in venation], I doubt if there is any affinity but rather a mere convergence towards *waltheri* and *icteroptera*. The real affinities are very probably with *cornelia* and *thais*. The shape and proportions of the terminal joint of the penis are in favour of this view.

The name chosen for this beautiful insect associates it with its congeners and at the same time alludes to the popular name "amberwing" for *Perithemis*.

Perithemis cornelia (Ris 1910/19, pars)

(Figs. 13, 56, 57)

Material examined: 18 males, 2 females. PERU: Iquitos, September, 1920, 1 male (W. R. Allen, collector, in Coll. Williamson). BOLIVIA: Cashuela Esperanza, April 10, 1922, 1 male (J. H. Williamson, collector, in Coll. Williamson). BRAZIL: State of Amazonas: Teffe-Ega, July-August, 1922, 2 males (A. H. Fassel, collector, in Coll. Ris); State of Matto Grosso: Abuná, March 18, 19 (from shallow creek in forest), 23 (from well-shaded creek in woods 4' to 6' wide and 1' deep, sluggish current, mud bottom and mud banks), 1922, 14 males, 2 females (J. H. Williamson, collector, in Coll. Williamson).

Male (Abuná, colors well preserved). Labium whitish yellow. Labrum and frons anteriorly dull light yellow. Frons laterally and above and vesicle dull greenish brown. Thoracic dorsum light greenish golden brown,

diffusely darker ferruginous bands at median and humeral sutures. Sides dull light greenish, indistinct dark virgules at the dorsal end of the second lateral suture. Legs very light ochraceous, more purely yellow on the extensor side of tibiae, spines black. Abdomen narrow, just an indication of spindle-shape by constriction of segments 2-3 and dilatation of 4-5. Dull light ferruginous, carinae only faintly darker; dorsal carina of 8-10 more distinctly and somewhat broader blackish, narrow black rings at base of 8-9, 10 almost wholly dark. No indication of other dark markings. Appendages dark ferruginous.

Wings rich and fiery orange yellow, venation lighter, gradually obscured from pterostigma onward to apex, in this area the color of membrane in some specimens gradually lighter. Two groups of dark markings: proximally a spot in the distal end of t to the space M_{1-3} - M_4 in the front wing, in the hind wing a spot in the same place and a curved band from the distal angle of the loop towards the anal angle; distally a spot at the bridge in the front wing and at the same place in the hind wing and continued into a curved band to the apex of the loop. These markings, though variable in extent, in maximum development do not reach the minimum in *thais*, and are not deeper colored than fuscous (not black). Pterostigma very dark ferruginous, almost black.

Female. (The only two specimens are very probably this species, not *thais*, though approaching *thais* in pattern of abdomen.) Thorax as in male. Abdomen very slightly fusiform; on each side a blackish longitudinal band, in breadth about one third of each side, nearer to the dorsal than to the ventral border, indistinct at base, well marked from the transverse carina of segment 4 posteriorly.

Wings in color and pattern as in the male. Dark pattern a little larger than in the males with the largest marks and a little deeper fuscous in color; the base of the front wing is hyaline behind the costal stripe and outward to the nodal region; the apex of the hind wing is hyaline from half-way nodus-pterostigma except that the posterior border remains fuscous.

Males: abd. 13, hw. 15 by 7, pt. 1.5-2; abd. 12, hw. 14 by 6.5, pt. 1.5. Females: abd. 11, hw. 16 by 6.5, pt. 1.5-2.

The two males from Teffe-Ega belong almost certainly to this species. They are very mature. Abdomen ferruginous, almost unmarked. Wings of similar shape and pattern, distinguished by the exceptionally deep and fiery ground color which approaches the tint of the petals of a fire-lily; this ground color gradually and considerably lightened from the pterostigma outward. Abd. 12.5, hw. 17 by 7.5, pt. 2. These two remarkable specimens are the only *Perithemis* contained in an extensive and varied collection of Odonata made by Mr. Fassl at Teffe-Ega and San Paulo de Olivença, the

last one before his untimely death. He writes that the specimens were only obtained by considerable exertions in a burning sun.

Venation:

Anq. 6 1/2-1, 7 1/2-24, 8 1/2-4 plus 2 (Teffe), 9 1/2-2 (Teffe), 7 2/2-3 (males): 7 1/2-3, 8 1/2-1 (females).

t in fw. free-23, two-celled-9 plus 4 (Teffe); t in hw. free-7, two-celled-25 plus 4 (Teffe); ti in fw. two-celled-26, three-celled-6 plus 4 (Teffe) (males): t in fw. free-4; t in hw. free-3, two-celled-1; ti in fw. two-celled-2, three-celled-2 (females).

Cells from M_4 to Cu_1 in hw. none-22 plus 4 (Teffe), one-10 (males): none-2, one-2 (females).

This species is described as the typical form of *cornelia* under *a* from Panama, *Lib.* p. 343, and one of the same specimens, again as typical, is figured p. 1117, fig. 640. Thus the limited signification of the name, first given to a collective species, is established.

Very unfortunately, the Panama types of this species, which is now shown to include *cornelia* plus *electra* in the main text, plus *domitia* in the supplement, were not well chosen. They were taken from some dealer's material, exact origin unknown, in the Selysian duplicates and were almost destroyed by mould. Later on this destruction was final and only the wings were saved by mounting in balsam. The origin of these specimens, now reduced to wing mounts, from Panama is by no means certain; it is quite possible that they came from somewhere on the Upper Amazons. In *Lib.* fasc. 10, colored plate 2, the first two male specimens figured under *P. domitia nairas* (now *P. lais*), are not that species, but, as far as can be judged from the non-photographic figures, are really *cornelia*; the specimens come from San Paulo de Olivença and Yurimaguas.

After the partial destruction of the first type, it is advisable to designate a new type for *cornelia*; the specimens from Abuná (in Coll. Williamson), of which one pair of wings is figured in figs. 56 and 57, may be designated as the type and allotype in this sense. In the present limits there are evidently no more alien elements within the species. This appears as a denizen of the Upper Amazon basin; its nearest ally is evidently *thais*.

9. *Perithemis thais* (Kirby 1889)

(Figs. 14, 66, 67)

Material examined: 39 males, 2 females. BRITISH GUIANA: Tumatumari, February 9, 1912, 1 male (B. J. Rainey and L. A. and E. B. Williamson, collectors, in Coll. Ris). TRINIDAD: Arima, March 4, 1912, 1 male (B. J. Rainey and L. A. and E. B. Williamson, collectors, in Coll. Ris). BRAZIL: State of Pará: Belem, July, August 2, 5, 1922, 3 males (Rev. Miles Moss,

collector, in Coll. Williamson); Prata, 100 km. east of Pará, February, 1920, 2 males; Cameté, Tocantins, March, 1922, 1 male; Cury, Tapajoz, November, 1921, 1 male; Itaituba, Tapajoz, April, 1922, 1 male (A. H. Fassl, collector, in Coll. Ris); State of Amazonas: Leticia, between S. Antonio and Coary, June 29, 1920, 2 females (H. S. Parish, collector, in Coll. Williamson); Porto Velho, February 25, 28, May 3, 5, (from shallow yellow water pools in wooded lands between bends of creek, or along pools of almost stagnant tributary creeks) 7, 16, 24, 1922, 20 males; State of Matto Grosso: Villa Murtinho, April 6, (*Perithemis* and *Fylgia* found closely associated) 7, (from bigger muddy creek lower down in woods) 1922, 9 males (J. H. Williamson and J. W. Strohm, collectors, in Coll. Williamson); Matto Grosso: 1 male (Zobrys, dealers, in Coll. Ris).

Male (Porto Velho, adult, colors well preserved). Labium, labrum, anteclypeus, postclypeus, and frons anteriorly light yellowish, frons above and laterally but little darker, vesicle greenish anteriorly. Thoracic dorsum dark golden brown; light yellowish green, broad, dorsally but little narrowed, slightly oblique, complete antehumeral bands from the first coxa to the antealar sinus; approximately as broad as the common median dark part of the mesepisterna, and as each lateral dark stripe, which reaches beyond the humeral suture by about one third of its breadth and occupies the anterior half of the mesinfraepisternum. Sides otherwise light greenish with a somewhat diffuse dark stripe on the posterior lateral suture, indistinct in the ventral half. Legs light ochraceous, spines black. Abdomen rather narrow, sides parallel in dorsal view; segments 2-3 very little widened dorsoventrally; ochraceous; sides of 1-3 greenish; 2-8 on each side with a complete longitudinal black band, close to the middorsal carina and narrowly confluent over the bases of each segment, broadening posteriorly from one-half to three-fifths of the side of each segment; 9-10 black with a narrow yellow line on the lateral margin. Appendages dull dark brown; in form similar to *lais*, with apical part somewhat shortened.

Wings rich golden yellow with two black, slightly metallic, transverse bands; the proximal one somewhat narrower, across the triangles and in the hind wing to the anal angle; the distal one broader, from the nodus to half-way nodus-pterostigma; in the front wing to the end of Cu_2 , in the hind wing to half-way Cu_1 -apex of loop. Venation yellow in yellow part of wing, in black parts black, sometimes with a few yellow veinlets; gradually blackish from pterostigma to apex; not rarely a diffuse brown cloud in the apex of the wing. Pterostigma very dark ferruginous to almost black.

Villa Murtinho. In the specimens of this series the antehumeral bands are less sharply defined, somewhat broader; the black longitudinal bands

of the abdomen slightly narrower, separated from the middorsal black carina on segment 9. Dark bands of wings a little narrower and not so deep black.

Belem. Sides of thorax without dark cloud in the dorsal end of the posterior lateral suture. Wing bands in two specimens like the lightest ones from Porto Velho and the darker ones from Villa Murтинho. Two specimens with apex of the hind wing hyaline from three cells proximal to the pterostigma, with narrow brown border at the anal margin (similar to the female of *cornelia* as described above). Similar to first two specimens, those from Trinidad, Prata, Tocantins, and Tapajoz.

The male from Matto Grosso, figured *Lib.* fig. 642 as *cornelia* form *f* is probably an aberrant specimen (or otherwise unknown racial form?) of *thais*, with reduced black bands on wings, the proximal ones almost wanting. A character of *thais* and not of *cornelia* is the broad and well defined black longitudinal bands on the abdomen of this specimen.

Female. Only the two females from Leticia are now before me. Neither are fully mature and they are both badly flattened, the pattern of thorax and abdomen is not visible. Wings deep and somewhat dull yellow; black bands as in male, but not metallic.

A different type of female from Pará, with wings in part hyaline, has been described *Lib.* p. 343. On the whole, only a very small number of females is known of this species.

Males: abd. 14, hw. 16.5 by 7, pt. 2; abd. 12.5, hw. 15.5 by 6.5, pt. 1.5-2.
Females: abd. 13, hw. 19 by 8.5, pt. 2.5.

Venation:

Anq. 7 1/2-36, 8 1/2-21, 9 1/2-2, 7 2/2-3, 8 2/2-4, (males): 8 1/2-1, 9 1/2-1, 8 2/2-1, 9 2/2-1 (females).

t in fw. free-66; t in hw. free-19, two-celled-47; ti in fw. two-celled-64, three-celled-2 (one specimen symmetrically) (males): t in fw. two-celled-4; t in hw. two-celled-4; ti in fw. two-celled-4 (females).

Cells from M_4 to Cu_1 in hw. none-15, one-46, two-5 (males): none-3, abnormal-1 (females).

10. *Perithemis lais* (Perty 1834, Kirby 1889)

(Figs. 15, 16, 60, 61, 62, 63)

Material examined: 75 males, 10 females. COLOMBIA: Rio Frio, January 4, 7, 1917, 7 males; Fundacion, January 13, 1917, 1 male; Puerto Berrio, January 31, 1917, 23 males, 2 females (J. H. and E. B. Williamson, collectors, in Coll. Williamson). VENEZUELA: El Guayabo, in Zulia, April 20, 1920, 1 male (W. H. Ditzler and J. H. and E. B. Williamson, collectors, in Coll. Williamson). BRITISH GUIANA: Georgetown, no date, 4 males (in

Coll. Ris). BRAZIL: State of Pará: Belem, July, 1922, 1 male (Rev. Miles Moss, collector, in Coll. Williamson), August 3, 5, 9, 1922, 20 males (J. H. Williamson, collector, in Coll. Williamson); Una, Pará, June 30, 1901, 1 male (C. Hagmann, collector, in Coll. Ris); Itaituba, Tapajoz, March, 1922, 1 male; Santarem and Taperinha, near Santarem, February, March, April, June, 1920, 6 males, 2 females (A. H. Fassel, collector, in Coll. Ris). State of Amazonas: Manaus, June 6, 1922, 1 male; Moura, Rio Negro, July 11, 1922, 1 male (J. H. Williamson, collector, in Coll. Williamson); Leticia, between S. Antonio and Coary, June 29, 1920, 2 males, 3 females (H. L. Parish, collector, in Coll. Williamson); Parintins, June, 1921, 1 female; Teffe-Ega, July, 1922, 1 male, 2 females, (A. H. Fassel, collector, in Coll. Ris); Porto Velho, February 6, 9, 10, May 24, 1922, 4 males. State of Matto Grosso: Villa Murтинho, April 1, 1922, 1 male (J. H. Williamson, collector, in Coll. Williamson).

Male (adult, colors well preserved, Puerto Berrio). Labium whitish yellow. Labrum and frons anteriorly light yellow; anteclypeus and postclypeus light yellow with a greenish shade; frons laterally and above dull greenish gray. Thoracic pattern very sharply defined: in side view, three light greenish and two dark golden brown bands, patterned as follows: thoracic dorsum dark golden brown; light greenish, broad antehumeral bands, oblique from second coxa toward the superior medial border of mesepisternum, which is not fully reached, slightly more than one-third the breadth of each mesepisternum, posterior ventral border of band touching the humeral suture. Mesepimeron divided obliquely: anterior ventral half dark, posterior dorsal half light. Metepisternum and metinfraepisternum light to a narrow border at second lateral suture. Metepimeron dark at second lateral suture, light posteriorly for two thirds the width at the dorsal and one half the width at the ventral margin. Metasterna light yellow. Legs very light ochraceous, spines black. Abdomen very short, comparatively robust, slightly fusiform by narrowing of segments 2-3 and widening of 4-6. Dull yellowish brown, sides of 1-3 with a greenish shade; carinae very finely black; otherwise unmarked. Appendages dull ochraceous; superior appendages comparatively shorter and more strongly curved than in other species; the terminal part beyond inferior angle markedly shorter.

Wings pure golden yellow, venation darker to reddish, mostly gradually darkening at apex. Typical pattern two brown curved bands. In the front wing the proximal one at the triangle, darkest in the distal half of triangle and supertriangle and corresponding level of space $M_{1-3}-M_4$; similar in the hind wing and continued after a short interruption, from Cu_2 to near the anal angle. The distal one in the front wing from the bridge

to the end of Cu_2 ; in the hind wing to the apex of the loop; color generally deepened at the bridge. Yellow ground color in most specimens somewhat cleared between the dark zones. Pterostigma dark ferruginous. There are varieties in the series from Puerto Berrio with brown bands very incompletely developed.

Pará and Porto Velho. In this series the brown wing bands are, as a rule, somewhat more complete and deeper in color than in the Colombian series. Immature males from Leticia, Manaus, and Moura are hyaline to very light yellow between bands, light yellow distally, thus resembling females in wing color and pattern.

Female. Colors and pattern like male, but light bands of thorax with a bluish white instead of greenish shade. Abdomen robust, segments 2-3 sensibly narrowed, 4-6 feebly dilated; dull brown, no pattern, blackish lines only on carinae.

Wings hyaline, with the arcuate bands of male strongly developed, brown narrowly lined with yellow. Base yellow to proximal band.

Smallest species, variations in size less conspicuous than in most other species. Males: abd. 10.5, hw. 13.5 by 5.5, pt. 1.5; abd. 12, hw. 15 by 6, pt. 1.5. Females: abd. 11, hw. 16 by 6, pt. 1.5-2.

Venation:

Anq. 6 1/2-116, 7 1/2-2, 6 2/2-6 (males): 6 1/2-9, 6 2/2-1 (females). t in fw. free-121, two-celled-3; t in hw. free-122, two-celled-2; ti in fw. free-124 (males): t in fw., t in hw., ti in fw. free-10 (females).

Cells from Cu_1 to M_4 in hw., one-6, two-65, three-52 (males): two-1, three-9 (females).

The Colombian series gives a considerable western extension to the habitat of this species as formerly known. In Lib. I could give the record "Venezuela" only without more precise indication for two specimens in the Selysian collection. For a discussion of the names *lais* Perty-Kirby and *naias* Bates MS.; see Ris *Lib.* p. 1119.

11. *Perithemis waltheri* (Ris 1910)

(Fig. 17)

Material examined: 4 males, 1 female. ARGENTINA: Misiones, March 12, 24, 1909, 4 males, 1 female (Joergensen, collector, in Coll. Ris).

Male. Labium, labrum, anteclypeus, and postclypeus dull light grayish green; frons and vesicle similar with a dull orange spot on top of frons. Thorax olive green, dorsum golden brown, unmarked. Legs very light ochraceous, spines black. Abdominal segments 2-3 very little narrowed, slightly fusiform posteriorly. Dull brown, ventral side lighter, carinae

narrowly black; 4-9 each side with a narrow, somewhat diffuse, oblique brownish band, from middle of anterior, to dorsal end of posterior margin.

Wings rich golden yellow, venation the same, or a little lighter. Distal angle of t in the front wing and the hind wing, external angle of loop in the hind wing, region of bridge in the front wing and the hind wing, corresponding level of M_4 - Cu_1 in the hind wing each with a diffuse brownish spot; ground color somewhat lightened between level of proximal and distal spots. Pterostigma rich golden brown.

Female. Colors on the whole as in the male. Abdomen very robust, only slightly fusiform; pattern as in the male, the oblique virgules less distinct.

Wings as in the male, but yellow color lighter and somewhat duller, venation darker, brownish spots a little larger. Pterostigma dark ferruginous.

Males: abd. 14, hw. 18 by 6.5, pt. 2. Females: abd. 14, hw. 20 by 8, pt. 2.5.

Venation:

Anq. 7 1/2-4 (males): 7 1/2-2 (females).

t in fw. free-1, two-celled-3; t in hw. two-celled-4; ti in fw. three-celled-4 (males): t in fw. free-1; two-celled-1; t in hw. two-celled-2; ti in fw. two-celled-2 (females).

Cells from M_4 to Cu_1 in hw. none-1, one-3 (males): none-2 (females).

As already stated in the introductory part, this short description of a few additional specimens cannot be regarded as revisional, or adequate for a discussion of the doubtful rights of this form as to specific distinctness from *icteroptera*. But since the original description was made from a homogeneous and beautiful series, collected by the late Baron Walther de Selys Longchamps at Rio de Janeiro, together with a number of similar specimens from the same geographical province, I am not now disposed to modify its position with so little positive evidence in hand. The solution of the question must be postponed for further investigation.

12. *Perithemis icteroptera* (Selys 1857, Ris 1910)

(Figs. 18, 35, 36)

Material examined: 17 males, 14 females. ARGENTINA: San Isidro, near Buenos Aires, January, 1891, 15 males, 12 females (F. Ris, collector, in Coll. Ris); Tigre, near Buenos Aires, January 26, 1913, 2 males, 2 females (Joergensen, collector, in Coll. Ris).

Male. (Buenos Aires, adult, colors in fair condition.) Labium whitish yellow. Labrum and frons anteriorly light and somewhat dull yellow. Anteclypeus, postclypeus, frons laterally and above, vesicle, pale greenish

gray. Thoracic dorsum light golden brown with a greenish shade, median and humeral sutures very diffusely lined with dark ferruginous. Sides light greenish yellow, unmarked. Legs very light ochraceous, spines black. Abdomen rather narrow, sides almost parallel with the slightest indication of spindle-shape. Dull light reddish brown with small blackish markings; carinae narrowly black; somewhat broader black on lateral margins of segments 5-9; points on 3-5, close to dorsal carina, touching posterior black carina; complete or nearly complete longitudinal blackish lines on 6-9, paler on anterior half of each segment, about one-fifth the width of each side. Segment 10 and appendages pale reddish brown.

Wings pale golden yellow, veins dark ferruginous, color of membrane a shade deeper along veins. Most specimens with a slight and diffuse clearing between t and nodus; part of the specimens with a brown shadow at the bridge, paler at the distal end of t. Pterostigma ferruginous to red.

Female. Colors of head and thorax as in the male. Abdomen rather robust, more distinctly spindle-shaped than in male by narrowing of segments 2-3 and broadening of 4-6. Pale grayish ochraceous; blackish lines at carinae very narrow to indistinct, pattern otherwise reduced to small and diffuse points on 4-9.

Wings paler and less pure yellow, a shade grayish. Clear space between t and nodus distinct in most specimens; dark clouds at bridge, at t in the front wing and the hind wing, distal end of discoidal field in the front wing and loop in the hind wing, feebly indicated in most specimens, distinct and larger than in males in one-fourth of them. Pterostigma dull ferruginous.

Figs. 35 and 36 are taken from specimens with a maximum of pattern, clear space, and shadows.

Males: abd. 15, hw. 19 by 7.5, pt. 2; abd. 13.5, hw. 17 by 7, pt. 1.5-2. Females: abd. 14, hw. 19.5 by 8, pt. 2-2.5.

Venation:

Anq. 6 1/2-9, 7 1/2-14, 8 1/2-9, 7-1, 8 2/2-1 (males): 7 1/2-21, 8 1/2-1, 7 2/2-2 (females).

t in fw. free-15, two-celled-19, t in hw. free-7, two-celled-27; ti in fw. two-celled-7, three-celled-27 (males): t in fw. free-11, two-celled-13; t in hw. free-8, two-celled-16; ti in fw. two-celled-8, three-celled-16 (females).

Cells from M_4 to Cu_4 in hw. none-19, one-15 (males): none-12, one-12 (females).

At San Isidro near Buenos Aires, in the first days of January, 1891, there was a small railway station with a few houses between big Eucalyptus trees on a rather high bank above the Rio de la Plata. At the foot of this bank a level plain went to the river, which was hidden behind a curtain

of weeping willows, which were fine good-sized trees. Along the woods on the land side, about shallow ditches full of water plants, dragonflies were swarming. *Acanthagrion lancea*, *bonariense*, *cheliferum*, and *ambiguum*, *Ischnura fluviatilis*, *Oxyagrion terminale*, and *saliceti* gave the assembly of Zygoptera a familiar note of blue, black, and scarlet red. The Anisoptera, represented by *Micrathyria didyma hypodidyma* and chiefly *Perithemis* looked less like those at home. I failed to recognize the presence of two species of *Perithemis* and thus captured only a few isolated females of *mooma* with the series of *icteroptera*. *Erythrodiplax connata fusca* was not in this company, but haunted in numbers the strand of the vast estuary itself. Towards sunset great flocks of *Tauriphila risi*, with a sprinkling of *Miathyria marcella*, enjoyed the evolutions of sailing flight on the western border of the woods, a sport very characteristic of members of the Tramea-group of Libellulinae. The scene was one of fascinating simple beauty; its silence was interrupted by the notes of a big green and black cicada, the gentle slapping of waves on the estuary, and the shrieking noise of some not too-well lubricated windmills on the bluff. I wonder how this place, so near the great city, may look now.

The first mention of this species I find by Rambur (5). Rambur has two species of *Libellula*, which belong to *Perithemis*: *chlora*, erroneously cited *chlorotica* by Selys (6) for our *tenera* (q.v.) and *domitia* Drury "De la collection de M. Serville, et indiquée de Buénos-Ayres; de l'île de Johanna, près de Madagascar, par Drury." Evidently Rambur had not consulted Drury's original description, which indicates Jamaica as the habitat of *domitia*. The short description applies without difficulty to our species and is evidently made from the same specimens to which de Selys gave the name *icteroptera* in 1857 (6). "La *Lib. icteroptera*, de Selys MS., de Buénos-Ayres, est une autre race intermédiaire, a ptérostigma assez court et a triangle interne de deux cellules." This is, of course, only a fragment of a description; but it establishes the valid name of the species; as far as I know, no other name has been given to this form. The two old specimens from Buenos Aires in the Selysian collection must be Rambur's *domitia*, notwithstanding that they are labelled "*chlorotica*"; the very error in this name (for *chlora*) indicates that the habitat Buenos Aires is of more weight for the identification of Rambur's specimens than the labels with the name.

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Full bibliographic references up to the respective dates may be consulted in Calvert (16) and Ris (18). Here we enumerate, chronologically, such works and papers as were important for our nomenclatorial discussions

and for the ecological description of the many stations where the Williamson expeditions collected the bulk of the material of the present study. These papers are cited in the above text under the number given below.

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SPECIMENS OF *Perithemis* IN MR. E. B. WILLIAMSON'S COLLECTION, EXAMINED IN NOVEMBER, 1927, IDENTIFIED ACCORDING TO THE ABOVE REVISION OF THE GENUS. (These specimens are earlier captures than most of the specimens studied by Dr. Ris for his revision of the genus. I inadvertently overlooked the desirability of Dr. Ris studying this material again until after I had received his manuscript. He kindly consented to report on

the material discussed below in order that my entire collection in this genus might have its maximum value for future students. These specimens are all in paper envelopes. There are in my collection a few pinned specimens which have not been restudied by Dr. Ris as I hesitated to send this material through the mails. But these, I think, can be readily correlated with the papered material and with Dr. Ris' revision without any possible error.—E. B. Williamson.)

1. *P. tenera*.

27 males, 20 females:

MASSACHUSETTS: 1 male, Concord, August 27, 1915. INDIANA: 3 males, 3 females, Viberg Lake, Allen Co., June 4, 1914, August 14, 1921; 3 females, Lake Everett, Allen Co., July 4, 1916, August 20, 1922; 2 males, Goshorn Gravelpit, Ossian, Wells Co., June 25, 1916, July 6, 1924; 1 male, 1 female, Dosters Ponds, Wells Co., July 12, 1914; 1 female, one quarter mile south of Vanemon Swamp, Wells Co., July 15, 1913; 1 female, Case Lake, two and one-half miles east of Howe, July 9, 1916; 1 male, 1 female, Hatchery Ponds, Round Lake, Whitley Co., September 10, 1916. KENTUCKY: 2 males, 2 females, Madisonville, July 24, 1918. OKLAHOMA: 1 male, Henrietta, September, 1907; 5 males, 3 females, Wister, June 3 and 4, 1907. TEXAS: 2 males, 1 female, Bay City, May 24 and 27, 1907; 1 male, Brownsville, May 13, 1907; 1 female, Mercedes to Brownsville, May 15, 1907; 2 males, 1 female, Black Bayou, May 17 and 22, 1907; 4 males, 2 females, Williams Lake, Matagorda Co., May 26, 1907. MEXICO: 1 female, San Pedro in Coahuila, August 22, 1906, leg. P. P. Calvert (*BCA* p. 408).

The specimens from San Pedro in Coahuila mean an extension of the habitat of *tenera*, as formerly seen by myself (but not as published). It seems that there can be no doubt about the identity. Calvert (l.c.) mentions a series of 4 males and 8 females. The present male is typical *tenera* by combination of the characteristic position of wing bands (yellow, broad, with brown spots at t, and narrow brown band distal to nodus within yellow) and venation details: Anq. 6 1/2, 6 1/2, t and ti all free. Abd. 13, hw. 19, pt. 2.5.

2. *P. seminole*.

FLORIDA: 1 male, Royal Palm Park, December 13, 1924, leg. Blatchley.

3. *P. intensa*.

26 males, 1 female:

ARIZONA: 16 males, Mesa, September 3, 8, 9, 10, 11, and 16, 1912; 3 males, Chandler, September 17, 1912; 2 males, 1 female, Salt River, April

12, 1902, Catalina Mts., May 12 and 15, 1903, leg. Osler (*BCA* p. 408); 4 males, Puente de Ixtla, July 2, 1890 (*BCA* p. 311).

4. *P. mooma*.

21 males, 22 females::

GUATEMALA (leg. E. B. Williamson): 3 males, 15 females, Amatitlan, June 9, 10, 1909 (*Lib.* p. 1115 sub *domitia*; 3 males, 4 females, Amatitlan, February 7 and 8, 1905 (*BCA* p. 314 sub *iris II* and *iris III*, and so labelled by Calvert); 1 male, 1 female, Morales, May 27, 1909 (*Lib.* p. 1115 sub *domitia*); 1 male, Zacapa, January 22, 1905; 2 males, 2 females, Laguna, February 8, 1905; 3 males, El Rancho, January 25 and 26, 1905; 1 female, Lake on r. r. west of Guatemala City, January 30, 1905; 2 males, Santa Lucia, February 2, 1905; 6 males, Gualan, February 11, 12, and 13, 1905 (all *BCA* p. 314 sub *iris II* and *iris III* and so labelled, except 1 male from Gualan, labelled *mooma* and so recorded *BCA* p. 315 by Calvert). SOUTH BRAZIL: 4 females, Blumenau, Sta. Catarina (*Lib.* p. 1115 sub *domitia*).

Of the Guatemala series of 1905, 7 females from Amatitlan, Laguna, and Guatemala City are very near the variety figured *Lib.* fig. 181.

5. *P. domitia*.

14 males:

GUATEMALA (leg. E. B. Williamson): 1 male, Morales, May 27, 1909 (*Lib.* p. 1118 sub *cornelia c*); 2 males, Los Amates, June 11, 1909; 4 males, Santa Lucia, January 31 and February 1, 1905; 2 males, Gualan, January 13, 1905; 1 male, Livingston, February 18, 1905; 2 males, Escuintla, February 3, 1905; (all *BCA* p. 313 sub *iris I* and so labelled by Calvert). TRINIDAD: 2 males, Diego Martin River, February 19, 1912, leg. E. B. Williamson (*Lib.* p. 1118 sub *cornelia c*).

7. *P. electra*.

3 males:

GUATEMALA: 1 male, Los Amates, February 9, 1905 (*BCA* p. 313 sub *iris I* and so labelled by Calvert). TRINIDAD: 1 male, Cumuto, March 10, 1902, leg. E. B. Williamson (*Lib.* 1118 sub *cornelia d*). PARAGUAY: 1 male, Sapucay, January 10, 1903, leg. W. T. Foster.

The specimen from Los Amates has the venation somewhat darkened and the membrane a little lighted from proximal end of pterostigma outward, thus approaching the form described from Colonia del Perené.

The male from Sapucay, in every respect a characteristic specimen of *electra*, somewhat large, abd. 15, hw. 19.5, pt. 2, means a considerable southward extension of the range of *electra*. But quite recently I examined another male, certainly this species, Bolivian Chaco, Suto, September 26, 1926, leg. Dr. Lindner, Nat. Hist. Museum in Stuttgart.

9. *P. thais*.

6 males:

BRITISH GUIANA: 2 males, Tumatumari, February 12, 1912. TRINIDAD: 1 male, Cumuto, March 8, 1912; 3 males, Arima, March 4, 1912, leg. E. B. Williamson (*Lib.* p. 1117).

10. *P. lais*.

11 males:

BRITISH GUIANA: 2 males, Georgetown; 4 males, Rockstone, February 12 and 14, 1912; 5 males, Tumatumari, February 12, 1912, leg. E. B. Williamson (*Lib.* p. 1119).

PLATE I

Penes of Species of *Perithemis*

- Fig. 1. *Perithemis tenera*, Indiana.
- Fig. 2. *Perithemis tenera*, Raleigh, North Carolina.
- Fig. 3. *Perithemis seminole*, Labelle, Florida.
- Fig. 4. *Perithemis intensa*, Acajoneta, Mexico.
- Fig. 5. *Perithemis mooma*, Bejuma, Venezuela.
- Fig. 6. *Perithemis mooma*, Perené, Peru.
- Fig. 7. *Perithemis mooma*, Abuná, Brazil.
- Fig. 8. *Perithemis mooma*, Bom Jesus de Itabapoana, Brazil.
- Fig. 9. *Perithemis domitia*, Palma Sola, Venezuela.

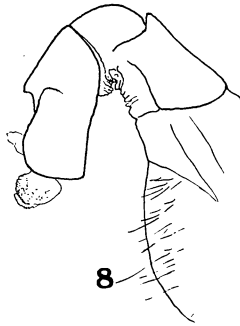
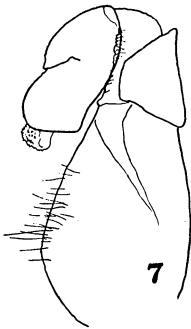
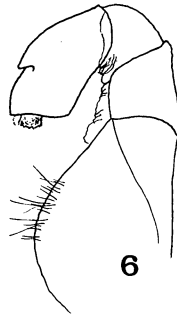
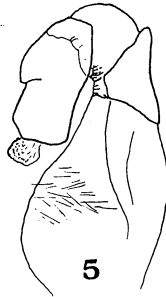
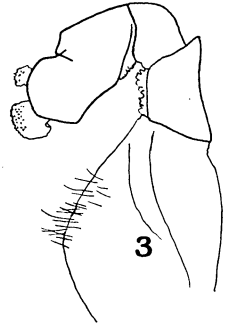
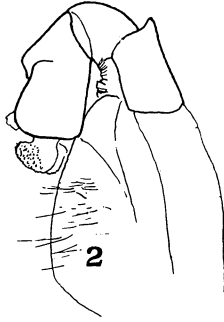
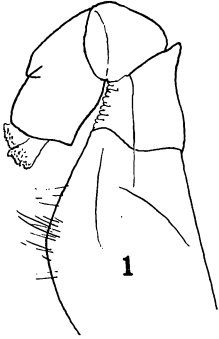


PLATE II

Penes of Species of *Perithemis*

- Fig. 10. *Perithemis bella*, Santarem, Brazil.
- Fig. 11. *Perithemis electra*, Palma Sola, Venezuela.
- Fig. 12. *Perithemis electra*, Perené, Peru.
- Fig. 13. *Perithemis cornelia*, Abuná, Brazil.
- Fig. 14. *Perithemis thais*, Porto Velho, Brazil.
- Fig. 15. *Perithemis lais*, Puerto Berrio, Colombia.
- Fig. 16. *Perithemis lais*, Belem, Brazil.
- Fig. 17. *Perithemis waltheri*, Misiones, Argentina.
- Fig. 18. *Perithemis icteroptera*, Buenos Aires, Argentina.

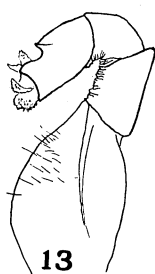
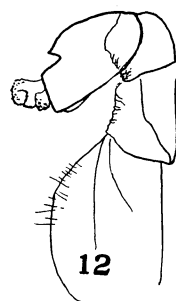
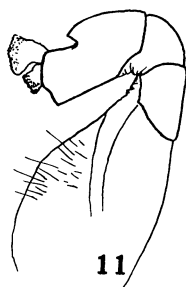
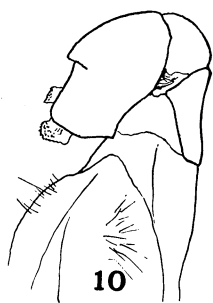


PLATE III

Wing Photographs of *Perithemis*

- Fig. 19. *Perithemis tenera*, male, Raleigh, North Carolina.
- Fig. 20. *Perithemis tenera*, male, Raleigh, North Carolina.
- Fig. 21. *Perithemis tenera*, female, Raleigh, North Carolina.
- Fig. 22. *Perithemis tenera*, female, Raleigh, North Carolina.
- Fig. 23. *Perithemis seminole*, male, Moore Haven, Florida.
- Fig. 24. *Perithemis seminole*, male, heavily marked, Labelle, Florida.
- Fig. 25. *Perithemis seminole*, female, black type, Labelle, Florida.
- Fig. 26. *Perithemis seminole*, female, black type, heavily marked, St. Petersburg,
Florida.

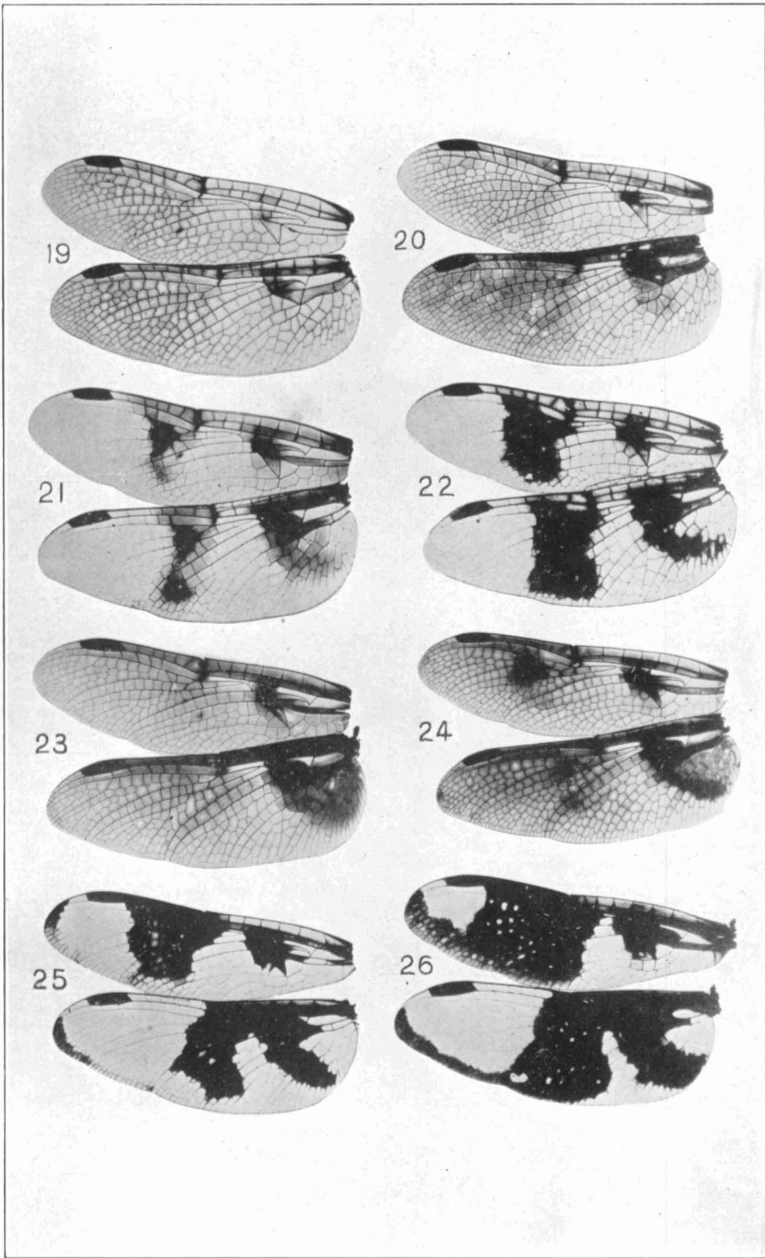


PLATE IV

Wing Photographs of *Perithemis*

- Fig. 27. *Perithemis mooma*, male, small form, Sta. Marta.
- Fig. 28. *Perithemis mooma*, male, large form, Perené.
- Fig. 29. *Perithemis mooma*, female, Rio Frio.
- Fig. 30. *Perithemis mooma*, female, Sta. Marta.
- Fig. 31. *Perithemis mooma*, female, Fundacion.
- Fig. 32. *Perithemis mooma*, female, Sta. Marta.
- Fig. 33. *Perithemis mooma*, female, Sta. Marta.
- Fig. 34. *Perithemis mooma*, female, Abuná.

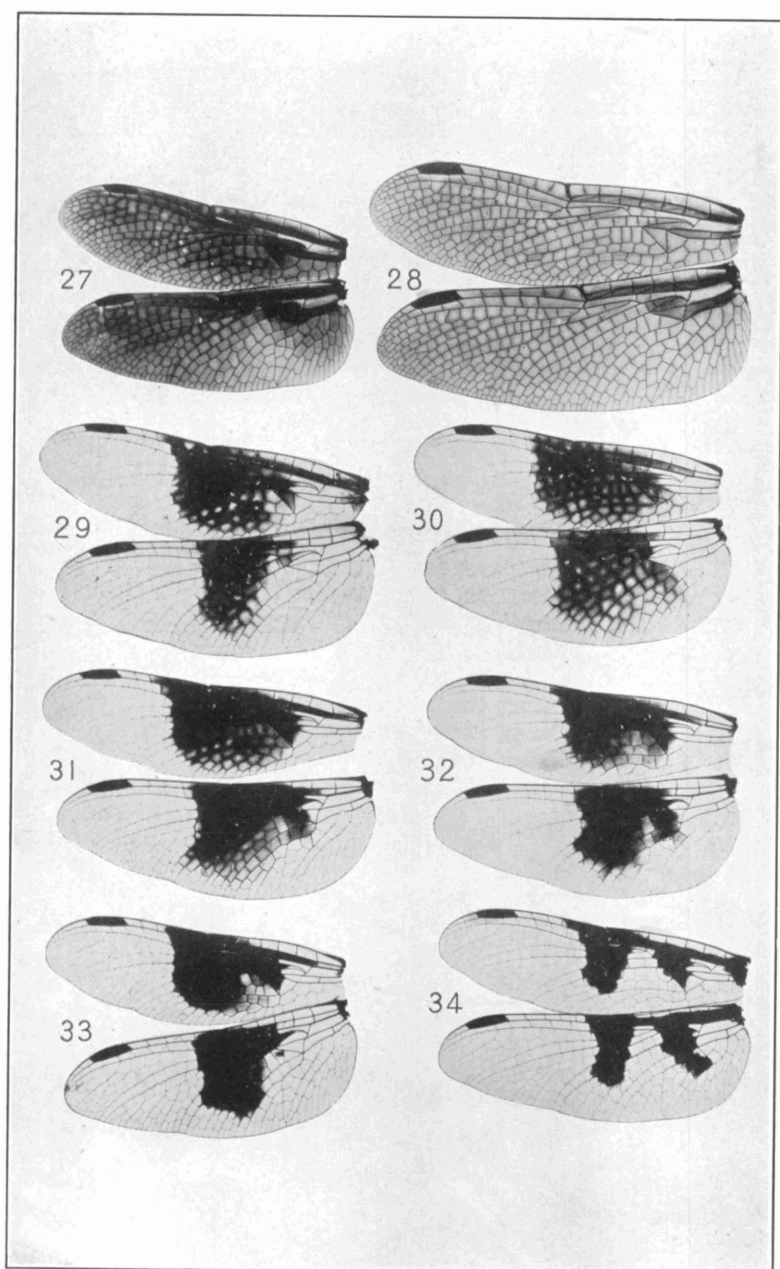


PLATE V

Wing Photographs of *Perithemis*

- Fig. 35. *Perithemis icteroptera*, female, Buenos Aires.
- Fig. 36. *Perithemis icteroptera*, female, Buenos Aires.
- Fig. 37. *Perithemis intensa*, female, var. 2, Guaymas, Mexico.
- Fig. 38. *Perithemis intensa*, female, var. 4, Tepic, Mexico.
- Fig. 39. *Perithemis mooma*, female, Perené.
- Fig. 40. *Perithemis mooma*, female, Buenos Aires.
- Fig. 41. *Perithemis electra*, female, La Fria.
- Fig. 42. *Perithemis intensa*, male, Tepic, Mexico.

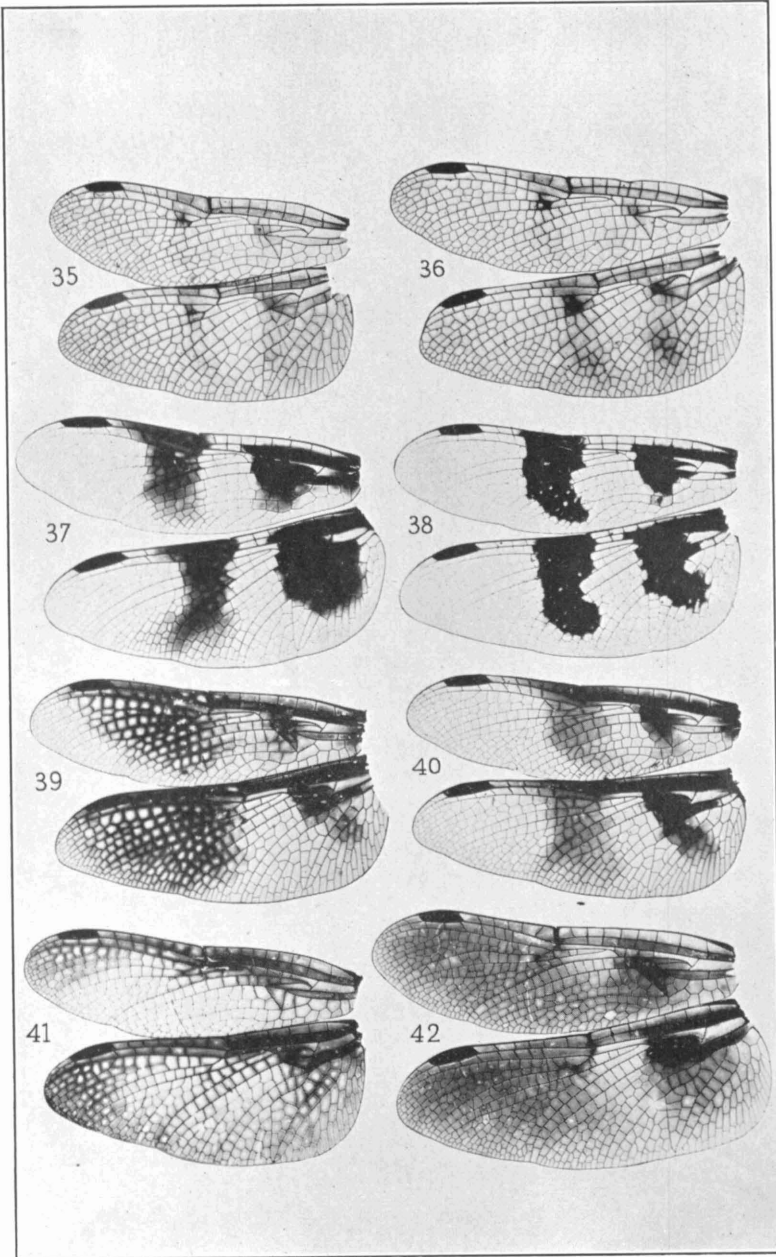


PLATE VI

Perithemis Types

- Fig. 43. *Perithemis mooma*, female type, Jamaica, Dublin Mus.
Fig. 44. *Perithemis domitia*, female var., type of *P. pocahontas* Kirby in Dublin Mus.
Fig. 45. *Perithemis domitia*, male, type Kirby, no locality, in Dublin Mus.
Fig. 46. *Perithemis domitia*, female, type Kirby, West Indies, in Dublin Mus.

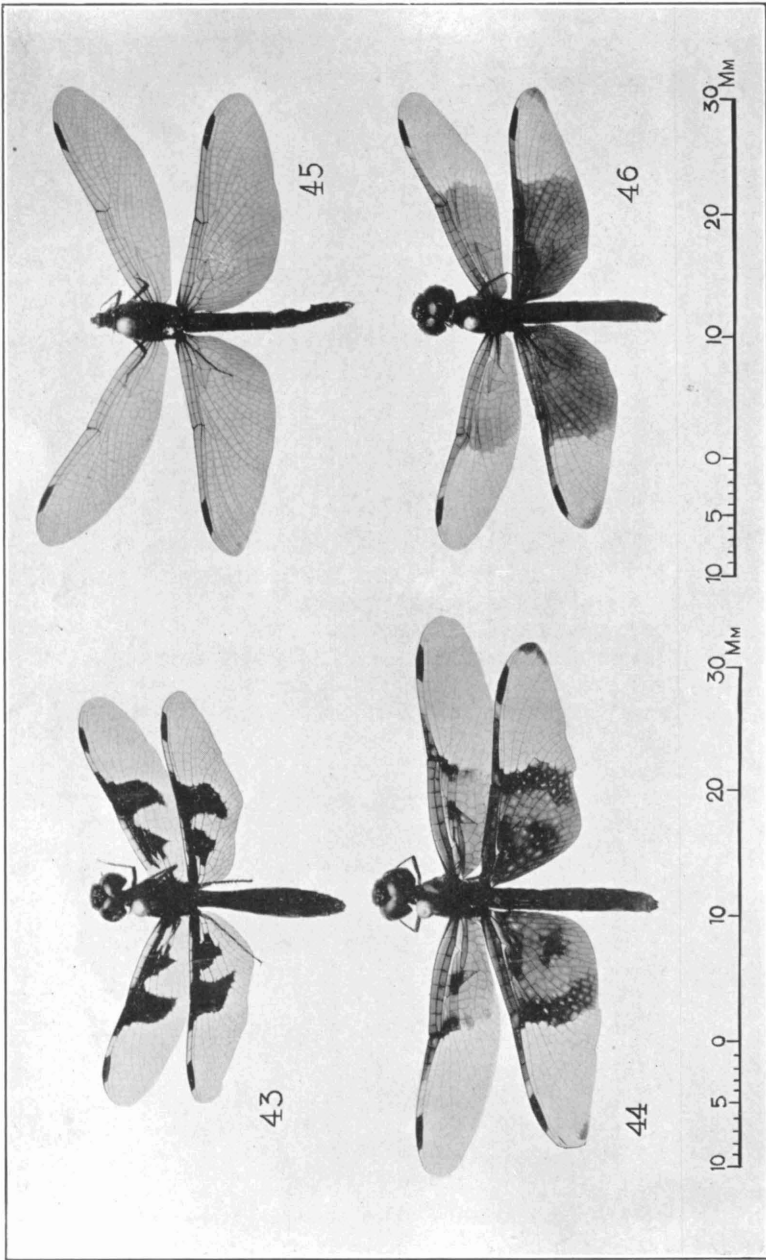


PLATE VII

Figs. 47-50, Wing Photographs of *Perithemis*.

Fig. 51, Drury's figure of *Libellula domitia*.

- Fig. 47. *Perithemis domitia*, male, Acaponeta.
- Fig. 48. *Perithemis domitia*, male, Bolivar.
- Fig. 49. *Perithemis domitia*, female, var. 1, Arroyo Grande.
- Fig. 50. *Perithemis domitia*, female, var. 4, Acaponeta.
- Fig. 51. Drury's original figure of *Libellula domitia* slightly enlarged.

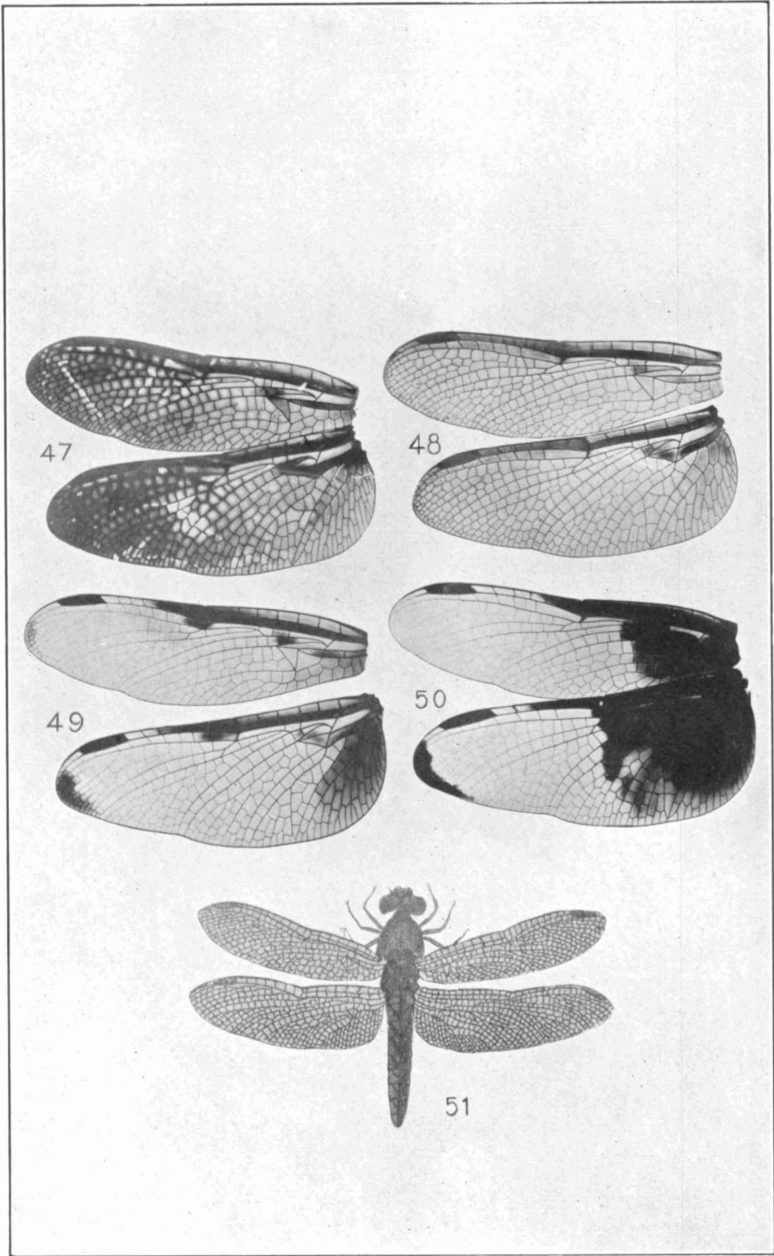


PLATE VIII

Wing Photographs of *Perithemis*

- Fig. 52. *Perithemis bella*, male, Santarem.
- Fig. 53. *Perithemis bella*, female, Santarem.
- Fig. 54. *Perithemis bella*, female, Santarem.
- Fig. 55. *Perithemis bella*, female, Santarem.
- Fig. 56. *Perithemis cornelia*, female, Abuná, new allotype.
- Fig. 57. *Perithemis cornelia*, male, Abuná, new type.
- Fig. 58. *Perithemis electra*, male, Perené.
- Fig. 59. *Perithemis electra*, male, Palma Sola.

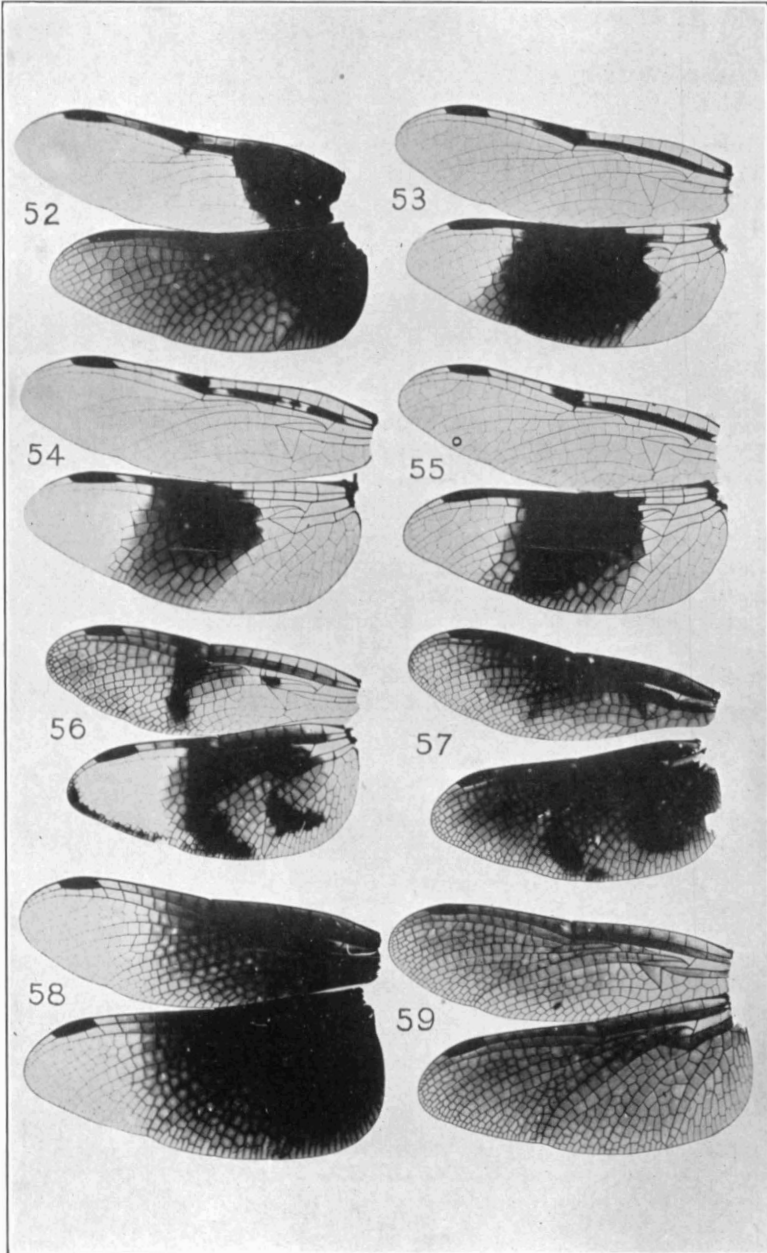


PLATE IX

Wing Photographs of *Perithemis*

- Fig. 60. *Perithemis lais*, male, very mature, Puerto Berrio.
Fig. 61. *Perithemis lais*, male, Puerto Berrio.
Fig. 62. *Perithemis lais*, male, immature, Leticia.
Fig. 63. *Perithemis lais*, female, Puerto Berrio.
Fig. 64. *Perithemis seminole*, female, yellow mixed type, St. Petersburg, Florida.
Fig. 65. *Perithemis seminole*, female, yellow mixed type, heavily marked, Enterprise, Florida.
Fig. 66. *Perithemis thais*, male, Porto Velho.
Fig. 67. *Perithemis thais*, female, Leticia.

