

**THE GENUS DIKRANEURA—A STUDY OF THE MALE
GENITALIA—WITH DESCRIPTIONS OF NEW SPECIES.**

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The Genus *Dikraneura* as known previously has now been separated into a number of distinct groups, genera and subgenera, by several authors. The whole group of species known at that time was treated by Gillette as *Dikraneura* in 1898.¹ In 1925² Ball and DeLong erected the Genus *Alconeura* and treated the species of this group and *Dikraneura*. In 1926³ McAtee described the Genus *Hyloidea* and the type species. In 1929⁴ Lawson erected the Genus *Dikraneuroidea* describing the type of the species and in 1930⁵ he described several new species of *Dikraneura*. In 1934⁶ and 1936,⁷ Beamer described some new species of *Dikraneura* and *Alconeura*. In 1936⁸ DeLong and Caldwell described the Genus *Forcipata* and several new species belonging to that group. The internal male genitalia were illustrated in this latter paper, but have not been used for other genera and subgenera. The present treatment is an attempt to study the group by the aid of the male genitalia and has helped us gain a much better idea of the relationships of the species and characters which distinguish them.

KEY TO DIKRANEURA AND CLOSELY ALLIED GENERA AND SUBGENERA.

1	Second pair of wings with two closed apical cells.....	2
1'	Second pair of wings with one closed apical cell.....	7
2 (1)	Second apical cell of elytra pedunculate basally.....	3

¹ Gillette, C. P. Proc U. S. Nat. Mus. 20 : 715-724, 1898.

² Ball, E. D. and DeLong, D. M. Anns. Ent. Soc. Amer. 18 : 324-337, 1925.

³ McAtee, W. L. Jour. N. Y. Ent. Soc. 34 : 162, 1926.

⁴ Lawson, P. B. Bull. Brooklyn Ent. Soc. 24 : 307-308, 1929.

⁵ Lawson, P. B. Can. Ent. 62 : 35-42, 1930.

⁶ Beamer, R. H. Can. Ent. 66 : 15, 1934.

⁷ Beamer, R. H. Can. Pac. Ent. 12 : 7-8, 1936.

⁸ DeLong, D. M. and Caldwell, J. S. Anns. Ent. Soc. Amer. 29 : 70-77, 1936.

- 2' Second apical cell of elytra not pedunculate, with cross vein at base.....4
- 3 (2) Head flattened and wider than pronotum.....*Hyloidea*
- 3' Head not flattened, cylindrical, not wider than pronotum.....*Alconeura*
- 4 (2') Male plates cylindrical proximal at base and apex but widely separated at middle. Elytra with cross vein of first apical cell wanting, second cross vein more caudal than third.....*Forcipata*
- 4' Male plates flat, triangular, usually contiguous for at least half their length, not widely separated at middle. Elytra with cross vein of first apical cell present.....5
- 5 (4') Second and third cross veins decidedly caudal to first and fourth cross veins.....6
- 5' First cross vein and sometimes fourth as nearly caudal or more so than second and third cross veins.....*Dikraneura*
- 6 (5) Male plates long, acutely pointed at apex, female segment entire.....*Notus*
- 6' Male plates very short and broad, female segment not entire, represented only by lateral lobate portions, vertex rounded or bluntly angled.....*Curta*
- 7 (1') Cross veins of elytra forming almost a straight line, second apical cell pedunculate, body form flattened.....*Dikraneuroidea*
- 7' Cross veins of elytra not forming a straight line, body form not flattened.....8
- 8 (7') Elytra with third apical cell parallel sided or quadrate.....*Idona*
- 8' Elytra with third apical cell bounded by curved veins which form an irregular shaped cell but not quadrate.....*Typhlocybella*

KEY TO SPECIES OF SUBGENUS DIKRANEURA.

- 1 Conspicuously marked with red coloration or with red bands or stripes.....2
- 1' Usually white, yellow or brown, not marked with red.....8
- 2 (1) Vertex pronotum and elytra with red spots or dots.....*maculata*
- 2' Red coloration usually in form of spots or bands.....3
- 3 (2') With a red transverse band across elytra just before middle.....*cockerelli*
- 3' Without reddish transverse band.....4
- 4 (3') Vertex, pronotum and claval area almost uniform dark red.....*rubens*
- 4' Elytra usually with short oblique reddish bands.....5
- 5 (4') Deep yellow with oblique stripes dark red.....var. *nevadensis*
- 5' Pale yellow, or white tinged with yellow, red oblique stripes lighter in color.....6
- 6 (5') Male oedagus with a dorsally directed median portion, bearing a caudally directed terminal process, apical portion short, directed caudally.....*californica*
- 6' Apical portion of oedagus long, slender, curved dorsally and caudally.....7
- 7 (6') Dorsally directed portion of oedagus with paired processes on caudal portion.....*pusilla*

7'	Dorsally directed portion of oedagus without processes on caudal portion.....	<i>cruentata</i>	
8 (1')	White with a black spot on inner angle of first apical cell of elytra (described from unique female, male unknown).....	<i>mera</i>	
8'	Usually yellowish or green in color, sometimes tinged with tan, without black spots in outer cell of elytron.....		9
9 (8')	Male plates with an enlargement about middle on outer margin, each bearing a pair of conspicuous tooth-like structures.....	<i>readionis</i>	
9'	Male plates normal in form without enlargement or tooth-like structures.....		10
10 (9')	Color bright or pale yellow.....		11
10'	Color dark greenish brown, orange or tan.....		13
11 (10')	Veins of elytra darkened just before cross veins, genitalia as in <i>californica</i>	<i>californica</i> var. <i>imbellus</i>	
11'	Veins of elytra not darkened before cross veins, oedagus with long slender dorsally directed processes.....		12
12 (11')	Basal dorsally directed portion of oedagus consisting of one broad dorsal process, a pair of broad dorsal processes and a pair of ventral processes.....	<i>aurulenta</i>	
12'	Basal dorsally directed process consisting of a narrow single portion, without paired processes.....	<i>sandersi</i>	
13 (9')	Dull brownish green, two white transverse bands on margin of vertex bordered by narrow black lines. Spine of ninth segment in male heavy, arising at caudal margin of segment and curving dorsally and outwardly.....	<i>marginella</i>	
13 (12')	Vertex, pronotum and scutellum tan or orange, pale margin on vertex not well defined, spine of ninth segment, broad, short, not extending beyond caudal margin of segment.....	<i>kunzei</i>	

The male of *mera* is unknown and consequently could not be illustrated. Also in the January, 1936 number of the Pan Pacific Entomologist Dr. Beamer described two species of this group, *aegra (mera)* Beamer which resembles *maculata*, and *santana* (closely related to *rubens*) which have not been examined nor included in this study.

Dikraneura maculata Gill.

D. maculata Gill. Proc. U. S. Nat. Mus., XX, p. 716, 1898.

D. celtidis Obs. Ohio Biol. Surv. Bull. 14, p. 344, May, 1928.

Male oedagus with a short, dorsally directed basal process and a long narrow sharply angled apical process which also extends dorsally. Styles with a narrow basal third and the apical two thirds broader, apex curved from outer margin to produced inner margin. Spines of ninth segment long, curving ventrally and caudally.

Eastern United States on hackberry.

Dikraneura cockerelli Gill.

D. cockerelli Gill. Psyche 7 : Supp. p. 14, 1896.

Male oedagus with a very short narrow basal process arising from base of apical portion which is long and broad with apex forming three processes. A central anteriorly curved portion is the terminus of the oedagus and on each side arises a more slender dorsally and laterally directed process. Styles narrow on basal half, apical half broad, a pointed spine-like process arising on inner portion and directed inwardly beyond apex. Spines of ninth segment long, arising on dorsal portion tapering to sharp pointed apex directed caudally and curved outwardly.

Known only from the Southwestern United States.

Dikraneura rubens Beamer.

D. rubens Beamer, R. H. Can. Ent. 66 : 16, 1934.

Male oedagus with the basal process narrowed at base, then enlarged directed dorsally and slightly curving anteriorly. Apical portion long, filamentous directed dorsally and inwardly, the two pieces crossing before their middle. Styles with narrow basal half, apical half broader with a long inwardly directed pointed process arising just before apex. Spine of ninth segment wanting.

Known from specimens from Arizona only.

Dikraneura pusilla Lawson.

D. pusilla Lawson. Can. Ent. 62 : 37, 1930.

Male plates long, tapered to narrow but blunt apices. Oedagus with a short dorsally produced process at base. A median process also extends dorsally about twice the distance of basal process and bears two pairs of processes on the caudal side. One pair is long and extends dorsally, the other is short and extends caudally. The apical portion consists of a single process which is long and extends dorsally and caudally. Styles narrow on basal half and broadened on apical half with a curved finger-like process extending inwardly and caudally on inner margin. Spine of ninth segment long, narrow, extending caudally and ventrally.

Known to occur only in Texas.

Dikraneura cruentata Gill.

D. cruentata Gill. Proc. U. S. Nat. Mus. 20 : 717, 1898.

D. kansiensis Lawson. Can. Ent. 62 : 38, 1930.

Male plates narrowed to blunt apices. Oedagus with a basal process which extends dorsally is enlarged on apical half and bears a posterior rounded and dorsally directed lobe. Ventral portion broadly curving to form a long very slender apical portion which extends dorsally and caudally. Styles long, basal half narrow, apical half broad, posterior margin concavely rounded, forming a pointed process on outer margin and a longer produced finger-like process on inner margin; spine of ninth segment long, narrow, arising dorsally and directed caudally and ventrally, a dorsal tooth at about the middle.

Common in eastern United States and reported from Colorado and California.

Dikraneura readionis Lawson.

D. readionis Lawson. Can. Ent. 62 : 39, 1930.

Plates long, narrowed to blunt apices which are divergent, an enlargement about middle on outer margin of each bears a pair of conspicuous tooth-like structures. Oedagus with a short rounded, dorsally produced basal process bearing on its posterior margin a pair of slender dorsally directed processes. Apical portion consisting of a pair of extremely long slender, curving, dorsally directed processes as long as anal tube. Styles long, narrow on basal half, apical half broad, with a long blunt finger process on inner margin. Spine of ninth segment short, slender, with apex curved upwardly.

Known only from Arizona.

Dikraneura californica var. **imbellis** Lawson.

D. californica var. *imbellis* Lawson. Can. Ent. 62 : 37, 1930.

Male plates long, rather gradually and concavely narrowed on apical half to blunt apices. Oedagus with a basal dorsally directed process, a central portion extending dorsally with a long caudally directed apex and an apical portion which extends caudally and is tapered to a pointed apex. Styles narrow on basal half and broad on apical half with a rather long inwardly directed process on inner margin. Spines of ninth segment long, arising on dorsal portion of segment, extending caudally with apical half bent ventrally and caudally.

Collected only in California.

Dikraneura aurulenta Lawson.

D. aurulenta Lawson. Can. Ent. 62 : 41, 1930.

Male plates long and broad, only slightly narrowed before apex. Male oedagus complicated in form consisting of a single and three pairs of processes. The basal process extends dorsally and is composed of a broad pointed process extending anteriorly and a similar one on the posterior side extending dorsally. Just below this a pair of similar portions extend dorsally on either side of the posterior process and still below the base of these a pair of small processes extend ventrally and curve posteriorly. The apical portion of the oedagus is composed of a pair of long curved slender processes arising at the base and extending dorsally beyond the processes of the basal portion. Styles long, narrow, the apical portion more strongly narrow to apex, which is enlarged and produced inwardly where the pointed apices almost touch. Spine of ninth segment broad, pointed at apex and extending caudally almost to caudal margin of segment.

Known to occur only in Texas.

Dikraneura sandersi Ball & DeL.

D. sandersi Ball & DeL. Anns. Ent. Soc. Amer. 18 : 332, 1925.

Male plates long, tapered to blunt apices. Oedagus with a looped portion which curves back upon itself. The dorsal portion of the loop with a long, broad apical process which extends caudally and dorsally. This bears a basal dorsally directed process just before the curved portion which forms a ventral portion of the loop which extends dorsally and caudally paralleling the dorsal

portion and extending to about the same length but which is much narrower in width. Styles long and narrow in ventral view, enlarged at apex on inner margin on which are formed slightly produced processes. Spines of ninth segment arising on dorsal portion directed caudally and slightly ventrally and not extending beyond apex of segment.

Known only from Central America.

Dikraneura marginella Baker.

D. marginata DeL. N. Y. Ent. Soc. 32 : 68, 1924.

D. marginella Bak. Philippine Journal Sci. 27 : 160, 1925.

(n. n. for *marginata*, preoccupied by *D. marginata* Sahl. 1871.)

Male oedagus with basal portion extending anteriorly and caudally. Apical portion curving dorsally with apex directed anteriorly. Styles angled at base, broad on basal half, apical half narrower, curved outwardly and with apex directed inwardly. Spine of ninth segment heavy, arising at apex of segment, curved upward and outwardly.

Known only from Florida and Central America.

Dikraneura kunzei Gill.

D. kunzei Gill. Proc. U. S. Nat. Mus., XX, p. 721, 1898.

Male plates long, tapered to blunt apices. Oedagus with a rather broad basal portion which extends dorsally. A median process is longer and more narrow, directed dorsally and tapering to a sharp pointed apex. The apical portion is a continuation of the ventral portion and is short, extending caudally and slightly dorsally. Styles long and rather narrow, slightly enlarged at apices and with a produced process on outer portion. Spine of ninth segment rising on dorsal portion, short and broad.

Known only from the Southwestern United States.

KEY TO SPECIES OF SUBGENUS NOTUS.

- 1 Length more than 4 mm. Elytra unusually long and narrow...*elongata*
- 1' Length not exceeding 4.0 mm. Elytra not unusually long.....2
- 2 (1') Ninth segment with conspicuous spines either on body of segment or at apex.....3
- 2' Ninth segment without a conspicuous spine.....*luna*
- 3 (2) Male oedagus curved so as to form a U-shaped or V-shaped structure by a basal dorsally directed portion and a posteriorly dorsally directed portion.....4
- 3' Male oedagus not U-shaped or V-shaped in form, if appearing so, with a basal portion extending anteriorly.....12
- 4 (3) Spine of ninth segment with caudal edge sloping dorsally and anteriorly and notched or serrate.....*serrata*
- 4' Caudal edge of spine on ninth segment not serrate.....5
- 5 (4') Terminus of oedagus with transverse process which bears anterior and posterior directed processes at each end.....*abnormis*
- 5' Terminus of oedagus enlarged, tapered or bent but without processes on lateral terminus.....6

6 (5')	Oedagus with terminus curved forward, spine of ninth segment arising on dorsal margin curved inwardly and anteriorly at apex of ninth segment.....	7
6'	Terminus of oedagus not curved forward, spine of ninth segment arising or appearing to arise on apical margin of ninth segment.....	8
7 (6)	Ninth segment rather broadly rounded on apical margin. Color white or pale green.....	<i>torta</i>
7'	Ninth segment strongly narrowed to narrowly rounded apex. Color pale yellow.....	<i>augustata</i>
8	Apex of oedagus bent abruptly caudally.....	9
8'	Apex of oedagus tapering and curved but not bent abruptly caudally.....	11
9 (8)	Reddish in color, male oedagus narrowed toward apex.....	10
9'	Yellowish green in color. Male oedagus not narrowed before apex.....	<i>arizona</i>
10 (9)	Male oedagus with small process on caudal margin near apex extending dorsally, apex of ninth segment tapered to form a pointed spine.....	<i>rufula</i>
10'	Male oedagus without a process on caudal margin extending dorsally near apex, apex of ninth segment forming a slender spine which is long, extending dorsally and anteriorly.....	<i>rubrala</i>
11 (8')	Male oedagus with a pair of lateral processes arising not far from apex.....	<i>carneola</i>
11	Male oedagus without lateral processes.....	<i>absenta</i>
12 (3')	Tinged with red, veins of elytra reddish, oedagus with caudally bent terminal, lateral and anterior processes.....	<i>rubica</i>
12'	White, green or yellowish in color, oedagus with either caudal or lateral process or with neither.....	13
13 (12')	Posterior portion of male oedagus divided into three long slender processes extending dorsally.....	<i>dubita</i>
13'	Posterior portion of male oedagus consisting of only one main process.....	14
14 (13')	Posterior process of oedagus tapered to pointed or narrow apex without terminal processes.....	15
14'	Posterior process of oedagus with terminal processes.....	16
15 (14)	Posterior process slender with sharp pointed apex.....	<i>termina</i>
15'	Posterior process broader with a pair of lateral processes near apex.....	<i>arcta</i>
16 (14')	Apex of oedagus with a pair of anterior and a pair of posterior processes, spine of ninth segment arising ventrally and curved dorsally.....	<i>urbana</i>
16'	Apex of oedagus with a pair of lateral processes, spine of ninth segment long, slender, directed ventrally and caudally.....	<i>mali</i>

D. robusta Lawson is known only by a single male specimen which was examined but not dissected. The holotype male of *D. hungerfordi* Lawson was also examined but not dissected,

and consequently no illustrations of these two species are included. Both types are in the Snow entomological collection, University of Kansas.

Dikraneura (Notus) luna, n. sp.

A blunt headed species resembling *Empoasca* in form and coloration but with distinct genitalia. Length 2.7 mm.

Vertex more than one third wider between eyes than length at middle.

Vertex, pronotum and scutellum yellowish green. Elytra dark smoky, veins broadly green.

Genitalia: Female last ventral segment rather short, truncate, a black marginal spot on middle of segment. Male plates rather long, apical half gradually tapered to blunt, rounded tips. Styles constricted at middle, both terminal portions broader and rounded. Apical portion with a short finger-like process arising on inner apical margin and curving outwardly. Oedagus long, curving dorsally and slightly anteriorly with apex tapered and sharply pointed. A pointed basal portion curves anteriorly and slightly dorsally and together they give the appearance of a sickle. Spines of pygofer wanting.

Described from one male from Mojave, California, July 7, 1933, three females from Tehechapi, Calif., July 7, 1933, and a male and female from Palmdale, Calif., July 6, 1933, all collected by Dr. R. H. Beamer. Male holotype from Mojave, female allotype from Tehechapi and male and female paratypes in Snow collection, University of Kansas. Male and female paratypes in collection of senior author.

Dikraneura (Notus) serrata, n. sp.

In general appearance resembling *abnormis*, but more strikingly marked and with distinct genitalia. Length 4 mm.

Vertex bluntly angled, a little wider between eyes than length at middle. Elytra long, greatly exceeding abdomen, color yellowish with two broad red stripes extending from apex of vertex to basal angles of scutellum. Elytra marked with oblique reddish brown stripes. Two are on claval area, one anterior to claval suture and anterior half of elytra reddish brown, veins between these stripes white.

Female last ventral segment with posterior angles produced and prominent, between which the posterior margin is slightly concavely rounded and embrowned at middle as in *mali*. Male plates triangular, gradually tapering to long narrow apices. Male oedagus with the basal arm extending dorsally to the base of the anal tube, the apical portion appearing broad in lateral view, apical portion long, extending dorsally and caudally, concave with two outer pointed teeth. A pair of rather long processes arising on ventral caudal margin, about half way to apex and curving laterally. The spine of the pygofer is long, reaching to its posterior margin where it is obliquely angled dorsally and anteriorly, posterior margin serrate. Styles long, constricted near apex and enlarged with an inner apical finger.

Described from a series of 42 specimens collected at Santa Rita Mts., Arizona, June 12, 1933, by Dr. R. H. Beamer. Male holotype, female allotype and male and female paratypes in Snow collection, University of Kansas. Male and female paratypes in collection of the senior author.

Dikraneura abnormis (Walsh).

Chloroneura abnormis Walsh. Prairie Farmer, Sept. 6, 1862, reprinted Boston Soc. Nat. Hist., IX, p. 316, 1864.

Male oedagus U-shaped, basal portion in lateral view broad and directed dorsally almost to base of anal tube, apical portion with basal half broad, then tapering to very narrow apical portion which bears a branched bifurcate portion at tip. This consists of an apical cross bar at the end of which on each side is a bifurcate spine, the longer arm of which extends caudally and the anterior arm, anteriorly. Just below this terminal process a pair of lateral processes arise from the slender portion of the oedagus. Styles long and slender, curved inwardly near apex and with an enlarged area on outer margin. Spines of ninth segment large, curving dorsally and bent outwardly at apex.

Occurring east of the Rocky Mountains.

Dikraneura (Notus) torta, n. sp.

In general form and appearance resembling *urbana*, but with distinct genitalia. Length 4 mm.

Vertex bluntly angled, one-third wider between eyes than length at middle. Pronotum almost twice as long as vertex. Body long and narrow.

Color: vertex straw yellow, pronotum pale yellow, disc tinged with orange. Elytra subhyaline, veins yellowish.

Genitalia: Male plates gradually tapered to bluntly angled apices. Oedagus U-shaped with the basal portion bluntly rounded and only about half as long as apical half, which is rather broad and appears twisted and pointed at apex. A pair of lateral processes arise near apex, which are quite conspicuous and which extend ventrally and anteriorly. The spines of the ninth segment appear recurved in lateral view extending inwardly and anteriorly with the recurved portion tapering to pointed apices. Styles in ventral view long, rather broad at base, constricted at middle and rather broad at apex, where they are abruptly narrowed, each having a finger process on inner margin.

Described from three male specimens collected at Chiricahua Mts., Ariz., June 9, 1933, by Dr. R. H. Beamer. Male holotype and male paratype in Snow collection, University of Kansas, male paratype in collection of the senior author.

Dikraneura augustata Ball & DeLong.

D. augustata Ball & DeL. Anns. Ent. Soc. Amer. 18 : 328, 1925.

Male oedagus with anterior process rather short, extending dorsally and bluntly rounded. Apical portion broad at base, narrowed toward apex, where it appears to be folded over. A pair of lateral processes arise near apex. Styles

long, basal half narrow, gradually broadened to apex, which bears a slightly rounded process on outer margin and a more produced, angled process on inner margin. Spine of ninth segment arising dorsally, apex long, slender, sharply pointed, extending inwardly and curving anteriorly.

Known from the eastern United States, Kansas and Texas.

Dikraneura (Notus) arizona, n. sp.

Resembling *mali* in form and general appearance but darker in color and with distinct genitalia. Length 3.7 mm.

Vertex bluntly angled, almost twice as wide between eyes as length at middle. Pronotum almost twice as long as vertex.

Color yellowish green tinged with brown, elytra greenish smoky subhyaline.

Genitalia: Female last ventral segment broadly roundedly produced. Male plates rather long and broad, apices bluntly angled and divergent. Male oedagus V-shaped, the basal portion directed dorsally and enlarged at apex. The apical portion is broad, directed dorsally with tip bifurcate and bent caudally. A pair of lateral processes arise not far from oedagus and extend laterally and dorsally. Styles in ventral view rather narrow, apex with an outer rounded lobe and an inner finger process. Spines of ninth segment arising at upper apical edge directed upward, slightly forward, and laterally.

Described from a series of 16 specimens collected at El Paso Co., Colo., June 19, 1929, Santa Rita Mts., July 17 and June 12, Douglas Co., Colo., June 27, 1929, Chiricahua Mts., Ariz., June 9 and July 8, Hauchuca Mts., Arizona, July 8, and Granite Dell, Arizona, July 30, 1933.

Male holotype and female allotype from El Paso, Colo., and male and female paratypes in Snow collection, University of Kansas. Male and female paratypes in collection of senior author.

Dikraneura rufula Gill.

D. abnormis var. *rufula* Gill. Proc. U. S. Nat. Mus., XX, p. 720, 1898.

The male oedagus has a basal portion extending dorsally half way to base of anal tube. The apical portion is long, directed dorsally, where it forms two processes. An anterior one extends upwards and is bent caudally, a short posterior process extends dorsally beneath the anterior one. In ventral view it appears to be broadened at apex. A pair of lateral spines arise from the enlarged portion near the base. Styles rather short, enlarged and curving outwardly near middle, an enlarged portion on outer margin near apex. Spine of ninth segment produced at apex of segment, broad at base, tapering to pointed apex, which is slightly curved outwardly at tip.

Known only from California.

Dikraneura (Notus) rubrala, n. sp.

Resembling *carneola* in general appearance but with distinct coloration and genitalia. Length 3.2 mm.

Vertex bluntly angled, more than one-third wider between eyes than length at middle.

Color: Yellowish marked with rose red. A spot on either side at base of vertex and an irregular area covering the disc of pronotum red. Elytra reddish, claval area and commissural line white, apical portion subhyaline, veins reddish.

Genitalia: Female last ventral segment broadly rounded and slightly produced at middle. Male plates long, concavely narrowed on apical half to rather blunt apices. Oedagus U-shaped, basal portion directed dorsally, apical portion long, broad at base, tapered to apex, which is directed caudally and is broad with a broad apical notch forming two diverging apical spines. A pair of lateral processes arise not far from apex. Styles narrow on basal half, broadened on apical half with a projecting, pointed finger-like process on inner margin. Spines of ninth segment formed at apex of segment, rather long and narrow, directed upwards, slightly forward and with apices turning outwardly.

Described from four male and four female specimens from Taylor's Falls, Minn., August 16, 1916, and one male specimen from Bayfield, Wis., August 10, 1916, all collected by J. G. Sanders and the senior author. Holotype male and allotype female from Taylor's Falls, Minn., and male and female paratypes from Taylor's Falls, Minn., and Bayfield, Wis., in the collection of the senior author.

Dikraneura carneola (Stal.).

Typhlocyba carneola Stal. Stet. Ent. Zeit., XIX, p. 196, 1858.

Male plates rather long, concavely tapering to blunt, narrow apices. Spines of ninth segment large, in lateral view appearing "S" shaped. Rather heavy at base, apical portion pointed upward and tapered to pointed apex. Oedagus in lateral view U-shaped with basal portion shorter and blunt on upturned apex. Apical portion longer, enlarged a short distance from apex with a pair of lateral processes arising on the caudal margin and curving laterally, ventrally and anteriorly. Apex in lateral view tapering and recurved. In ventral view appearing bifurcate. Styles rather short, slightly curved outwardly, a little wider on basal than on apical half.

Known to occur only in the western and northwestern States.

Dikraneura carneola var. **shoshone**, n. var.

In form and appearance resembling *carneola* but with apical portion of oedagus differing.

Color yellowish, tinged with dull red, claval vein white.

The oedagus resembles that of *carneola* but the apex is recurved and in ventral view appears enlarged with the lateral portions curved caudally. It agrees with *carneola* in being enlarged and bearing the lateral processes.

Described from three male specimens collected by the senior author at Shoshone Basin, Idaho, July 27, 1930. Holotype male and male paratypes in senior author's collection.

Dikraneura (Notus) absenta, n. sp.

Resembling *carneola* in general form and appearance but with different male genitalia. Length 3.5 mm.

Vertex strongly produced and bluntly angled, more than one-third wider between eyes than length at middle. Elytra long and narrow as in *carneola*.

Color dull green without definite color markings.

Genitalia: Female last ventral segment with lateral angles of posterior margin rounded. Central half shallowly emarginate. Male plates long, gradually tapering to narrow, but rounded apices. Male oedagus similar to *carneola* but with apical portion of U-shaped loop gradually tapered to bifurcate apex, without enlarged portion or the lateral processes which are typical of *carneola*.

Described from a series of 95 specimens collected in Idaho, California, Arizona, British Columbia, Washington, Oregon, Colorado and Utah, by Dr. R. H. Beamer, B. T. Peters and the senior author. Holotype male from Craters of the Moon, Idaho, collected June 9, 1930, and allotype female from Kalona, Washington, July 21, 1931, and male and female paratypes in collection of senior author. Male and female paratypes in Snow Collection, University of Kansas.

Dikraneura (Notus) rubica, n. sp.

In general appearance and coloration resembling *rufula* but with distinct genitalia. Length 3.5.

Vertex about one third wider between eyes than length at middle.

Color: Vertex yellow, tinged with orange, pronotum pale with disc dull reddish. Scutellum yellowish. Elytra dull reddish. Claval suture pale.

Genitalia: Female last ventral segment rounded and sloping from about half its length to posterior margin, which is about half the width of segment and is truncate. Male plates gradually tapered to bluntly rounded apices. Styles wedge shaped with apical portion broad and bearing a short heavy finger-like process on inner margin. Oedagus with a narrow basal process extending dorsally about half way to the base of anal tube. Apical portion broader with a short spine extending anteriorly, a pair of processes arising dorsal to these on the caudal margin and extending laterally and a narrower terminal portion which curves caudally. Spine of pygofer extending from apex of the ninth segment, curved outwardly at apex.

Described from one male and one female specimen collected at Grand Canyon, Arizona, in August, 1930. Male holotype and female allotype in collection of the senior author.

Dikraneura (Notus) dubita, n. sp.

Resembling *abnormis* in general appearance but with vertex more bluntly angled and with distinct genitalia. Length 3 mm.

Vertex as long as width between eyes, not quite as long as pronotum.

Color yellowish with three pale elongated areas on vertex. A long one on

middle and a shorter one either side. Pronotum mostly milky white except yellowish area on disc. Scutellum white except basal angles, which are yellowish.

Genitalia: Male plates tapering on apical half to form blunt and rather broad apices. Styles broad, rounded on basal end, apex sloping from outer margin to form produced inner margin. Oedagus in lateral view with broad basal portion which is truncate anteriorly. Constricted, then forming a broad dorsally directed apical portion which is divided into three long finger-like processes which extend to dorsal wall of pygofer. Spine of ninth segment very short, broad and pointed.

Described from a single male specimen from Estes Park, Colorado, collected August 25, 1930, by Prof. H. C. Severin, which is unique in type. Male holotype in collection of senior author.

Dikraneura (Notus) termina, n. sp.

Resembling *carneola* in general form and appearance but more slender, elongate and with distinct genitalia. Length 3.7 mm.

Vertex bluntly angled, about one-third wider between eyes than length at middle.

Color: yellow tinged with dull greenish without definite color markings. Elytra smoky subhyaline, veins yellow.

Genitalia: Female last ventral segment produced, lateral angles rounded, posterior margin truncate. Male plates gradually tapering to blunt narrow apices. Styles rather short, wedge shaped, apices rather broad, with an inner caudally directed finger-like process. Oedagus in lateral view with a basal process extending dorsally about half way to the anal tube. Apical portion extending dorsally and caudally, apex narrowed to a sharp point. Pygofer spines arising on outer, apical margin and directed dorsally and caudally with apices turned sharply outwardly.

Described from a series of three male and four female specimens collected at Oak Creek Canyon, Arizona. One female was taken July 31, 1933, and the others August 9, 1932. All collected by Dr. R. H. Beamer. Male holotype, female allotype and male and female paratypes in Snow collection, University of Kansas. Male and female paratypes in senior author's collection.

Dikraneura (Notus) arcta, n. sp.

Resembling *augustata* in general form and appearance but with distinct genitalia. Length 3 mm.

Vertex strongly produced and bluntly angled, about one-fourth wider between eyes than length at middle. Elytra long and narrow.

Color: Cream washed with yellowish. Elytra subhyaline, basal third and veins yellow.

Genitalia: Male plates long, apical half tapering, concavely rounding on outer margin, to blunt but rather pointed apices. Spine of pygofer arising on dorsal apical margin, apical portion curved upwardly, inwardly and anteriorly. Styles

in ventral view long, basal half slender, apical half broader and curved inwardly, apex pointed. Oedagus with basal process which is rather broad, extending dorsally and curved at apex. Apical portion long, rather broad, enlarged just before tapered, bluntly pointed tip. A pair of short lateral processes arising from enlarged portion near apex.

Described from a single male specimen collected at Red Lake, Arizona, August 5, 1933, by Dr. R. H. Beamer. Holotype male in Snow collection, University of Kansas.

Dikraneura urbana, Ball & DeLong.

D. abnormis var. *urbana* Ball & DeL. Anns. Ent. Soc. Amer., 18 : 329, 1925.

Male oedagus in lateral view appearing very much like *abnormis* but the basal portion is much shorter and the apical portion is much broader near apex. A pair of long bifurcate processes at apex extend caudally and a smaller pair extend anteriorly. Styles long, basal half narrow, apical half constricted about middle and enlarged either side. The apex is the broadest portion with the caudal margin concavely rounded. Spines of ninth segment arising ventrally, constricted at about half their length and produced to form sharp pointed apices which are directed outwardly and dorsally.

Described from and known only by specimens from Iowa.

Dikraneura mali (Prov.).

Erythroneura mali Prov. Pet. Faune Ent. Can., III, p. 298, 1890.

Male oedagus long, with a short broad basal process directed anteriorly and dorsally with the apex curved caudally. Apical portion long, with apex curved anteriorly. A pair of long lateral processes arising at apex and directed laterally. Spines of ninth segment long extending, posteriorly and ventrally across ninth segment, with apex bent anteriorly. Styles in ventral view with basal half narrow, apical half broadened to the apex, which appears deeply notched between outer and inner produced margin, the latter of which is formed into a finger-like process.

Occurring east of the Rocky Mountains.

Subgenus *CURTA* nov.

Venation as in *Notus* but with rounded or bluntly angled head, male plates very short and broad, only slightly protruded beyond the valve. Female segment not entire, central portion wanting and segment represented only by lateral curved lobes extending from each side about half way to median line.

Type of subgenus *Curta alta*, DeLong & Caldwell, n. sp.

KEY TO SPECIES OF SUBGENUS *CURTA*.

- 1 Golden yellow in color, male style forming abruptly pointed apex, terminal caudal portion of oedagus rather long and narrow.....*alta*
- 1' Yellowish green in color, male styles branched near apex forming an outwardly and dorsally directed apical spine and a long, heavy dorsally directed spine; terminal caudal portion of oedagus broad and blunt at apex.....*sitka*

Dikraneura (curta) alta, n. sp.

Resembling *mali* in general appearance but bright yellow and with distinct genitalia. Length 4 mm.

Vertex bluntly angled, one-third wider between eyes than length at middle, anterior half of pronotum fitted into the concavity of the vertex. Elytra long and narrow.

Color: golden yellow, elytra subhyaline, veins yellow.

Genitalia: Female last ventral segment similar to *sitka*, not entire but represented only by lateral curved portions, which extend about half way from either side to mid line of segment. Male plates very short and broad, separated at base, proximal at apex, with tips blunt and pointed inwardly. Style long, broadened before apex then strongly convexly curved on inner margin to form abruptly pointed tip. Oedagus very broad with lateral processes arising from outer margins of apical portion. In lateral view the apical portion is broad, the lateral processes curving caudally and another portion ventrally. The basal portion is also broad with a dorsal and a ventro-anterior projection. Spine of pygofer wanting.

Described from five male and five female specimens collected at Gillette, Penna., Aug. 30, 1922, by Prof. J. G. Sanders and the senior author. Male holotype, female allotype and male and female paratypes in collection of the senior author.

Dikraneura (curta) sitka, n. sp.

In general form resembling *robusta* but with different genitalia. Length 4 mm.

Vertex bluntly angled, almost rounded, in male more than twice as wide between eyes as length at middle, pronotum more than twice as long as vertex. The vertex of the female is twice as wide as long.

Color dull yellowish green, unmarked.

Genitalia: Female last ventral segment not entire, represented only by a lateral rounded lobe on each side, which extends about half way from the lateral margin to the middle of the segment.

Male plates broad and very short, separated at base, bluntly pointed and proximal at apex. Styles very long, narrow at base, broadened gradually on apical half, deeply roundedly notched on inner margin just before apex, then convexly curved on outer margin to form an outwardly and dorsally directed apical spine and a long heavy dorsally directed spine just before apex. Oedagus with a single terminal process and widely separated laterally curved bifurcate processes at about the middle. The terminal process extends caudally and is blunt at apex. The laterally diverging portions at the middle are narrow and extending dorsally and caudally, the single basal process is broad and shorter, extending almost dorsally.

Described from one male and five female specimens collected at Katmai, Alaska, by Prof. J. S. Hine, Aug. 15, 1917. Male holotype and female allotype in collection of senior author, paratypes in Herbert Osborn collection.

EXPLANATION OF PLATES 1, 2 AND 3.

Ventral and lateral views of ninth segment of male abdomens showing the internal genital structures in situ.





