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THE DRAGONFLY FAUNA OF THE BIG BEND REGION  
OF TRANS-PECOS TEXAS

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The first report on the dragonflies of the Big Bend Region of Trans-Pecos Texas, was made by E. R. Tinkham (1934), who listed 19 species. The present paper records 31 additional species, of which five are apparently new for the state, and gives a revised and annotated list that includes a detailed description of the female of *Aeshna dugesi* Calvert and notes on the habits and taxonomic status of several of the species.

The Big Bend Region embraces Presidio, Brewster, and Jeff Davis counties. A brief description of the geographic features and water sites, and a discussion of the two faunal zones—Upper and Lower Sonoran—are given by Tinkham (1934: 213–14). At present this region furnishes the northernmost, the easternmost, and the westernmost records for a few species of Odonata. None of these records is particularly remarkable or inconsistent with the known range of each species. The discordant distributional records noted by Tinkham were based on the misidentification or mislabeling of four species. *Plathemis lydia* (Drury), *Tramea carolina* (Linné), *Progomphus obscurus* (Rambur), and *Lestes unguiculatus* Hagen of his list are, respectively: *Plathemis subornata* Hagen, *Tramea lacerata* Hagen, *Progomphus borealis* MacLachlan, and *Argia plana* Calvert.

I have made no attempt to follow Tinkham's arrangement of species according to environment. In this region where the water supply is erratic, with only a river, a few creeks, and cattle tanks that contain water throughout the year, it would be difficult to classify the adult of any strong-flying species of dragonfly as belonging to a lenitic or a lotic environment. Adults may occur wherever there is

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water, be it a flood torrent or water tank; for example, Tinkham collected *Brechmorhoga mendax* (Hagen) at a pond, but I captured it on a stream. *Plathemis subornata* Hagen and *Belonia saturata* (Uhler) have been taken on streams as well as at ponds. The adult of *Anax walsinghami* MacLachlan is a stream "tourist," but in Arizona its nymph has been found in a horse tank. It would seem that the weaker fliers are not so particular either, for in Brewster County I observed *Argia immunda* (Hagen) breeding in both hot and cold springs. Perhaps this indiscrimination does not result in much productivity, but the species met with in such regions take advantage of all sources of water supply and in this way manage to survive. The range of ecological tolerance for nymphs has not been determined.

My study is based on specimens collected by F. M. Gaige, from May to July, 1916 and 1928; by O. C. Poling, in 1925; by Howard K. Gloyd, Hobart M. Smith, and the author in July, 1930; by the author in June, 1931; by H. K. Gloyd in September and October, 1935; by J. Van Tyne and W. F. Blair from March to May, 1937; and by Karl P. Schmidt and Walter Necker in August, 1937. It also includes E. R. Tinkham's material which he kindly sent me, one specimen of *Paltothemis lineatipes* Karsch collected in 1952 by Ronald H. Leuschner, and a single specimen of *Argia munda* Calvert collected in 1953 by George W. Byers. All these specimens, except for duplicates given to various institutions, are now in the Williamson-Kennedy Collection, Museum of Zoology, University of Michigan. In the List of Species the name of the collector is indicated by initials.

Dates of capture for the Trans-Pecos species range from March 30 to November 11. Most of the specimens were taken by scientists who visited the region primarily to collect or to study other groups of animals. A more thorough and prolonged survey would undoubtedly reveal a greater seasonal range as well as the presence of several more species. Of the 33 species from the Pecos River collected by Captain Pope (Hagen, 1861) all but eight—*Enallagma exsulans* (Hagen), *Dromogomphus spoliatus* (Hagen), *Gomphus externus* Hagen, *Gomphoides stigmata* (Say), *Macromia annulata* Hagen, *Epicordulia princeps* (Hagen), *Macrodiplax balteata* (Hagen), and *Dythemis velox* Hagen—have been taken in the Big Bend Region. Some of these species, as well as *Brachymesia furcata* (Hagen), *Celithemis eponina* (Drury), *Perithemis tenera* (Say), perhaps *P. intensa* Kirby, *Anomalagrion hastatum* (Say), *Enallagma basidens* Calvert, and *Ischnura barberi* Currie, *cervula* Selys, *damula* Calvert, and *perparva* Selys, are to be expected. Collecting at higher elevations in the mountains might

yield other species of *Aeshna*, *Oplonaeschna armata* (Hagen), or possibly a species of *Somatochlora*.

LIST OF SPECIES

AESHNIDAE

*Aeshna dugesi* Calvert

(Plate I, Figs. 1-8)

Jeff Davis Co.: Davis Mountains, Limpia Canyon (Granger's Ranch), 3♂, July 4, and 6♂ 1♀, July 5, 1930; 4♂ 1♀, June 25, 1931, LKG. The female collected on July 5 is here designated the hypotype.

The specimens of *Aeshna dugesi* listed above were reported as a new United States record by Gloyd (1932) and, apparently, are still the only ones reported from the United States. The species is known from these fifteen Texas specimens and three males from Mexico (Calvert, 1956), two of which constitute the type series (Calvert, 1905:184).

The excellent key to the North American species of *Aeshna* by E. M. Walker (1912:57-66) may be modified to accommodate *dugesi* by changing the parts dealing with the *A. multicolor* group as follows.

KEY TO SPECIES OF THE *Aeshna multicolor* GROUP

I. MALES

- NN. No black line on frontonasal suture (brown line may be present in *dugesi*); superior appendages with an antepical inferior spine (much reduced in *dugesi*), the apices acute and decurved, superior carina angulate; inferior appendage slightly more than half as long as superior pair ..... *multicolor* group
- O. Abdomen (excluding appendages) less than four times as long as thorax; a prominent ventral tubercle on abdominal segment 1; height of superior carina above outer margin, in profile, not less than depth of appendage directly below it. Outer side of anal loop in hindwing longer than inner side of triangle
- P. Distance from summit of superior carina to apex of appendage greater than one-third the length of the appendage; in profile, antepical inferior process prolonged and recurved; greatest depth of appendage below outer margin posterior (apical) to greatest height of superior carina ..... *multicolor* Hagen
- PP. Distance from summit of superior carina to apex of appendage slightly less than one-third the length of the appendage; in profile (Pl. I, Fig. 8), antepical inferior process obtusely angulate and not prolonged; greatest depth of appendage below outer margin opposite the greatest height of superior carina ..... *dugesi* Calvert

- OO. Abdomen (excluding appendages) not less, generally a little more, than four times as long as the thorax; ventral tubercle on abdominal segment 1 but little elevated; inferior subbasal tubercle of the superior appendages at one-sixth to one-seventh the length of the appendage; height of superior carina above outer margin, in profile, generally much less than the depth of the appendage directly below it; distance from summit of superior carina to apex of appendage about one-third of the length of the appendage; outer side of anal loop in hindwing about as long as the inner side of the triangle ..... *mutata* Hagen

## II. FEMALES

- AA. Abdominal segment 1 with a distinct ventral tubercle; fork of *Rs* nearly symmetrical at base
- N. Genital valves without distinct lateral carinae
- O. A black line on the frontonasal suture; supratriangle of forewings with a single cross vein; length of hindwing distinctly less than that of abdomen ..... *californica* Calvert
- OO. Without a black line on the frontonasal suture; supratriangle of forewings with 2-4 cross veins
- P. Abdomen scarcely more than four times as long as the thorax; a prominent ventral tubercle on abdominal segment 1; appendages somewhat shorter than segments 8+9 (5-6 mm.), each with both margins arcuate, the curve of the inner margin not much stronger than that of the outer; outer side of anal loop of hindwing longer than inner side of triangle; hindwings longer than abdomen ..... *multicolor* Hagen
- PP. Abdomen four and one-half times as long as thorax; ventral tubercle on abdominal segment 1 but little elevated; each appendage a little longer than segments 8+9 (6.5-7.5 mm.), outer margin straight, inner margin arcuate; outer side of anal loop of hindwing about as long as inner side of triangle; hindwings slightly shorter than abdomen ..... *mutata* Hagen
- NN. Genital valves with a distinct lateral carina; each appendage about the same length as segments 8+9, outer margin straight, inner margin arcuate; a brown line on frontonasal suture; hindwing longer than abdomen ..... *dugesi* Calvert

### SUPPLEMENTARY DESCRIPTION OF *Aeshna dugesi* CALVERT

In order to preserve uniformity in treatment of the species in the genus, the form and terms employed by Walker (1912) are followed as closely as possible. Abbreviations used in describing the color pattern of the abdomen (Walker 1912:9, Figs. 1-2) are as follows: *AD* = anterodorsal spot; *AL* = anterolateral spot; *AML* = combination of *AL* and *ML* on segment 2; *D* = dorsal spot of segment 1; *L* =

lateral spot of segment 1; *MD* = mediodorsal spot; *ML* = mediolateral spot; *PD* = posterodorsal spot; and *PL* = posterolateral spot.

MALE.—Color pattern similar to that of *Aeshna mutata*. In life, eyes a deep rich blue; pale areas of face and body, bright sky blue.

The accessory genitalia of abdominal segment 2 are shown in Plate I (Fig. 6). Each superior abdominal appendage (Pl. I, Figs. 7–8) about one-third longer than segments 9+10, slender at base, expanding in basal third on the inner margin to twice that at base or approximately one-sixth of the total length; mesal part curving strongly downward to a peak at slightly less than distal third, thence narrowing to the rounded and slightly decurved apices. Superior carina elevated in distal three-fifths to a peak at apical third, thence sloping gently to apex of appendage. In lateral view (Pl. I, Fig. 8) a low subbasal ventral tubercle at two-ninths of the length; depth of dorsal carina at apex slightly less than that of the downwardly curved mesal part, peak of the latter only very slightly distal to that of the former and not prolonged into a strong spine directed ventrad and caudad as in *multicolor* and *mutata*. Inferior appendage elongate-triangular, five-ninths the length of the superiors. Median carina on upper surface absent (present in *Aeshna multicolor*); apex about one-fifth the basal width of appendage, rounded, and with a pair of small recurved dorsal teeth; in lateral view (Pl. I, Fig. 8), moderately curved dorsad.

FEMALE.—In life, eyes and light areas of body, a yellowish gray-blue which turned yellow in the cyanide bottle. Color pattern (Pl. I, Figs. 1–2): Thorax brown; dorsal bands yellow, not quite touching the mesothoracic half-collar below or the anteoralar carina above where they are somewhat approximated; greatest width 0.4 mm. or about half as wide as in males. Lateral bands yellow, almost straight, greatest width in lower half about 1.2 mm.; first band rounded below, slightly narrowed beyond the middle, then expanded to double its narrowest width at lateroalar carina; second band about the same width as the first, broader at lateroalar carina than at base. Wings smoky to level of distal end of pterostigma. Abdomen of hypotype: segment 1, *L* and *D* present but small; segment 2, *AML* confluent with *PL* and narrowly with *MD* anterior to transverse carina; segments 3–7, *AD* confluent with *AL* forming a narrow basal ring, *AL* and *ML* rather large, *AD* narrowly separated from *ML*, *PD*, and *PL* confluent except on segment 7 where *PL* is absent; segment 8, *AD* on either side represented by a small spot, *AL* and *PD* rather large; segment 9, only a large *PD* present; segment 10, pale above and below with a narrow, dorsal, basal band continuing laterally to apical margin of

segment. Abdominal pattern on segments 1-5 of second female is not as clearly defined as in the hypotype, probably because of post-mortem changes.

Abdomen about four times as long as the thorax and not quite as long as hindwing, more robust than that of the male, slightly widened at apex of segment 8 and on segment 9. Segment 3 slightly shorter than segments 1+2 and one-seventh longer than segment 4. Genital valves about as long as dorsum of segment 9, in profile (Pl. I, Fig. 4), slightly convex or arcuate in proximal four-fifths, apices straight with each bearing a pencil of pale hairs; lateral carinae distinct, rounded, and almost straight in apical three-fourths, the space enclosed by them in ventral view subparallel in basal three-fifths, thence tapering evenly to narrow apices. Styli each two-thirds as long as dorsum of abdominal segment 10. Posterior margin of basal plate straight. Appendages (Pl. I, Figs. 7-8) a little longer than dorsum of abdominal segments 8+9, each slender at base, outer margin almost straight, inner margin arcuate, the curve at base and apex about the same; midrib nearer to lateral than mesal margin; greatest breadth at about the middle, a little more than one-sixth of the length; apices rounded.

Measurements in millimeters (where the two females differ, the first figure is for the hypotype): Thorax length, 11.0, 11.3; abdomen length, 45.5, 46.0; segment 2 depth, 6.0; segment 3 length, 7.0; segment 4 length, 6.0; abdominal appendage length, 6.7, 7.0; abdominal appendage width, 1.2; genital valve length, 2.5; hindwing length, 48.5, 50.5; pterostigma length, 3.4, 3.2.

Limpia Canyon is the only place where *Aeshna dugesi* has been taken in the United States. On both occasions when we visited the habitat, the rocky stream bed was partly dry. In July, 1930, water came to the surface at two points a short distance below the cliff at the mouth of this canyon and flowed for 25 or 30 feet before uniting to form one stream about two and a half feet wide and 8 to 10 inches deep. At a point about 60 feet from the junction the stream spread out to approximately 15 feet in width for a distance of 30 or more feet, then narrowed suddenly to one and a half to two feet wide. In the latter part of June, 1931, the stream was coming to the surface in much the same places, but the two streamlets united sooner and there were two expanded areas, each about four feet wide, instead of one. The small area was at the junction of the two streamlets and the larger one five or six feet below it. From the latter there was a thumblike offshoot which had mats of algae in it and supported

a growth of low aquatic plants. South of the stream there was a sandbar and on the north a steep bank six to seven feet high.

On June 24, 1931, we made an overnight camp at the base of the mountains and I was down by the stream at daybreak. No dragonflies were flying at this time, but the mayflies were out in great swarms above the creek and a hummingbird was weaving back and forth through the swarms, feeding upon them. About 7:00 A.M. an *Aeshna dugesi* male came upstream and was netted. Fifteen minutes later another one "breezed" along. Next an *Anax walsinghami* made his appearance but escaped the net. A half-hour later a female *Aeshna dugesi* came upstream and alighted on low vegetation in the shallow backwater projection at the widened part of the stream described above. Her feet seemed to be at water level, her wings almost touching the surface. When settled she began to lift up her abdomen and slap it repeatedly into the water amid the low plants and submerged algae. She was captured before she had completed her activities. At 8:00 A.M. the first *Belonia saturata* appeared. Individuals of *Aeshna multicolor* and more of *A. dugesi* appeared at intervals of about five to fifteen minutes. Collecting had to be discontinued at 8:30 A.M., just as the dragonflies were coming to the stream in greater numbers. Other species taken at this early hour were *Brechmorhoga mendax*, *Argia nahuana*, *A. plana*, and *Hesperagrion heterodoxum*.

The year before (1930), at this same locality, we collected for a little while on the afternoon of July 4 and the morning of July 5. As in 1931 few dragonflies were on the wing in the morning before the sun had warmed the atmosphere. The early morning catch on July 5 consisted of *Tamea onusta*, *Belonia saturata*, and *Pseudoleon superbus*, all of which were taken at a small isolated pool near the base of the cliff. Later in the morning, at the widened part of the stream, it was a beautiful sight to see the glowing red *Belonia saturata*, the grape-blue *Libellula comanche*, and *Aeshna dugesi*, with its bright sky-blue markings, darting and dashing together in the bright sunshine. Occasionally an *Anax walsinghami* flashed through this riot of colors like an airplane passing through a cloud. Closer to the ground, the colorful *Hesperagrion heterodoxum*, *Argia nahuana*, *A. hinei*, and *A. plana*, and the sombre *Hyponeura lugens* were found.

#### *Aeshna multicolor* Hagen

Jeff Davis Co.: Davis Mts.—Cherry Canyon, 1♂, June 15, and 1♀, June 20, 1916, FMG; Limpia Canyon, 3♂, June 25, 1931, LKG. 1 mile north of Ft. Davis, 1♀, May 12, 1937, WFB. Presidio Co.: Presidio, 2♂,

Aug. 16, 1929, ERT. (1 ♂ listed as collected June 20, 1930, by Tinkham, 1934, was not examined.)

*Anax junius* (Drury)

Brewster Co.: Garden Spring, south of Marathon, 1 ♂, July 15, 1930, LKG. Jeff Davis Co.: Phantom Lake, 2 ♂, July 13, 1916, FMG. Musquiz Creek, 6.5 miles southeast of Ft. Davis, 1 ♂, Oct. 8, 1935, HKG. 2 miles southwest of Ft. Davis, 3 ♂ 2 ♀, April 28, 1937, WFB. Presidio Co.: Marfa, 1 ♂, 1925, OCP. Presidio, 1 ♂, Aug. 16, 1929, ERT.

*Anax walsinghami* MacLachlan

Jeff Davis Co.: Davis Mts., Limpia Canyon, 2 ♂, July 5, 1930, HMS and LKG.

The males of *Anax walsinghami* fly in a straight line and so fast that it is very difficult to time the swing of a net to catch them. Their reaction is quick, too, for I have seen them speed up to keep ahead of my net or to rise above it as I swung the net as fast as I could. F. M. Gaige once remarked that after you get an *Anax walsinghami* in your net it can reverse itself and fly out before you can complete your swing. While we were on the stream the males came singly and several minutes apart. No females were seen.

GOMPHIDAE

*Erpetogomphus compositus* Hagen

Brewster Co.: Boquillas Road, 1 ♂ 1 ♀ (pair), Aug. 10, 1937, WN. Glenn Springs, 2 ♀, June 16; 1 ♀, June 21, 2 ♀, June 24; and 1 ♀, June 26, 1928, FMG. Chilicotat Spring, 1 ♀, July 1, 1928, FMG. Chisos Mts., Upper Juniper Spring, 2 ♂, July 6, 1928, FMG. Presidio Co.: Presidio, 1 ♂, May 24, 1930; 1 ♀, Aug. 28, 1929; and 1 ♀, Sept. 9, 1928, ERT.

*Erpetogomphus designatus* Hagen

Jeff Davis Co.: Phantom Lake, 1 ♀, June 1; 1 ♂ 1 ♀, June 15; and 1 ♀, July 16, 1916, FMG. Presidio Co.: Presidio, 1 ♂, Aug. 28; and 1 ♀, Aug. 29, 1929, ERT.

*Erpetogomphus lampropeltis* Kennedy

Jeff Davis Co.: Davis Mts., Limpia Canyon, 1 ♂ (incomplete), Oct. 4, and 3 ♂, Oct. 5, 1929, ERT. Limpia Creek, 2-3 miles north of Ft. Davis, 1 ♂, Oct. 7, 1935, HKG. Musquiz Creek, 6.5 miles southeast of Ft. Davis, 6 ♂, Oct. 8, 1935, HKG.



*Gomphus militaris* Hagen

Jeff Davis Co.: Phantom Lake, 5♂ 5♀, June 1, 1916, FMG.

*Progomphus borealis* MacLachlan

Jeff Davis Co.: Phantom Lake, 2♂ 1♀, June 1; 5♂ 2♀, June 9; and 1♂, July 13, 1916, FMG. Presidio Co.: Shafter, 1♂ 1♀, Sept. 9, 1929, ERT (♂ listed as *obscurus* Rambur by Tinkham, 1934:216).

*Stylurus intricatus* (Hagen)

Brewster Co.: Hot Springs, on Rio Grande, 1♀, July 12, 1930, LKG; 1♂, Oct. 4, 1935, HKG. Published record: On the Rio Grande, 1♂ 2♀, Mitchell and Cushman (Kennedy, 1917:554). Presidio Co.: Presidio, 1♂, June 8, 1930, ERT.

## LIBELLULIDAE

*Belonia croceipennis* (Selys)

(Plate II, Figs. 9, 11)

Brewster Co.: Chisos Mts.—Upper Juniper Spring, 2♂ 1♀, June 29, 1928, FMG; Juniper Canyon, 4700 ft., 2♂ 2♀, Aug. 1937, WN; Upper Cat-tail Canyon, 4300 ft., 1♂, Aug. 3, 1937, KPS. Jeff Davis Co.: Davis Mts., Cherry Canyon, 2♂, July 9, 1916, FMG.

The genus *Belonia*, when first described contained five species, with the new species *foliata* designated as the genotype (Kirby, 1889:288, 333). A year later Kirby (1890: 28–29) added five more species. *Belonia* was soon regarded as a synonym of *Libellula* and remained so until Kennedy (1922:111) recognized it as a subgenus of *Libellula*, composed of *foliata*, *saturata*, *croceipennis*, and *herculea* Karsch. The genitalia in each of these species has three asymmetrically arranged, barbed cornua of unequal length (Kennedy, 1922: Pl. IV, Figs. 2, 4–6). Primarily because these species are so strikingly different in this respect, I think *Belonia*, as limited by Kennedy, should be restored to generic rank. Venational differences common to the four species have not been found that will separate them from other species included in the genus *Libellula*, but in body form, coloration, and genital characters, they seem to form a natural group.

*Belonia croceipennis* is closely related to the less robust *B. saturata*. Compared with that species: In the male, the hamules are broader, the hood of the penis is prolonged and compressed into a keel (Kennedy, 1922: Pl. IV, Fig. 5), which may be seen (in resting position) projecting between the hamules, the inferior abdominal appendage

is proportionately wider, the abdominal segments are wider in proportion to length (Pl. II, Figs. 9–10), and the red-orange coloration of each wing does not extend beyond the nodus nor does it have a darker area in the region of the cubitoanal space and triangle. In the female, the superior appendages are shorter and more slender, the papillae or styli on the venter of abdominal segment 9 are black-tipped and more robust, the vulvar lamina has a prominent median tumescence, and the lateral extensions of abdominal segment 8 (Pl. II, Figs. 11–12) are wider, about 0.9 mm. in contrast to 0.55 mm. in *saturata*. Often the wing coloration is limited to a trace in the basal area and to the larger veins. In both sexes of *croceipennis* the pterostigma is usually more than 5.0 mm. long, and in the hindwing there are two cubitoanal cross veins.

*Belonia saturata* (Uhler)

(Plate II, Figs. 10–12)

Brewster Co.: Glenn Springs, 1♂ 1♀, June 17, 1928, FMG; 7♂ 1♀, July 13, 1930, LKG. Chisos Mts., Upper Cat-tail Canyon, 4300 ft., 1♀, Aug. 3, 1937, KPS. Hot Springs, 3♂, Oct. 4, 1935, HKG. Jeff Davis Co.: Phantom Lake, 7♂, May 26; 1♂, June 1; 1♀, June 6; 3♂, June 15, 1916, FMG. Davis Mts.—Cherry Canyon, 1♀, July 6, and 2♂ 1♀, July 8, 1916, FMG; Limpia Canyon, 1♂, Oct. 5, 1929, ERT; Limpia Canyon (Granger's Ranch), 6♂, July 4, and 10♂ 3♀, July 5, 1930, HKG, LKG, and HMS, and 1♂, June 25, 1931, LKG. Musquiz Creek, 6.5 miles southeast of Ft. Davis, 1♂ 1♀, Oct. 8, 1935, HKG. Presidio Co.: Marfa, 1♀, 1925, OCP. Chinati Mts., 1♂, Sept. 11, 1929, ERT.

The basal red-orange area of each wing is much more extensive in *Belonia saturata* than in *B. croceipennis*. In the males and, occasionally, in a few females, there is a distinctly darker spot within this red area in both front and hind wings. In the front wing the spot covers the cubitoanal space distal to *Ac* and the supratriangle; in the hindwing, it occupies the region of the cubitoanal space, triangle, supratriangle, and area between *MA* and *Rs* to the first cross vein. The red-orange area in the wings of the females is usually much smaller than in those of the males and often is not evident below the triangles or below *M* distal to the nodus. In both sexes the pterostigma is usually less than 5.0 mm. long and the hindwing has only one cubitoanal cross vein.

Females were observed laying eggs in the widened part of the stream in Limpia Canyon (described under *Aeshna dugesi*). They slapped the tips of their abdomens in the water and flipped up small

drops as high as six or eight inches. Whether the eggs were washed off with the downward slap or were contained in the drops of water could not be ascertained, but the impact of the abdomen or of the falling drops of water would seem sufficient to break the surface film and allow the eggs to sink. The females repeated this slapping performance several times at intervals of a few seconds before circling and flying away.

*Brechmorhoga mendax* (Hagen)

Jeff Davis Co.: Davis Mts., Limpia Canyon (Granger's Ranch), 1♂, June 25, 1931, LKG. Phantom Lake, 2♂ 1♀, June 1, 1916, FMG. Presidio Co.: Presidio, 1♀, Aug. 13, 1929, ERT.

*Dythemis fugax* Hagen

Jeff Davis Co.: Phantom Lake, 1♀, June 16 and 1♂ 1♀, July 12, 1916, FMG.

*Erythemis collocata* (Hagen)

(Plate II, Figs. 14-15)

Brewster Co.: Garden Spring, south of Marathon, 1♀, July 15, 1930, LKG. Hot Springs, 1♂, Oct. 4, 1935, HKG. Jeff Davis Co.: Phantom Lake, 1♀, May 26; 2♂ 1♀, June 16; 1♂ 3♀, June 9; 1♂, June 21, 1916, FMG.

Apparently *Erythemis collocata* is much more abundant in western Texas than is *E. simplicicollis*, but this may vary according to season. On October 4, at a place where both species were flying together, H. K. Gloyd collected three specimens of the latter and only one of the former. Such a small series may or may not be indicative of the relative numbers of the two species at that time of year.

In 1930, as we traveled the highway in the midst of desert conditions, we came quite suddenly upon a most unusual rather small area beside the road about ten miles south of Marathon, known as Garden Spring. A small stream, less than a foot deep and from two to five feet wide, flowed around a low hillside and for a short distance near the highway before it disappeared underground. At one place where the stream was widest, it supported a small group of desert willows, about five feet tall, as well as a rich growth of grasses and other low plants. The air was alive with darting and dashing dragonflies. We collected here only a few minutes about 10:30 A.M., just long enough to capture at least one specimen of each species seen, namely, *Erythemis collocata*, *Libellula comanche*, *Orthemis ferruginea*, *Pla-*

*themis subornata*, and *Anax junius*. In 1937, J. Van Tyne and W. F. Blair found *Argia nahuana*, *A. immunda*, and *Hesperagrion heterodoxum* here also.

*Erythemis simplicicollis* (Say)

(Plate II, Figs. 13, 16)

Brewster Co.: Hot Springs, 3♂, Oct. 4, 1935, HKG.

In the teneral state, *Erythemis simplicicollis* can be readily distinguished from the more robust *E. collocata* by the color pattern of the abdomen. In *simplicicollis* (Pl. II, Fig. 16) a well-defined black patch occupies the apical half (one-third of segment 4 in some specimens) to two-thirds of the dorsum of segments 4–6; the middorsal carina is narrowly margined with black on the apical part of segment 2, the full length of segment 3, and basal to the black patches on segments 4–6; and segments 7–9 are suffusely or entirely black except for a geminate spot on the dorsum of 7. In *collocata* (Pl. II, Fig. 15) the black stripe of the middorsal carina is irregular in outline, the basal part is broader than that of *simplicicollis*, and on each of segments 6–9 or 7–9, widens from base to apex to form an irregular triangular area; the pale spots on segment 7, if present, are widely separated on the dorsum. In both species the brilliant green and black pattern of teneral adults becomes completely obscured with age as a result of the development of a dark grape-blue or pruinulent blue coloration of the entire body. These dark-colored adults can be separated on the basis of structural characters. One of the most obvious characters that is common to both males and females is the proportion of width to length of the abdominal segments. For example, on segment 4 the width of the ventral portion of the tergite on each side between the lateral and ventral carinae in *simplicicollis* is about one-sixth the total length of the segment (Pl. II, Fig. 13); in *collocata* the width of this part is between one-fourth and one-third the length (Pl. II, Fig. 14).

*Erythrodiplax connata connata* (Burmeister)

Brewster Co.: Glenn Springs, 3♂, July 13, 1930, LKG. Hot Springs, 3♂, Oct. 4, 1935, HKG. Presidio Co.: Presidio, 2♂, Aug. 23, 1929, ERT.

The specimens from Glenn Springs and Presidio were determined by Borror (1942:178). Although usually considered a pond species, at Glenn Springs *Erythrodiplax connata connata* was found on or near a small stream emerging from springs in a wide arroyo.

*Erythrodiplax umbrata* (Linné)

Brewster Co.: 7 miles east of Basin, Chisos Mts., 1 ♀, Aug. 2, 1937, WN. 6 miles east of Chisos Mts., waterhole on Boquillas Road, 1 ♀, Aug. 7, 1937, WN.

In southern Texas ponds support large populations of *Erythrodiplax umbrata*. In the western part of the state the species is not common and I believe the above are the westernmost records for the United States.

*Libellula comanche* Calvert

Brewster Co.: Garden Spring, south of Marathon, 2 ♂ 2 ♀, July 15, 1930, LKG. Hot Springs, 2 ♂, Oct. 4, 1935, HKG. Jeff Davis Co.: Phantom Lake, 1 ♂, June 1; 1 ♂ 2 ♀, June 9; 1 ♀, June 15; 1 ♂, June 16; 1 ♂, July 11; and 2 ♂ 1 ♀, July 13, 1916, FMG. Davis Mts., Limpia Canyon (Granger's Ranch), 2 ♂, July 4, 1930, LKG.

*Libellula comanche* is sometimes confused with *L. cyanea* Fabricius because both species have bicolored pterostigmas. They are easily distinguished by the white face of the former and the black face of the latter. Both species occur in Texas but records indicate that *cyanea* is limited to the northeastern counties.

*Libellula luctuosa* Burmeister

Jeff Davis Co.: Phantom Lake, 1 ♀, June 1; 1 ♂, June 5; 1 ♀, June 9; 3 ♂, June 15; 1 ♂, June 16; and 1 ♂, July 11, 1916, FMG.

*Micrathyria hageni* Kirby

Brewster Co.: 6 miles east of Chisos Mts., waterhole on Boquillas Road, 3 ♂ 1 ♀, Aug. 7, 1937, WN.

*Orthemis ferruginea* (Fabricius)

Brewster Co.: Chilicotal Spring, 1 ♂, July 1, 1928, FMG. 6 miles east of Chisos Mts., waterhole on Boquillas Road, 3 ♂, Aug. 7, 1937, WN. Glenn Springs, 3 ♂, July 13, 1930, LKG. Hot Springs, 3 ♂, Oct. 4, 1935, HKG. Garden Spring, south of Marathon, 1 ♂, July 15, 1930, LKG. Jeff Davis Co.: Phantom Lake, 1 ♂, June 16; 1 ♂, July 11; 1 ♂, July 13, 1916, FMG. Presidio Co.: Presidio, 1 ♂, June 30, 1930, ERT.

*Pachydiplax longipennis* (Burmeister)

Jeff Davis Co.: Phantom Lake, 3 ♂ 2 ♀, June 20; 1 ♂ 1 ♀, June 21; and 1 ♂, July 11, 1916, FMG. Presidio Co.: Presidio, 4 ♂, Aug. 23, 1929, ERT.

*Paltothemis lineatipes* Karsch

Brewster Co.: Chisos Mts., Upper Cat-tail Canyon, 4300 ft., 1 ♂, Aug. 3, 1937, KPS. Jeff Davis Co.: Fort Davis, 1 ♀ (teneral), Sept. 27, 1952, RHL.

The only previous record for *Paltothemis lineatipes* in the state is based on a male in the Museum of Comparative Zoology (Calvert, 1898:312). Concerning this specimen Kenneth Christiansen (*in litt.*, May 24, 1951) says, "We have a single specimen from Texas with a Hagen label but no further data save for a mystic tab with the numbers 9/10 on it in red ink."

*Pantala flavescens* (Fabricius)

Brewster Co.: Glenn Springs, 1 ♂, June 16, 1928, FMG. Jeff Davis Co.: Phantom Lake, 1 ♀, June 15, 1916, FMG.

*Pantala hymenaea* (Say)

Jeff Davis Co.: Phantom Lake, 1 ♀, June 15; and 1 ♂, July 14, 1916, FMG. Presidio Co.: Marfa, 1 ♂, 1925, OCP.

*Plathemis subornata* Hagen

Brewster Co.: Garden Spring, south of Marathon, 7 ♂ 3 ♀, July 15, 1930, HMS and LKG; 2 ♂, April 16, 1937, WFB. Jeff Davis Co.: Phantom Lake, 8 ♂ 4 ♀, May 26; 2 ♂ 1 ♀, June 6; 2 ♂ 1 ♀, June 9; 1 ♀, June 15; 1 ♂, July 13; and 1 ♀, July 16, FMG. Presidio Co.: Candelaria, 1 ♀, Oct. 16, 1928, ERT. Chinati Mts., 1 ♂, Sept., 1931, ERT (Tinkham, 1934, as *P. lydia*).

Mature males of *Plathemis subornata* are frequently mistaken for *P. lydia* (Drury), because there is apparently only one black band across each wing. If a specimen of *subornata* is held so that light comes through the wings, one can readily see that the proximal and distal margins of the bands are much darker and correspond to the two dark bands of teneral specimens. In *lydia* this broad dark band is uniform in color. The females of the two species are usually not confused, because the wing tips are clear in *subornata* and black in *lydia*.

*Pseudoleon superbus* (Hagen)

Brewster Co.: Glenn Springs, 1 ♂, June 20, 1928, FMG. Jeff Davis Co.: Davis Mts., Limpia Canyon, 1 ♂, July 5, 1930, HKG.

The only specimen of *Pseudoleon superbus* seen in Limpia Canyon was taken at a small pool in the semidry stream bed near the base

of a cliff not far above the place where the water came to the surface to form the small stream described under *Aeshna dugesi*.

*Sympetrum corruptum* (Hagen)

Brewster Co.: Glenn Springs, 1 ♀, June 17, 1928, FMG. Hot Springs, 4 ♂, Oct. 4, 1935, HKG. Chisos Mts., 1 ♂, Sept. 29, 1935, HKG. Jeff Davis Co.: Phantom Lake, 3 ♂, June 15, and 1 ♀, July 14, 1916, FMG. Limpia Creek, 2-3 miles north of Ft. Davis, 2 ♀, Oct. 7, 1935, HKG. Musquiz Creek, 6.5 miles southeast of Ft. Davis, 9 ♂ 1 ♀, Oct. 8, 1935, HKG.

*Tramea lacerata* Hagen

(Plate III, Fig. 17)

Jeff Davis Co.: Phantom Lake, 1 ♂, July 13, 1916, FMG. Limpia Canyon, Davis Mts., 2 ♂, "Gottholt Bros." (listed by Tinkham 1934: 217, as *carolina* Linné).

It is often difficult to identify specimens of *Tramea lacerata*, *T. carolina*, and *T. onusta* by the color or by the size and shape of the basal spot of the hindwings. In life, especially when they are flying in bright sunshine, *carolina* and *onusta* are distinctly red species, and *lacerata* is dark brown or black with purple reflections. In preserved specimens, the red wing spots appear to be brown, and often the red of the body also will appear to be brown. In size and shape the basal wing spots are most similar in *lacerata* and *carolina*, although, especially in the females, specimens of *carolina* with reduced spots can easily be confused with *onusta*. These three species may be distinguished by other characters as follows:

1. Male, hamules shorter than lateral lobes of abdominal segment 2, inferior abdominal appendage less than 1/2 the length of the superiors; female, vulvar lamina short (about 1/2 of segment 9), with a distinct marginal lobe or protuberance at mid-length on each side of the median cleft (Pl. III, Fig. 17) . . . . . *lacerata*
- 1'. Male, hamules as long or longer than lateral lobes of abdominal segment 2, inferior abdominal appendage more than 1/2 the length of the superiors; female, vulvar lamina more than 1/2 the length of segment 9, no lobe or protuberance on margin of median cleft (Pl. III, Figs. 18 and 19) . . . . . 2
2. Male, hamules only as long or very slightly longer than lateral lobes of abdominal segment 2; female, vulvar lamina two-thirds the length of segment 9 (Pl. III, Fig. 18) . . . . . *carolina*
- 2'. Male, hamules about one-third longer than lateral lobes; female, vulvar lamina subequal in length to segment 9 (Pl. III, Fig. 19) . . . . . *onusta*

*Tramea onusta* Hagen

(Plate III, Fig. 19)

Jeff Davis Co.: Phantom Lake, 2♂, June 15; and 1♂ June 16, 1916, FMG. Limpia Canyon, Davis Mts., 1♂, July 5, 1930, HKG.

## CALOPTERYGIDAE

*Hetaerina americana* (Fabricius)

Brewster Co.: Hot Springs on the Rio Grande, 1♀, Oct. 4, 1935, HKG. Jeff Davis Co.: Davis Mts., Limpia Canyon, 1♀, Oct. 5, 1929, ERT. 1 mile north of Ft. Davis, 1♀, May 12, 1937, WFB. Limpia Creek, 2-3 miles north of Ft. Davis, 2♂ 1♀, Oct. 7, 1935, HKG. Musquiz Creek, 6.5 miles southeast of Ft. Davis, 4♂, Oct. 8, 1935, HKG. Phantom Lake, 1♂ 2♀, June 9; 1♂ 3♀, June 16; and 1♂ 1♀, July 13, 1916, FMG.

## LESTIDAE

*Archilestes grandis* (Rambur)

Brewster Co.: Chilicotol Spring, 1♂, July 1, 1928, FMG. Glenn Springs, 1♀, June 21, 1928, FMG. Jeff Davis Co.: Davis Mts.—Cherry Canyon, 2♂, July 8, 1916, FMG; Limpia Canyon, 1♂ (incomplete), Oct. 5, 1929, ERT; near Miter Peak, 1♂, Oct. 6, 1935, HKG. Musquiz Creek, 6♂ 3♀, Oct. 8, 1935, HKG.

*Lestes alacer* Hagen

Jeff Davis Co.: Ft. Davis, 1♀, March 30, 1937, WFB. Phantom Lake, 1♂, May 26; 2♂ 2♀, June 15; 4♂, July 11, 1916, FMG.

*Lestes disjunctus* Selys

Jeff Davis Co.: Davis Mts., near Miter Peak, 1♂, Oct. 6, 1935, HKG.

## AGRIONIDAE

*Argia hinei* Kennedy

Brewster Co.: Chisos Mts.—1♀, July 12, 1930, LKG; 2♂ 2♀, July 17, 1930, ERT (Tinkham, 1934, listed as *violacea*); Upper Cat-tail Canyon, 4300 ft., 1♂ 2♀, Aug. 3, 1937, KPS. Glenn Springs, 2♂, July 13, 1930, LKG.

*Argia hinei* is so closely related to *A. violacea* Hagen that it is difficult to distinguish them at first except by direct comparison. *A. hinei* is a more slender species, its violet color is usually more delicate and orchid-like, and there are slight but distinct differences of diagnostic



value between the two species in the shape of the abdominal appendages of the males and of the vulvar laminae of the females. In the male of *hinei*, each superior appendage (in dorsal view) has the apical margin from base of mesal thumblike projection to lateral apical angle distinctly convex; in *violacea*, this apical margin (exclusive of sensory hairs) is almost straight. In the female of *hinei*, the mesocaudal extension of each mesostigmal lamina is prolonged, columnar, and almost erect, and has no small knob or tubercle at base; in *violacea*, this extension is flat and there is a small knob near the mesal margin at base (best seen from an oblique lateral view of the projection). Both species have been taken in the Big Bend Region, but not during the same month. The above are the easternmost United States records for *hinei*.

*Argia immunda* (Hagen)

Brewster Co.: Glenn Springs, 2♂, July 13, 1930, LKG. Hot Springs on the Rio Grande, 1♂, July 12, 1930, LKG; 9♂ 2♀, Oct. 4, 1935, HKG. Garden Spring, south of Marathon, 1♂, April 16, 1937, WFB. Jeff Davis Co.: Davis Mts., Cherry Canyon, 1♀, June 28, 1916, FMG. Musquiz Creek, Oct. 8, 1935, 1♂, HKG.

*Argia moesta* (Hagen)

Brewster Co.: Boquillas, 2♂ 5♀, Aug. 10, 1937, WN. Chilicotal Spring, 2♂, July 1, 1928, FMG. Hot Springs on the Rio Grande, 4♂ 2♀, July 12, 1930, LKG; 1♀, Oct. 4, 1935, HKG. 6 miles east of Chisos Mts., waterhole on Boquillas Road, 2♀, Aug. 7, 1937, WN. Jeff Davis Co.: Musquiz Creek, 1♂, Oct. 8, 1935, HKG.

*Argia moesta* is quite variable in the amount of dark coloration, especially on the thorax. I have been unable to detect any specific structural differences or any distributional pattern or geographic range of subspecific significance and am inclined to believe that the extent of dark areas may be due to external factors during nymphal growth or possibly during the teneral adult state. I agree with Williamson (1912:200) and with Walker (1953:128) that the dark form *A. putrida* (Hagen) should be regarded as a synonym of *moesta*.

*Argia munda* Calvert new status

*Argia vivida* var. *munda* Calvert, 1902:96.

*Argia rita* Kennedy, 1919:17-18. New synonymy.

Jeff Davis Co.: Ravine (part of Limpia Creek drainage) north of Fort Davis, 1♂, August 3, 1953, GWB.

According to George W. Byers (letter of January 28, 1957), the specimen of *Argia munda* that he collected was found behind the ruins of Old Fort Davis in a ravine having no more than a trickle of water. The region was one of junipers, scrubby oaks, acacia-like shrubbery, prickly pear, and bushy opuntias. The time of collection was between 1:00 and 2:00 P.M. and the temperature was 108° F. The *Argia* was one of few insects found and collected in this place. Previously, *Argia munda* has been known only from Arizona and Mexico.

Calvert (1902:96) described *munda* as a variety of *Argia vivida* Hagen. Had he not omitted, through an unaccountable oversight, comparing the mesostigmal laminae of the females in the type series with those of *A. vivida* and *A. plana*, he would have recognized the specific distinctness of this *Argia* immediately. Not only does the female of *munda* differ from the females of the other two in the shape of the laminae but also in having a deep mesothoracic pit adjacent to each lamina. A female from the Santa Rita Mountains in Arizona, described by Kennedy (1919: 17-18, Figs. 3-5) as *Argia rita*, is identical to the females of *munda* in coloration, in shape of the mesostigmal laminae, and in the position of the deep mesothoracic pits. I compared specimens of this species with the type female of *rita* in the Snow Museum at the University of Kansas and with types of *munda* in the Museum of Comparative Zoology at Harvard College and consider them conspecific. Accordingly, *Argia rita* Kennedy is here regarded as a new synonym of *munda* Calvert.

The superior appendages of *munda* males are dome-shaped, somewhat like halves of a hollow rubber ball as seen in lateral view, and each has a prominent, pointed apical tooth. The tori differ from those in *Argia plana* and *A. vivida* (Pl. III, Figs. 21-22) in that they are transversely elongate and confined to the apical ridge of each side of the torifer. The penis differs from those of the other two species in having the terminal membranous portion broad and rounded—not tapered or thickened at the apex.

*Argia nahuana* Calvert, new status

(Plate III, Fig. 20)

*Argia argioides* var. *nahuana* Calvert, 1902:99-100.

Brewster Co.: Garden Spring, south of Marathon, 10♂ 6♀, April 16, 1937, WFB and JVT. Jeff Davis Co.: Davis Mts., Limpia Canyon (Granger's Ranch), 1♂, July 4, 1930; 1♂, June 25, 1931, LKG. Limpia Creek, 2-3 miles north of Ft. Davis, 8♂ 2♀, Oct. 7, 1935, HKG. Mus-

quiz Creek, 3♂, Oct. 8, 1935, HKG. Phantom Lake, 10♂ 7♀, FMG. Presidio Co.: Marfa, 3♂, Nov. 11, 1925, OCP.

The name *nahuana* (Calvert 1902:99-100) was first applied to some dark-patterned specimens from Mexico which were considered to represent a variety of *Argia agrioides* Calvert. My study of the type material indicates that *nahuana* differs in structural characteristics from *agrioides* and should be raised to specific rank. The most conspicuous differences are in the size and shape of the tori at the apex of the tenth abdominal segment of the males (Pl. III, Fig. 20) and in the shape of the mesostigmal laminae of the females. In *nahuana* males, the tori are each more than three times as wide as long and are narrowly separated middorsally by about the length of one torus; in the females the mesally directed extensions of the mesostigmal laminae are separated middorsally by a distance of about 0.2 mm. In *agrioides* males, the tori are only about twice as wide as long and are widely separated, by slightly less than the width of one torus; in the females, the distance between the extensions of the mesostigmal laminae is about 0.5 mm. The Texas specimens have a reduced black color pattern but otherwise seem to be identical with *nahuana*. According to my data the range of *agrioides* Calvert is limited to Baja California; that of *nahuana* is more extensive, including California, Arizona, New Mexico, Oklahoma, Texas, and Mexico.

*Argia plana* Calvert, new status

(Plate III, Fig. 22)

*Argia vivida* var. *plana* Calvert, 1902:96.

Brewster Co.: Chisos Mts.—foothills, 2♂ 1♀, July 12, 1930, LKG; Juniper Canyon, 4700 ft., 2♂, Aug. 1937, WN; Upper Juniper Spring, 1♂, June 29, 1928, FMG. Jeff Davis Co.: Davis Mts.—Elev. 8-9000 ft., 1♂ 1♀, Oct. 3, 1931, ERT (Tinkham, 1934:218; the ♀ was recorded as *Lestes unguiculatus* Hagen); Cherry Canyon, 1♂ 2♀, June 29, and 1♂ 3♀, July 1, 1916, FMG; Limpia Canyon (Granger's Ranch), 1♂, July 4, 1930, and 3♂ 1♀, June 25, 1931, LKG. Ft. Davis, 1♂, April 14, 1937, JVT. 1 mile north of Ft. Davis, 1♀, May 7; 2♂, May 10; and 1♂, May 12, 1937, WFB. Limpia Creek, 4♂ 4♀, Oct. 7, 1935, HKG. Musquiz Creek, 1♂ 3♀, Oct. 8, 1935, HKG. Phantom Lake, 2♂, June 21, 1916, FMG.

*Argia plana* was described (Calvert, 1902:96) as a variety of *A. vivida* Hagen largely on the basis of a difference in color. The blue areas of *vivida* were violet in the corresponding areas of *A. plana*, and the females of the latter had a short inferior black stripe on the apical

half of each side of abdominal segments 8 and 9. In the Big Bend Region, some violet specimens, some blue, and some showing both colors in the same individual were taken. Comparison of typical *vivida* from California with *plana* from Arizona has resulted in the discovery of structural characters which can be used to separate them. In *vivida* males, the downwardly directed apical part of each superior abdominal appendage is long and tapered gradually to a point (Pl. III, Fig. 21), whereas in *plana*, this part is short and narrowed abruptly immediately beyond the angulation (Pl. III, Fig. 22). In *vivida* females, the dorsolateral indentation on each side of the middle lobe of the prothorax is shallow and its long axis is subparallel to the suture between the middle and hind lobes; in *plana*, this indentation is deeper, oblique, and confluent posterolaterally with the suture between the middle and hind lobes. All the specimens examined from the Big Bend Region have the structural characters of *plana*. A preliminary study of more than a hundred specimens of *vivada* and of *plana* indicates that *plana* should be given specific rank and that all specimens taken in the region between the Mississippi River and the Rocky Mountains, some of which have been recorded in the literature by various authors as *vivida*, are actually a blue form of *plana*.

*Argia sedula* (Hagen)

Jeff Davis Co.: Phantom Lake, 1 ♂, June 9, 1916, FMG.

*Argia violacea* (Hagen)

Jeff Davis Co.: Musquiz Creek, 1 ♂, Oct. 8, 1935, HKG.

Taxonomic notes for *Argia violacea* are included under *A. hinei*.

*Hyponeura lugens* (Hagen)

Brewster Co.: Chisos Mts.—1 ♂ (incomplete), July 17, 1930, ERT; Upper Cat-tail Canyon, 4300 ft., Aug. 3, 1937, KPS. Jeff Davis Co.: Davis Mts., Limpia Canyon, 2 ♂ 4 ♀, July 4 and 1 ♂ 3 ♀, July 5, 1930, LKG. Limpia Creek, 2 ♂, Oct. 7, 1935, HKG. Musquiz Creek, 6 ♂ 4 ♀, Oct. 8, 1935, HKG. Phantom Lake, 2 ♂ 2 ♀, June 1, 1916, FMG.

In Limpia Canyon, individuals of this large zygopteran species were found only on the rocky bank of the north branch near the fork of the stream (see under *Aeshna dugesi*).

*Enallagma civile* (Hagen)

Brewster Co.: Chisos Mts.—1♂ 5♀, Sept. 29, 1935, HKG; 7 miles east of Basin, 1♂, Aug. 2, 1937, WN. 6 miles east of Chisos Mts., 2♂ 2♀, Aug. 1937, WN. 6 miles southeast of Chisos Mts., waterhole on Boquillas road, 6♂ 1♀, Aug. 7, 1937, WN. Hot Springs on Rio Grande, 4♂, Oct. 4, 1935, HKG. Jeff Davis Co.: Davis Mts., Limpia Canyon, 1♂, June 24, 1931, LKG. Musquiz Creek, 6♂, Oct. 8, 1935, HKG. Phantom Lake, 1♂ 1♀, June 9; 1♂, June 15; 1♂ 1♀, June 21, 1916, FMG.

*Enallagma praevarum* (Hagen)

Jeff Davis Co.: Musquiz Creek, 28♂ 4♀, Oct. 8, 1935, HKG.

*Hesperagrion heterodoxum* (Selys)

Brewster Co.: Garden Spring, south of Marathon, 1 teneral ♀, April 16, 1937, JVT and WFB. Jeff Davis Co.: Davis Mts.—Limpia Canyon, 1♂, June 24 and 2♂, June 25, 1931; 6♂ 4♀, July 4 and 3♂ 1♀, July 5, 1930, LKG; near Miter Peak, 1♂ 1♀, Oct. 6, 1935, HKG; Limpia Creek, 1♂ 6♀, Oct. 7, 1935, HKG. Musquiz Creek, 17♂ 11♀, Oct. 8, 1935, HKG. 1 mile north of Ft. Davis, 3♂ 5♀, May 7; 4♂ 6♀, May 10; and 12♂ 9♀, May 12, 1937, WFB. Presidio Co.: Marfa, 3♂ 2♀, Nov. 11, 1925, OCP.

Preserved specimens of *Hesperagrion heterodoxum* give only a slight indication of the beautiful colors of the living insect. In the male, there are two round bright red spots between the eyes; the thorax, except for dorsal markings of a rich light yellowish brown, is pale yellow above, paler below; abdominal segments 1–3, base of 8, and 9–10 are red-orange dorsally, segments 4–8 are deep rich brown dorsally, and all are yellow laterally. The female has a similar pattern but the spots on the head and the entire dorsum of the body are golden yellow.

*H. heterodoxum* has been previously reported from the Big Bend Region by Ferguson (1942:149), who found it "common along a small spring-fed creek with scarcely any vegetation on its banks on Miter Peak Ranch, Jeff Davis County (April)."

*Ischnura demorsa* (Hagen)

Jeff Davis Co.: Limpia Creek, 2♂, Oct. 7, 1935, HKG. Musquiz Creek, 4♂ 2♀, Oct. 8, 1935, HKG. Phantom Lake, 6♂ 4♀, May 26; 4♀, June 15; 1♀, July 11, 1916, FMG. Presidio Co.: Marfa, 1♂, Nov. 11, 1925, OCP.

*Ischnura denticollis* (Burmeister)

Jeff Davis Co.: Phantom Lake, 2♂ 1♀, May 26, and 1♂ 2♀, June 15, 1916, FMG.

*Telebasis salva* (Hagen)

Brewster Co.: Glenn Springs, 2♂ 1♀, July 13, 1930, LKG. Hot Springs on the Rio Grande, 8♂ 2♀, Oct. 4, 1935, HKG. Jeff Davis Co.: Musquiz Creek, 44♂ 5♀, Oct. 8, 1935, HKG. Phantom Lake, 8♂ 2♀, May 26, and 1♂, July 11, 1916, FMG.

## LITERATURE CITED

- BORROR, DONALD J.  
 1942 A Revision of the Libelluline Genus *Erythrodiplax* (Odonata). Ohio State Univ., Graduate School Studies, Contrib. Zool. and Ent., No. 4, Biol. Ser., pp. xv + 1-286, Pls. 1-41.
- CALVERT, PHILIP P.  
 1898 The Odonate Genus *Macrothemis* and its Allies. Proc. Boston Soc. Nat. Hist., 28 (12):301-32, Pls. 1-2.  
 1901-1908 Odonata. In: Biologia Centrali-Americana. Vol. 50: Neuroptera, pp. i-xxx + 17-420, Pls. 2-10, 1 map.  
 1956 The Neotropical Species of the "Subgenus *Aeschna*" sensu Selysii 1883 (Odonata). Memoirs Amer. Ent. Soc., No. 15, pp. i-v + 1-251 + i-iv, Pls. 1-47, Tables 1-19, Maps 1-7.
- FERGUSON, ALICE  
 1942 Scattered Records of Texas and Louisiana Odonata with Additional Notes on the Odonata of Dallas County. Field and Laboratory, 10(2):145-49.
- GLOYD, LEONORA K.  
 1932 Four New Dragonfly Records for the United States (Odonata). Ent. News, 43:189-190.
- HAGEN, HERMAN  
 1861 Synopsis of the Neuroptera of North America. Washington: Smithsonian Institution. Pp. xx + 1-347.
- KENNEDY, CLARENCE HAMILTON  
 1917 Notes on the Life History and Ecology of the Dragonflies (Odonata) of Central California and Nevada. Proc. U.S. Nat. Mus., 52:483-635, Figs. 1-404.  
 1919 A New Species of *Argia* (Odonata). Can. Ent., 51:17-18, Figs. 3-5.  
 1922 The Phylogeny and Geographical Distribution of the Genus *Libellula* (Odonata). Ent. News, 33:65-111, Pl. 4.
- KIRBY, WILLIAM F.  
 1889 A Revision of the Subfamily Libellulidae with Descriptions of New Genera and Species. Trans. Zool. Soc. London, 12 (Pt. IX, No. 1): 249-348, Pls. 51-57.  
 1890 A Synonymic Catalogue of Neuroptera Odonata, or Dragonflies, with an Appendix of Fossil Species. London: Gurney and Jackson. Pp. ix + 1-202.
- TINKHAM, E. R.  
 1934 The Dragonfly Fauna of Presidio and Jeff Davis Counties of the Big Bend Region of Trans-Pecos, Texas. Can. Ent., 66:213-18.
- WALKER, EDMUND M.  
 1912 The North American Dragonflies of the Genus *Aeshna*. Univ. Toronto Studies, Biol. Ser. No. 11:1-213, Pls. 1-28, Figs. 1-8.  
 1953 The Odonata of Canada and Alaska. Toronto: Univ. Toronto Press. Vol. 1, pp. xi + 1-292, Pls. 1-44.
- WILLIAMSON, E. B.  
 1912 The Dragonfly *Argia moesta* and a New Species (Odonata). Ent. News, 23:196-203.

*Leonora K. Gloyd*

PLATE I

*Aeshna dugesi*. Limpa Canyon, Davis Mountains, Jeff Davis County, Texas, July 5, 1930, L. K. Gloyd.

FIG. 1. Color pattern of hypotype female, in lateral view.

FIG. 2. Dorsum of frons, hypotype female.

FIG. 3. Thoracic color pattern of male.

FIGS. 4-5. Apex of abdomen of female, showing vulvar lamina and appendages, in lateral and ventral views.

FIG. 6. Abdominal segments 1-2 of male, in ventral view.

FIGS. 7-8. Male abdominal appendages, in dorsal and lateral views.

Drawings by the late Grace Eager, Artist, Museum of Zoology.



PLATE I

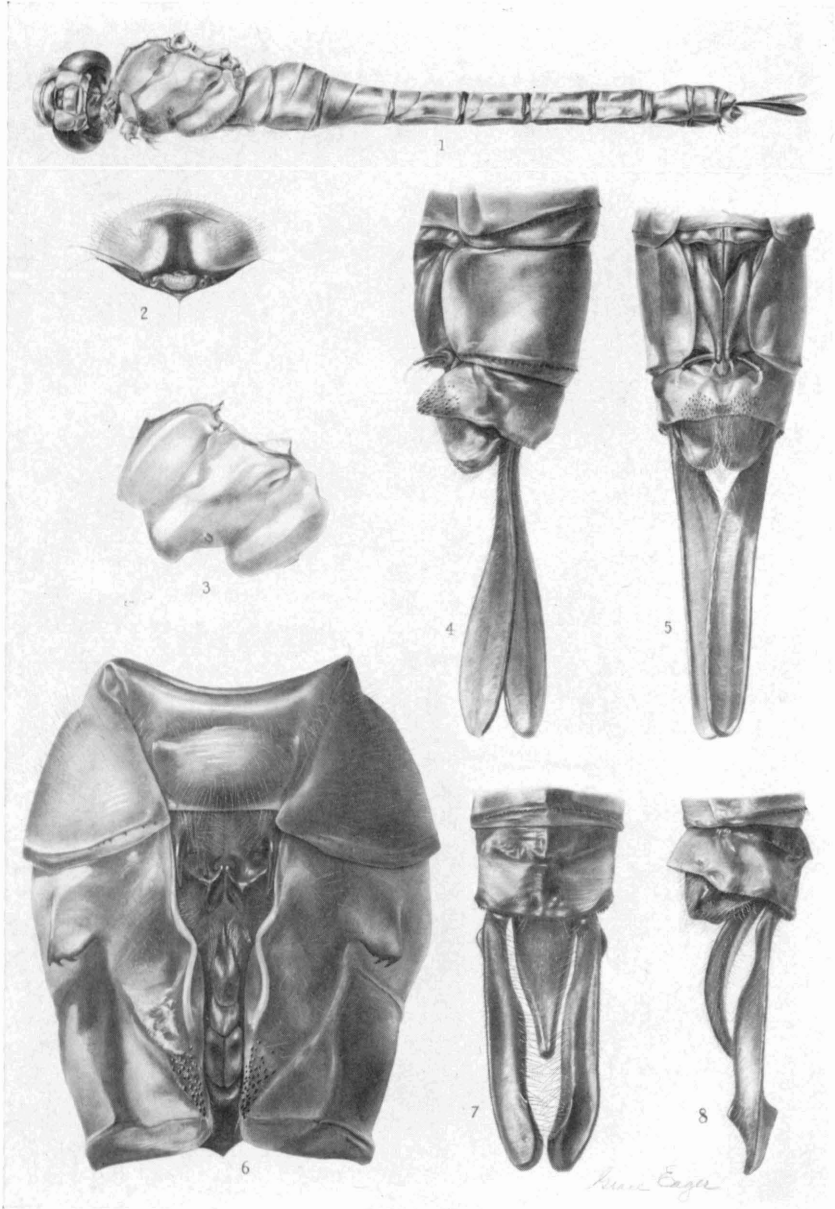


PLATE II

FIGS. 9-10. Ventral view of abdominal segment 4 of male, in *Belonia croceipennis* (Fig. 9) and *B. saturata* (Fig. 10).

FIGS. 11-12. Lateral view of abdominal segment 8 of female, in *Belonia croceipennis* (Fig. 11) and *B. saturata* (Fig. 12).

FIGS. 13-14. Ventral view of abdominal segment 4 of male, in *Erythemis simplicicollis* (Fig. 13) and *E. collocata* (Fig. 14).

FIGS. 15-16. Color pattern of abdomen of teneral female, in *Erythemis collocata* (Fig. 15) and *E. simplicicollis* (Fig. 16). Dorsolateral view and drawn to same scale.

Figures 9-14 are all of the same magnification.

PLATE II

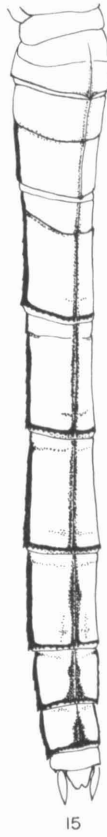
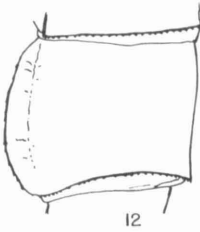
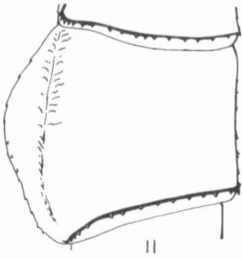
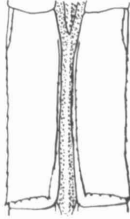
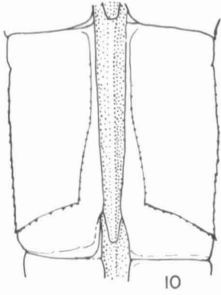
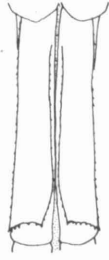
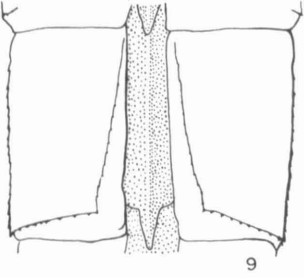


PLATE III

FIGS. 17-19. Ventral view of abdominal segment 8 showing vulvar lamina, in *Tramea lacerata* (Fig. 17), *T. carolina* (Fig. 18), and *T. onusta* (Fig. 19).

FIGS. 20-22. Apex of abdominal segment 10 of male, in *Argia nahuana* (Fig. 20), dorsal view, and *A. vivida* (Fig. 21) and *A. plana* (Fig. 22), oblique dorsolateral view. Since corresponding structures are illustrated in Figures 21-22, only those in Figure 20 are labeled. *inf. ap.*, inferior appendage; *sup. ap.*, superior appendage; *t*, torus (pl. tori), one of a pair of pads or cushion-like structures that apparently aid the male in maintaining a firm hold on the female during copulation and egg laying activities; *ta*, toreola (pl. toreolae), one of the small mounds or swellings on the raised shieldlike area between and usually slightly posterior to the tori; *tf*, torifer, dorsal, indented area, at the apex of segment 10, bearing the tori and toreolae. Specimens drawn in the position in which structures can most easily be seen under the microscope, that is, with the tip of abdomen tilted upward and directed slightly to the right of the source of light.

PLATE III

