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LXVI

THE CANADIAN ENTOMOLOGIST

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Excerpt from the Canadian Entomologist July 1934

NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA IV*

BY J. MCDUNNOUGH,

Ottawa, Ontario.

Ephemerella ingens n. sp.

Male. Eyes deep black-brown. Head black with the pits of the antennae and a small area posterior to the mid-ocellus pale yellowish. Pronotum black; mesonotum black with slight brownish shading along lateral edges posteriorly; the membranous area between base of wing and fore coxa pale yellowish, shaded with light brown, and containing a blackish streak; metanotum black with slight yellowish tinges in median area; pleura and sternum black with the less heavily chitinized portions, especially around bases of legs, pale yellowish. Abdomen dorsally with lateral and posterior edges of segments smoky yellow or yellow-brown, most of segments II-VII occupied by a large quadrate median black patch and lateral circular patches of same color, indistinctly separated by bands of dull yellow-brown; on the rear segments the black areas more or less coalesce. Ventrally the light yellow-brown posterior banding of segments is broader and more distinct, remainder of segment blackish with a slight ruddy tinge and faint traces of small oblique submedian pale streaks on anterior margin. Forceps dull brownish; setae black. Forelegs almost entirely blackish, tinged with pale smoky yellowish along edges of femur, especially near base; mid- and hind legs with blackish coxa and femur, the latter as well as the trochanter tinged with dull yellowish at base and along edges; tibia equal in length to femur plus trochanter, dull yellowish; tarsi smoky yellow (at times decidedly smoky). Wings hyaline with black-brown veins and cross veins, the latter somewhat indistinct in pterostigmatic region; no fusion of veins Cu_2 and 1st A.

Female. Somewhat paler in coloration than the male, but with similar maculation. Head black with a broad band of ruddy brown between the eyes, just posterior to the ocelli. Thorax considerably suffused with brown, some yellowish shading on the anterior portion of the mesosternum, and the pale shades around bases of legs quite extensive. Abdomen more definitely pale-banded both dorsally and ventrally and with lateral edges distinctly pale yellowish. Subanal plate blackish with well-defined apical excavation. Length of body 13-15 mm.; of forewing 16-18 mm.

In a male alcohol specimen the abdominal maculation is as follows: dorsally segments II-VII pale smoky amber with large, black-brown, median quadrate patches not quite attaining either margin and cut faintly by a narrow pale median line, the lateral borders slightly deeper in color than the central section; a series of large, circular, lateral patches of a similar color, narrowly separated from the median ones by a band of pale color. Segments VIII-X largely black-brown with faint ruddy tinge and only traces of the pale bands separating the dark median and lateral areas; posterior margin of IX narrowly whitish. Ventrally anterior half of segments I-VII deep black-brown, slightly ruddy and showing paler, obscure, oblique, submedian dashes on anterior margins of IV-VII with traces of median pale dots; segments VIII and IX largely blackish, the former with whitish posterior border.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Holotype—♂, Oliver, B. C., June 5, (A. N. Gartrell) (bred from nymph); No. 3760 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, June 14.

Paratypes—1 ♂, 2 ♀, same data, May 21, 28, June 12; also 1 ♂ (in alcohol) June 25.

The species is undoubtedly very close to *grandis* Eaton from Colorado, as defined by Needham (1927, Ann. Ent. Soc. Am. XX, 108). I have no adult material from Colorado for comparison, but through the kindness of Dr. Needham some of his Logan, Utah, nymphal material is deposited in our collection and I am regarding this as typical of *grandis*. Mature nymphs of *ingens* from Oliver differ from those of *grandis* in the decidedly greater length of the tibiae, especially those of the hind legs, and the longer occipital tubercles. The thoracic and abdominal spining is very similar in both species; it might be noted that the subdorsal ridge in the central portion of the mesothorax is slightly better developed in *ingens* and in some females shows a distinct rounded wart; as in *grandis* the pair of spines on abdominal segment II are rather close together, those on III somewhat wider apart and those on the balance of the segments much wider apart; taken as a whole, however, the two rows of spines are closer together in *ingens* than in *grandis*. There is apparently also less of a gradual increase in size from the second to the eighth pair so that in consequence the difference in size between the spines of the seventh and eighth pairs is more marked, the latter being at least one and one-third times the length of the former; the spines of the eighth and ninth pairs show a tendency in *ingens* to bend slightly towards each other apically whilst in *grandis* they are either straight or slightly divergent. There is not much difference between the species in the length of the postero-lateral prolongations of the segments, and there appears to be a certain amount of sexual variation in this character. When long series are available for comparison it is quite possible that some of these rather slight differences will prove of little value as a means of separation.

***Ephemerella flavitincta* n. sp.**

Male.—Head black, the pits of the antennae yellowish. Thorax shiny black with the membranous portions of the pleura dull yellow-brown, with brighter yellow around the bases of the legs. Abdomen dorsally black, the posterior margins narrowly pale yellow, most noticeably in lateral angles and on segments VIII and IX, the other portions being somewhat dulled (at least in specimen examined) with smoky brown. Ventrally black with rather bright yellow posterior borders to segments I-VII, posterior segments and forceps entirely black. Setae black, paling to pale smoky distally. Forelegs deep black, tarsi somewhat paler; mid and hind legs with coxa and trochanter blackish, separated by a narrow ring of yellow membrane, femur largely black, edged at base with yellowish, tibiae and tarsi rather bright yellow with claw-segment tinged with smoky. Wings hyaline, tinted with light amber, the color paling apically; veins and cross-veins strong, blackish, latter faint in pterostigmatic area; no fusion between Cu_2 and 1st A.

Female. Paler than the male. Head posterior to ocelli yellowish, tinged with brown next the eyes and with the vertex broadly shaded with black-brown. Mesonotum largely suffused with light brown and the yellow areas on pleura

and at bases of legs bright and quite prominent. Abdomen, legs and wings much as in male with the dorsal yellow bands of former brighter in color. Subanal plate with a small, apical, V-shaped incision. Length of body 15 mm.; of forewing, 18 mm.

Holotype—♂, Luckiamute Riv. Hoskins, Ore., May 6, (R. Dimick) (bred from nymph); No. 3761 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, April 15.

Paratype—1 ♂, nymph, taken in a stream near Eddyville, Ore., on April 8th, and agreeing with the nymphal exuvia of the type.

I am much indebted to Dr. Dimick, who is investigating the Ephemerid fauna of Oregon for permission to retain these specimens.

The nymph is very similar to that of *glacialis* Trav., but considerably larger in every way, the male nymph being 16 mm. long as compared with 13 mm. for *glacialis*. The head is broader and the occipital tubercles better developed; on the pronotum the posterior one of the submedian pair is much longer than the corresponding tubercle in *glacialis*. Abdominal spining much as in *glacialis*, but the spines appear longer due to larger size of nymph. Viewed from beneath the lateral edges of the abdominal segments appear less convex than in *glacialis* and the posterior spine-like prolongations project in consequence more beyond the body-line.

The amber-tinted wings and the large size render the species one of the most striking in the group.

***Ephemerella spinifera* Needh.**

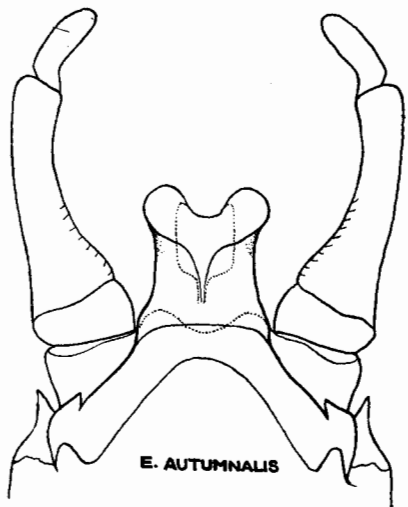
Ephemerella spinifera Needham, 1927, Ann. Ent. Soc. Am. XX, 110; Walley 1930, Can. Ent. LXII, 17, Pl. III, figs. 1-3.

As our knowledge of the western Ephemerid fauna increases it has become evident that there are several closely allied species in the *spinifera* group of the genus *Ephemerella*; it is of considerable importance, therefore, to tie down the above name correctly. It was based, unfortunately, on several immature nymphs from the Blackfoot River, Potomac, Mont. (June 20); one of these I have examined and the entire type series has been studied by Dr. J. Traver of Cornell University and compared with specimens of nymphs submitted by me. We both agree that the mature male nymph, from the Gardiner river, Yellowstone National Park, Wyoming (July 26) figured by Walley (*op. cit.*) is referable to this species. I append a detailed description of this nymph, which will supplement the original one.

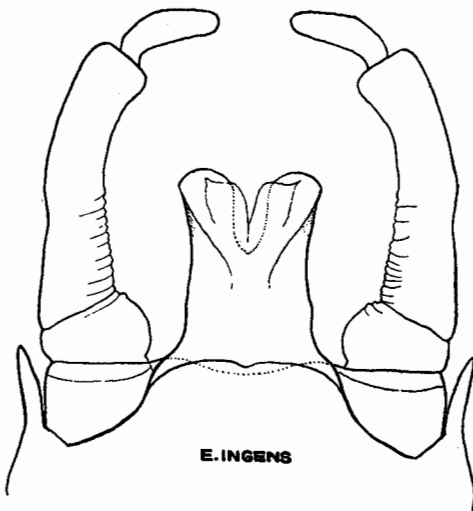
Length of body, 11 mm., of tails, an additional 9 mm.

Color light brown, but this is probably due to fading in the alcohol and fresh specimens may be considerably darker and show an abdominal pattern. Head with a pair of long, erect, pointed tubercles on vertex, about as long as distance separating them. Pronotum with a twin pair of tubercles on each side subdorsally, situated on posterior half of segment, the anterior one being twice as high as the posterior one, both pointed; a lateral pointed tubercle at same level as anterior subdorsal one and somewhat smaller than this.

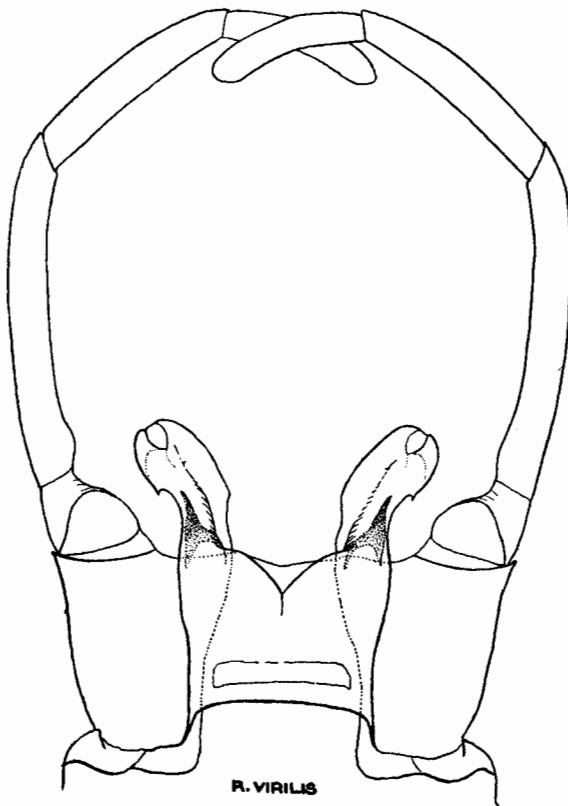
Mesonotum with a small pair of rounded wart-like tubercles, situated subdorsally on anterior margin; laterad and slightly posterior to these on each side is a longer, sharply pointed tubercle, directed slightly backwards; in central



E. AUTUMNALIS



E. INGENS



P. VIRILIS

NORTH AMERICAN EPHEMEROPTERA.

area is a pair of long, pointed subdorsal tubercles, twice as large as the preceding pair, and also slightly slanting backwards, and there is a single median rounded wart-like prominence on the posterior portion, equivalent to the scutellum of the adult; in the latero-anterior angle is a small rounded wart, separated by a slight excision from a still smaller wart, placed directly behind it; somewhat dorsad of these is a slight raised ridge.

On abdomen dorsally segments 2-7 bear each a pair of sharply pointed, spine-like tubercles on the posterior margin; these are all practically equal in length and directed slightly backward; the two on segment II are closer together than those on the following segments and on segments IV-VII the distance between the tubercles is slightly greater than their height. On segments VIII and IX the spine-like tubercles are enormously increased in size and fully four times the length of the preceding pairs; they are pointed and covered with long, scattered bristles, the pair on VIII faintly divergent apically, those on IX slightly smaller than on VIII, subparallel and rather more decumbent. Tails light brown in basal fourth, broadly ringed with darker brown in outer three-quarters. Lateral spine-like prolongations of abdominal segments III-VII increasing in size from front to rear; lateral margin of VII slightly convex, of VIII and IX distinctly sinuate, the prolongations on these last two segments being subequal and somewhat longer than on VII. Ventrally on abdomen are sub-lateral rows of dark brown dashes, one dash to each segment. Legs pale brown, the femora of two posterior pairs showing traces of two dark transverse bands on outer sides; hind tibia equal in length to femur and trochanter combined.

***Ephemerella autumnalis* n. sp.**

Male. Eyes deep red-brown. Head black, the circular pits of the antennae and a small area posterior to mid-ocellus pale yellowish. Pronotum black with yellowish shades laterally at bases of prolegs; mesonotum black shaded with pale yellow-brown as follows:—a lateral streak extending forward from base of wing, the lateral edge of the anterior projection, the lateral posterior edges reaching caudad to beginning of scutellum and relieving in this region a black dorsal band as broad as and extending over scutellum; metanotum black with slight yellowish median shading on posterior projection; pleura black with the less heavily chitinized parts, especially at bases of legs, pale yellowish or yellow-brown; sternum black. Abdomen dorsally black, with the anterior margins inclined to paler, the latero-posterior angle with a small pale yellowish spot and the posterior margins of segments IX and X bordered with pale yellowish; ventrally blackish with faint ruddy tinge and both anterior and posterior borders indistinctly palish, especially the latter on the two rear segments which show a distinct pale yellow margin. Bases of forceps pale yellow-brown, forceps blackish, paling to yellow-brown apically. Setae black. Fore-legs with the femora and tibiae subequal, light amber, heavily suffused with blackish, the pale color only showing at bases of femora and at joint, tarsi paler, light smoky amber; mid- and hind legs with tibia equal in length to femur plus trochanter, both light amber with femur suffused in apical third with blackish, tarsi and claw darker in color, dull smoky. Wings hyaline, tinged slightly with smoky costo-apically, with rather fine, dark veins and crossveins, the latter paler in the pterostigmatic region.

Female. Quite similar to male. Vertex of head blackish with a broad curved band of light brown extending between eyes just posterior to the ocelli; the lighter areas on both thorax and abdomen better developed, so that both dorsally and ventrally the abdomen appears banded with light yellow-brown, with segment X dorsally almost entirely this color; the genital plate at posterior margin of segment VII is rather strikingly bordered with pale yellow, the subanal plate largely light brownish, broad apically and with a distinct but shallow excavation. Length of body, 11 mm.; of forewing 15 mm.

Holotype—♂, Shingle Creek Road, Keremeos, B. C., Sept. 8 (A. N. Garrett) (bred from nymph); No. 3759 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Sept. 7.

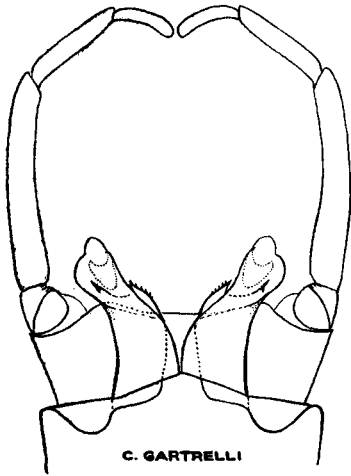
Paratypes—2♂, 1♀ (dried) same data, Aug. 27, Sept. 2, 3; 1♂ (in alcohol) same data as holotype.

The nymph is much the same size as that of *spinifera*, but appears considerably darker; this may, however, be merely due to the fresher condition of the material, the abdominal markings of the adult showing through subcutaneously. The arrangement of tubercles is essentially the same as in *spinifera*, the following differences being noted:—the twin pair on pronotum are subequal, the posterior one being larger than in *spinifera*; the lateral posterior spine-like prolongations of abdominal segments VIII and IX, but notably of IX, are shorter than in *spinifera*; the long dorsal spines of segment VIII are more strongly bent backward and downward. These differences are slight and may not always be constant, but when we combine with this the fact that the *spinifera* nymph apparently matures at high altitudes in the main chain of the Rocky Mountains in late July, whereas *autumnalis* nymphs are not mature at quite low levels until fully a month later, I believe we are justified in holding the two as distinct species.

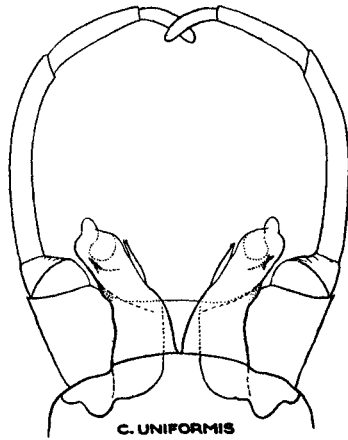
It might be noted that, whilst both in holotype and allotype the venation is normal as regards the non-fusion of veins Cu_2 and 1st A., it is variable in the paratypes, one male showing non-fusion on one side and fusion on the other and the female showing fusion on both sides; the character is obviously of no subgeneric value and varies in our series of all the larger western species, including *doddsi* Needh. for which the subgenus *Eatonella* was erected, largely on the strength of the fusion of these veins.

From the male alcohol paratype the following description of the abdominal maculation is drawn up, it being more clearly visible in such a specimen:—

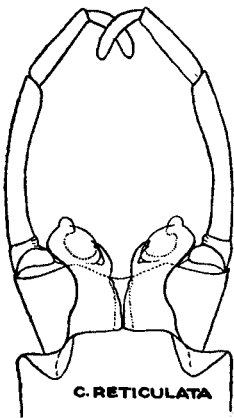
Dorsally segments I and II almost entirely black; segments III-VII blackish, narrowly pale smoky on anterior margin, more broadly so on posterior one, especially in median area; traces of a geminate dark median line, filled with pale color; on segments V-VII there is a tendency for the black area to break up into three patches, due to paler submedian prongs projecting from the posterior pale area into and almost separating the dark area; laterally there are faintly pale comma-like marks in the dark areas. Segments VIII and IX almost entirely blackish except for a narrow whitish posterior band; segment X pale, narrowly dark on anterior border with median and lateral prongs projecting backward into the pale area. Ventrally segments II-VII narrowly pale anteriorly, broadly pale posteriorly (almost one-third of segment), remainder of segment blackish with following pale markings:—A pair of oblique, submedian, lunate



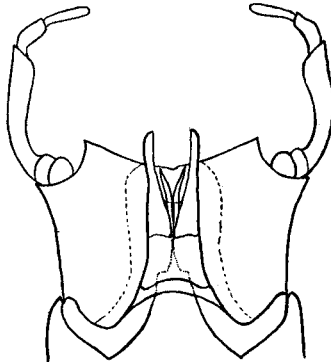
C. GARTRELLI



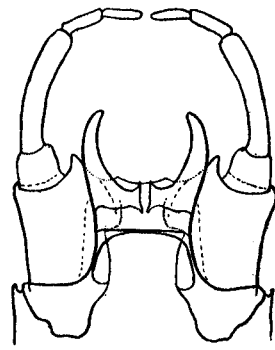
C. UNIFORMIS



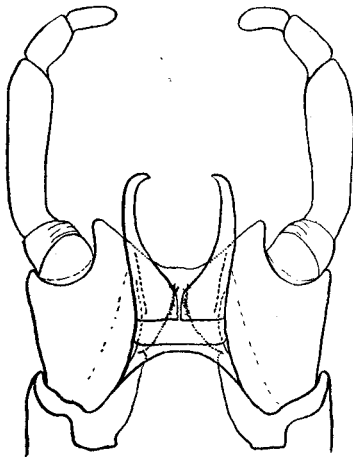
C. RETICULATA



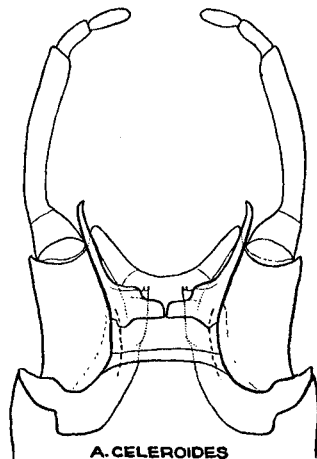
A. AEQUIVOCUS



A. ALTICOLUS



A. CELER



A. CELEROIDES

NORTH AMERICAN EPHEMEROPTERA.

marks, based on anterior pale area, two small centrally-placed, median dots and a somewhat larger lateral dot or dash, all rather obscure; segments VIII and IX black, the former with pale posterior border.

Genus *Ameletus* Eaton

With the accumulation of nymphal material from various sections of Western Canada and the association of nymphs and adults through breeding experiments it has become evident that there are several closely allied species in the *velox* group which have been confused under the one name on account of the similarity of the male genitalia. A discussion of these species follows:—

Ameletus velox Dodds

Ameletus velox Dodds, 1923, Trans. Am. Ent. Soc. XLIX, 105, Pl. VIII, figs. 16, 17; Dodds and Hisau, 1924, Ecology, V, 139, Pl. 1, fig. 1.

An excellent figure of the large nymph of this species is given by Dodds and Hisau, and the characteristic dark stripes on the gills, at about one-fourth the width of the gill from the dorsal margin, is clearly indicated. The gills are broad and well-tracheated and in my figure (fig. A) the finer detail is shown; the tails are blackish, tipped with white and very broadly haired.

The species appears to be uncommon in Canada and the only record we have so far is based on a single mature nymph from Glacier Creek, Crow's Nest Pass, Alta., taken on June 9, 1930, by J. H. Pepper. Other nymphal material before me includes one of the type lot from Tolland, Colo., and a single nymph from the Gardiner River, Yellowstone National Park, Wyo., July 26, 1928. I have examined no adult specimens, but, to judge by the size of the nymph, should imagine the species will prove to be one of the largest in the genus.

Ameletus celer n. sp.

Male. Head and thorax black-brown, the postero-lateral edges of the pronotum and the membranous parts of the pleura paler brown. Abdomen dorsally with segments II-VII semihyaline, pale ochre-brown with numerous fine tracheae, posterior margins of segments dark sepia brown with narrow brown subdorsal bands projecting forward from this area, but not attaining anterior margin; posterior segments somewhat deeper in color and opaque. Ventrally somewhat paler than above, without dark bands on posterior margins, but with a median row of dark, oval, ganglionic patches; area at base of forceps paler than preceding portion. Setae whitish with slight smoky tinge, narrowly ringed with black-brown. Legs sepia-brown. Wings rather dull hyaline, due to a very faint smoky tinge; veins fine, brown, cross-veins very fine, light brown and rather faint. Genitalia with the forcep-joints rather clumsy, the penis-lobes close together and subparallel, with fine spining ventrally at their bases.

Female. Similar to male, but rather paler in color, especially on mesonotum. Head posterior to ocelli about same color brown as thorax, somewhat paler laterad of and anterior to lateral ocelli. Length of body, 13-14 mm.; of forewing, 13-14 mm.

Holotype—♂, Glacier Creek, Crow's Nest Pass, Alta., June 25, 1930, (J. H. Pepper); No. 3762 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—8♂, 11♀, same data.

The whole series was bred from subimagos found sitting on the rocks bordering the creek; at the same time mature nymphs were plentiful in the creek and, while not actually bred through, may be safely associated with the above adults. In early July, 1923, I found at Waterton, Alta., in a very small stream running from Mt. Crandall, similar nymphs from which the subimagos were also emerging, and the resulting adults agree with those from the Crow's Nest Pass. The species has been misidentified by myself as *velox* Dodds, but the nymphs are only about half the size of *velox* nymphs (10 mm. length) and show other excellent characters whereby the species may be differentiated. The gills (fig. b) are smaller and much less heavily tracheated and there is no dark interior band of chitin, but the *dorsal margin itself* is chitinized and appears black-brown; the tails are pale ochreous (not blackish) and much less heavily haired than in *velox*. Dorsally the abdomen is light yellow-brown to deep brown with a double row of submedian dark dashes, the included space being sometimes paler; segments VI and VII appear at times paler than the others, but the material has been too long in alcohol to be sure of any details of coloration. Ventrally the usual whitish dots are present in the antero-lateral corners of each segment and the ganglionic marks show subcutaneously. The legs are quite pale ochreous except the distal ends of the tarsi which are banded with deep brown; there is a faint smoky streak on the outer side of the femora.

***Ameletus celeroides* n. sp.**

Male. Very close to the preceding, but smaller in size. Thorax decidedly shiny blackish; the postero-lateral corner of the pronotum creamy in color rather than light sepia-brown and this same creamy shade tends to replace the light brown shades on the abdomen, especially laterally on segments VI-VIII and ventrally on segments VII and VIII; there is also a pale creamy line on the lateral edge of segment IX, this being sometimes found also on the two preceding segments. The hind-legs are paler and duller than in *celer* and the wings seem to have none of the faint smoky appearance of this species; the cross-veins are very fine and quite indistinct. The genitalia have the forceps-joints rather thin and fine and the penis-lobes are broadly divergent apically; the spining at the base ventrally seems to be limited to two small apical spines.

Female. Very similar to the male, the vertex of head shaded with creamy. Length of body, 8 mm.; of forewing, 8-8½ mm.

Holotype—♂, Penticton, B. C., June 22 (A. N. Gartrell) (bred from nymph); No. 3763 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

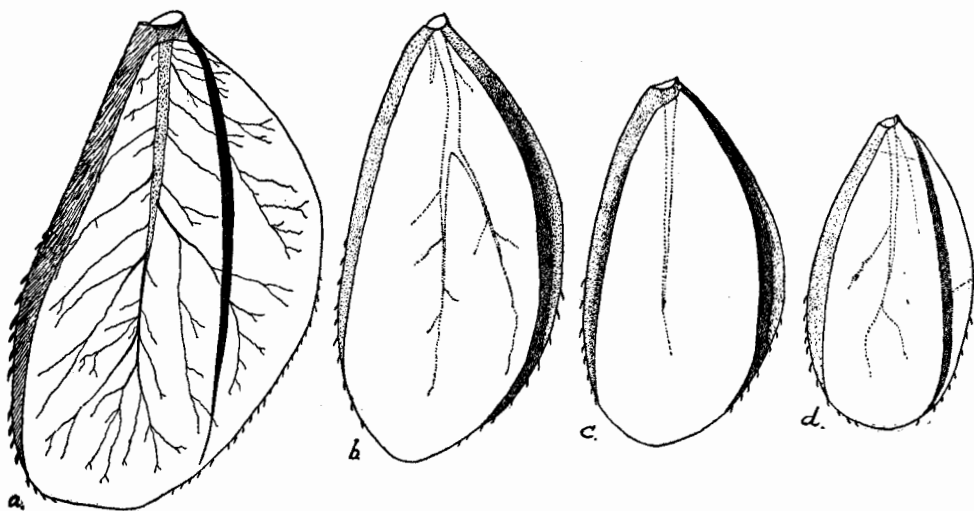
Paratypes—2♂, 4♀, same data, June 21, 22, 23, 26, 28; 2♂, 1♀, Mt. Apex, Hedley, B. C., (4,500 ft) Aug. 12, 13, 22.

The nymph is very similar to that of *celer*. The size is somewhat smaller; the gills are more heavily margined, especially on ventral edge, with a narrow dark, chitinized area and only very faintly tracheated (fig. c). The abdominal ground color is light brown with the usual darker submedian rows of spots or dashes, but there seems to be a greater extension of the pale suffusion dorsally than in *celer*, segments VI and VII both dorsally and ventrally and X dorsally being largely pale and II, III, and VIII showing considerably pale suffusion laterally; the tails are pale at the base and apex, the whole intermediate section

being deep smoky, giving a broad-banded appearance; the tarsi are dark-banded both proximally and distally. As already noted the nymphal material of *celer* at my disposal has probably faded considerably from its long immersion in alcohol, so that some of the above points may prove to be of little value as a means of separation when fresh nymphal material of *celer* is available.

***Ameletus alticolus* n. sp.**

Male. Close to the preceding, but thorax and abdomen dorsally quite evenly deep brown, without any of either the blackish or pale coloration found in *celeroides*. Head deep brown with pale shading laterad of the antennae. Thorax deep brown, pronotum faintly tipped with creamy at postero-lateral angle; anterior portion of mesonotum edged laterally with a creamy line, tinged



Fourth Gill of (a) *Ameletus velox* Dodds, (b) *A. celer* McD., (c) *A. celeroides* McD., (d) *A. alticolus* McD.

with pink; a creamy patch with slight pinkish shading anterior to wing base; pleura as usual shaded with creamy-brown. Abdomen dorsally rather even, deep, shiny brown with little deepening of color along posterior margins of segments, ventrally pale creamy, with the usual dark ganglionic marks. Forelegs dark brown; mid and hind legs rather pale, creamy-brown. Wings hyaline; veins fine, brown; cross-veins pale, indistinct, except in costo-apical area, where they are brown and finely anastomosed. In the genitalia the forceps are rather short and stumpy and the excavation of the apical margin of the forceps-plate is much less deep than in the two-preceding species; the penis-lobes are rather broad and short and there appears to be no ventro-basal spining. Length of body, 8 mm.; of forewing, 8 mm.

Holotype—♂, Blairmore, Alta., June 23, 1930, (J. H. Pepper); No. 3764 in the Canadian National Collection, Ottawa.

Paratype—♂, same data.

This species has not actually been bred from the nymph, but the following association is fairly certain of being correct as the material was taken at the same time and place as the type subimagos and is fully mature. According

to this association the rather slender nymph is almost entirely light brown with faint double row of dorsal abdominal dark streaks or dots and pale tails. Ventrally the abdomen shows as usual the white dots in the latero-posterior corners and the median ganglionic marks. The characteristic feature is found in the gills, which show *blackish chitinized bands slightly inward* from dorsal margin (fig. d), approaching *velox* in this respect, but of course, differing greatly in the much smaller size and almost entire lack of tracheation. I have examined similar nymphs from Cameron Lake, Waterton Park, Alta., Aug. 31, 1929, (altitude 5-6000 ft.) (J. H. Pepper).

***Ameletus aequivocus* n. sp.**

Belongs in the *cooki* group but differs in the browner coloration and details of genitalia.

Male. Head dark brown. Pronotum rather deep brown; mesonotum light brown shaded with black-brown laterally and broadly so posteriorly in the regions laterad of the scutellum; pleura and sternum deep brown, with the membranous portions pale brownish; metanotum brown, shaded with black-brown posteriorly. Abdomen dorsally with segment I black-brown, segments II-VII with anterior margin and a large subtriangular lateral patch pale, semihyaline, remainder of segments light brown, this color extending forward laterally almost to anterior margin; segments VIII-X opaque and more uniformly brown with paler brown patches laterally on IX and X. Ventrally segment I light brown, II-VI light ochreous, VII-IX light brown with posterior portion of IX and the genital plate somewhat paler; *no* ganglionic dark marks. Setae pale, dull brownish white. Forelegs with femora and tibiae deep brown with faint purplish tinge, tarsi pale brownish; mid and hind legs pale brownish with traces of a ruddy streak on femora on outer side. Wings hyaline, veins fine, brown, cross-veins indistinct, faintly tinged with brown, except in costo-apical area, where they are better defined and regularly anastomosed. Length of body, 9 mm.; of forewing, 9 mm.

Holotype—♂, Gunnison River, nr. Almont, Colo., 8000 ft., June 25, (A. W. Lindsey); No. 3765 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, same data as holotype; 1 ♂, Tolland, Colo., July.

The species is duller in coloration than *cooki*; in the male genitalia the basal plate is broader with the projections from posterior margin differently shaped; the penes are closer together and the stimuli are considerably longer.

(To be Continued)

Excerpt from the *Canadian Entomologist*, August 1934

NEW SPECIES OF NORTH AMERICAN EPHEMEROPTERA IV.

BY J. MCDUNNOUGH,

Ottawa, Ontario.

(continued from page 164)

Genus **Cinygma** Eaton

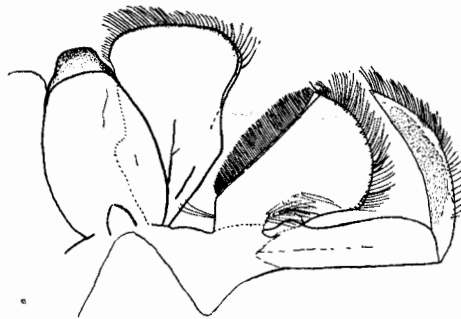
In my paper on the nymph of *Cinygma integrum* (1933, *Can. Ent.* LXV, 73) there is a rather serious error which I wish to correct. At the time my material was limited to a single nymphal exuvia; now with the mature nymphs and more exuviae at my disposal I find that the peculiar nature of the maxillae, as described and figured in the above paper, was abnormal and probably brought about by contraction occurring during the process of making a slide of the mouth-parts. I present a corrected drawing of the maxillae with the hypopharynx and paragnatha attached; from this it is at once evident that the maxilla is shaped much as in *Heptagenia*, so that my original contention that the genus *Cinygma* was closely allied to *Heptagenia* receives additional support.

***Cinygma dimicki* n. sp.**

Head pale yellowish faintly tinged with light brownish on vertex. Pronotum pale ochreous tinged with brownish, each lobe bordered laterally by a black line and with an oblique black median streak; a strong black streak at base of foreleg. Mesonotum pale brownish, lateral edges and scutellum light yellow; pleura pale brownish with a light yellow patch anterior to wing base, this patch bordered both dorsally and ventrally by distinct black streaks; black streaks at bases of both mid and hind legs. Metanotum pale brownish with a paler, more yellowish, median projection. Abdomen with segments I-VII pale hyaline yellowish, each segment with narrow posterior black border and with dark streak on posterior half of lateral edge; last three segments opaque, tinged with light brown. On all but the first and the last two segments there are indistinct, lateral, L-shaped smoky marks with small comma-like streaks attached ventrad to the anterior ends of same. Ventrally pale yellowish, the two posterior segments faintly tinged with brownish. Forceps pale smoky; setae deep smoky with fine dark intersegmental rings. Legs dull amber, the tibiae and tarsi tinged with smoky, the femora twice-banded with purple-brown, coxa with a black streak. Wings hyaline with fine dark veins and crossveins. Length of body, 11 mm.; of forewing, 11 mm.

Holotype—♂, Rock Creek, Philomath, Ore., May 1, 1934, (R. E. Dimick); No. 3814 in the Canadian National Collection, Ottawa.

Paratypes—4♂, same data, two of which are in the Coll. Oregon State College, Corvallis, Ore.



Maxilla and hypopharynx of *Cinygma integrum* Eat.

The male genitalia are quite similar to those of *integrum*, but the stimuli are smaller, and the apex of each penis-lobe is evenly rounded and without the slight tooth found in *integrum*; there is also less of a lateral excavation at the junction between the basal and apical sections. Both species show a pair of minute spines dorsally near the base of each penis-lobe, a feature not shown in my drawing of *integrum* (1926, Can. Ent. LVIII, 302). I take much pleasure in naming this species after Dr. R. E. Dimick who is considerably advancing our knowledge of the western American Ephemeroidea fauna by his investigations in the state of Oregon.

***Cinygmula gartrelli* n. sp.**

Male. Eyes (dried) deep black-brown, not contiguous. Head with anterior portion sepia-brown with paler antennal pits and some black shading on

each side of the vertical keel; vertex of head behind the ocelli deep blackish. Thorax dorsally sepia-brown, shading into black-brown on mesonotum posteriorly and with lighter shades on anterior projection of mesonotum and faintly cephalad of scutellum; pleura brown, with the membranous portions paler, a wine-colored patch anterior to base of forewing from which a pale ochreous dash projects towards the pronotum; there are also faint ruddy tinges at bases of legs; sternum brown, shaded with black brown. Abdomen dorsally with segment I deep brown, segments II-VII with anterior half pale, semihyaline ochreous-brown, the posterior portion deeper brown with a slight ruddy tinge, giving a distinct banded appearance; segments VIII-X opaque, more evenly dark brown with the paler areas showing as small lateral patches on VIII and IX. Ventrally light ochre-brown, faintly tinged with ruddy along posterior margins and at times on three posterior segments; ganglionic marks very faintly visible. Forceps and setae deep smoky. Forelegs deep smoky-brown, tibia slightly longer than combined trochanter and femur; mid and hind legs paler brown with slight ruddy tinge on the femora. Wings very characteristically marked, hyaline with a brownish-amber tinge at base, extending more faintly along costal region of both wings; veins fine, brown; crossveins strong, brown, lightly bordered in the costal half of forewing with brown shading which gives them a decidedly thickened appearance in this region.

Female. Slightly paler than male. Head light brown, shaded with ruddier brown next the eyes. Pleura and abdomen with more extended ruddy brown suffusion than in the male. Forelegs paler. Length of body, 9 mm.; or forewing, 10 mm.

Holotype—♂, Deep Creek, Peachland, B. C., May 23, (A. N. Gartrell); No. 3768 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—20 ♂, 15 ♀, same data.

This species belongs in the *mimus* group according to male genitalia, differing in the presence of a small subapical spine on the ventral surface of each penis-lobe. *Mimus* shows none of the heavy dark cross-veining on the forewings found in the present species, and is somewhat smaller and occurs about a month later in the year.

***Cinygmula uniformis* n. sp.**

Very similar to the preceding in genitalic characters. Differs at once by the uniform light amber coloration of the entire wings and the lack of heavy cross-veining.

Male. Head smoky brown with the pits of the antennae pale ochreous; thorax brown, a slightly paler shade than in *gartrelli*, with more extended lighter brown shading cephalad of the scutellum; pleural coloration much as in *gartrelli*. Abdomen dorsally with the hyaline areas on segments II-VII more extended, in consequence the brown posterior banding is narrower and also paler, showing none of the ruddy shades of *gartrelli*; the opaque posterior segments are almost unicolorous sepia-brown with a fine, blackish, posterior border to VIII. Ventrally very pale ochreous, segments VIII and IX shaded with light ochre-brown; ganglionic marks very faint, slightly ruddy. Forceps and setae light smoky. Legs light brown, the anterior tibia considerably longer than

trochanter and femur combined and longer than the same joint in *gartrelli*; mid and hind femora lightly tinged with ruddy. Wings *unicolorous light amber* with fine brown veins and crossveins.

Female. Very similar to male. Head brown, frequently with considerable ruddy suffusion, vertex tipped laterally with light ochreous. Length of body, 9-10 mm.; of forewing, 10 mm.

Holotype—♂, Shingle Creek, Penticton, B. C., Oct. 4, (A. N. Gartrell) (bred from nymph); No. 3769 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, Oct. 3.

Paratypes—21 ♂, 20 ♀, same data, Oct. 3, 4, 5, 9.

Further bred specimens before me are from Powers Creek, Westbank, B. C., Oct. 1-17.

The nymph is a typical *Cinygmula*, slender, light brown, streaked on the thorax with pale ochreous. The abdominal maculation consists of a pale broken dorsal line, of varying width and intensity, flanked on each side by two minute pale dots; there are also pale, broken submedian bands and traces of pale markings along the lateral edge; on segments VIII and IX the pale markings may coalesce, in which case the whole segment is pale with an irregular dark anterior border. Ventrally pale with faint median brown lunate marks and lateral longitudinal streaks on the last four segments. Tails pale ochreous. Legs pale ochreous with two broad bands of brown on femora. Gills broadly oval, moderately well tracheated, pale whitish with the dorsal half distinctly suffused with smoky. *No filaments* at bases of gills.

The male genitalia are very close to those of *gartrelli*; the subapical spines, however, of the penis-lobes are slightly stouter and show a tendency to become bifid at tip; further the outer edges of the stimuli are not so distinctly spined, there being at the most a minute apical spine, causing the tip to appear faintly bifid.

***Cinygmula reticulata* n. sp.**

Very similar to *mimus* Eat. differing principally in the maculation of the wings.

Male. Head and thorax brown, the latter with the usual lighter brown shading in the region anterior to scutellum and with the pleura streaked with light ochreous; a faint ruddy patch anterior to base of forewing. Abdomen dorsally with the anterior half of segments II-VII hyaline, the posterior half irregularly, purple-brown (deeper in color than in *mimus*), segments VIII-X opaque, largely purple-brown, with lighter brown shades along lateral edges, and also on posterior margin of X. Ventrally with much the same coloration, but considerably paler, genital plate light ochre-brown; traces of ganglionic marks. Forceps and setae light smoky. Legs pale brown, the femora with faint ruddy tinges. Wings entirely suffused with pale amber, veins and crossveins brown, the latter broadly but rather faintly bordered with pale smoky, giving a very characteristic checkered appearance to the entire wings, a feature not at all present in *mimus*. The male genitalia are so very similar to those of *mimus* that no definite character for separation can be given, unless it be that the stimuli are somewhat larger.

Female. Quite similar to male but crossveins on wings less distinctly bordered with smoky. Head rather light ochre-brown, slightly reticulate with smoky and with a darker shading posterior to the mid-ocellus. Length of body, 8 mm.; of forewing, 9 mm.

Holotype—♂, Luckiamute River, Kings Valley, Ore., May 10, 1933, (R. Dimick); No. 3770 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, May 16.

Paratypes—1 ♂, same data, May 16; 11 ♂, Marion Cr. (trib. Santiam Riv.) Ore., March 14, 1934; 2 ♀, Zig-zag, Ore., May 3, 1934; these last two lots received after completion of this paper and mostly deposited in the Coll. Oregon State College, Corvallis, Ore.

The 1933 specimens are marked as having been reared, but I have no data on the nymph.

Genus *Rhithrogena* Eaton

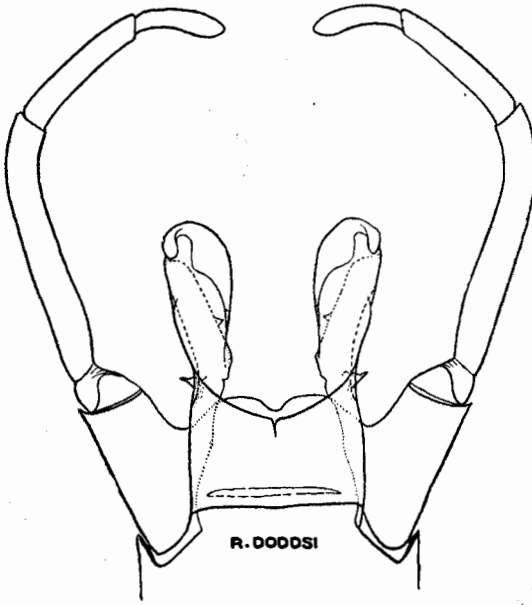
The western species of the *brunnea-doddsi* group are so similar in general color and maculation that without a careful study of the male genitalia it is almost impossible to identify them correctly. The penes are long and rod-like and the chief characteristic of the group is the presence of a strong lateral spine at the base of each penis-lobe. A detailed study of considerable accumulated material has convinced me that the group is in need of a certain amount of revision and that it includes several undescribed species.

In the first place I find that my identification of *brunnea* Hag. (1928, Can. Ent. LX, 9) has been incorrect; I have recently been able to study a slide of the genitalia of the type male specimen in the Museum of Comparative Zoology at Cambridge, Mass., from the Sierra Nevada Mts., Calif. I am unable to match it with anything before me; it appears to be a distinct species and Eaton's figure of the ventral surface (right-hand side) is good; I would call particular attention to the excurved apex of each lobe and the strong spine near the inner margin.

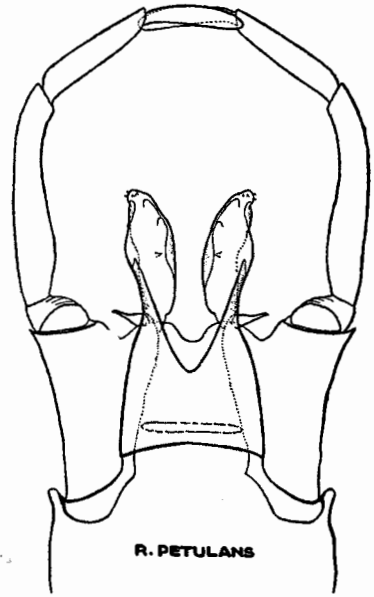
Through the co-operation of Dr. J. Traver at Cornell University the identity of *petulans* Seemann (1927, Jour. Ent. & Zool. 42, Pl. IV, fig. 3) has been established; we find that the original drawing of the genitalia has omitted several small, but important details. Finally of the remaining three described species, viz. *morrisoni* Banks, *flavianula* McD., and *doddsi* McD., I have paratype and type material respectively before me. With the aid of the following key and drawings the species should now be capable of separation without undue difficulty.

KEY TO SPECIES OF BRUNNEA GROUP OF RHITHROGENA.

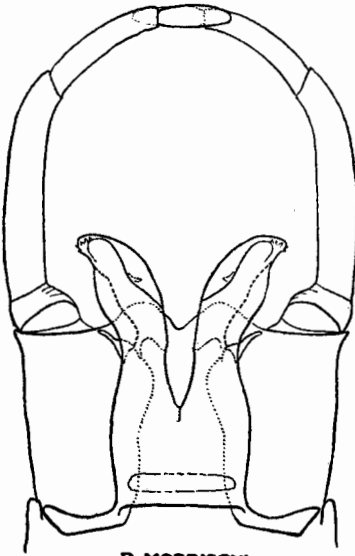
1. Latero-apical edge of each penis-lobe drawn out to a small, sharp spine as in *Heptagenia* *virilis* n. sp.
 Latero-apical edge of penis-lobe rounded, without spine..... 2
2. Each penis-lobe with ventral spine situated near inner margin, about half-way between lateral spine and apex..... 4
 Each penis-lobe without ventral spine but with one or more dorsal ones situated in central area..... 3
3. A single central dorsal spine on each lobe, smaller species.... *futilis* n. sp.
 Five or six dorsal spines on each lobe; large species..... *flavianula* McD.
4. Penis-lobes only slightly divergent apically..... 6



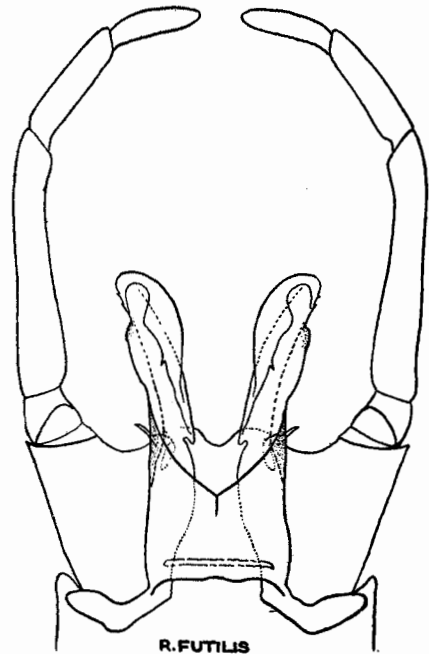
R. DODDSI



R. PETULANS



R. MORRISONI



R. FUTILIS

NORTH AMERICAN EPHEMEROPTERA.



- Penis-lobes strongly divergent apically 5
5. Penis-lobe narrowed apically with a curved row of 5-6 small ventral spines *morrisoni* Banks
 Penis-lobe broader apically, with stronger mid-ventral spine and weaker apical ones *brunnea* Hag.
6. Penis-lobe broad apically with latero-apical spining minute.... *doddsi* McD.
 Penis-lobe narrowed apically with better developed latero-apical spining *petulans* Smn.

***Rhithrogena virilis* n. sp.**

Male. A large species with the usual almost unicolorous, brown coloration. Head brown with ochreous shading around bases of antennae and the anterior portion suffused with smoky. Notum brown, with the scutellum and adjacent parts light ochre-brown; pleura shaded with ochreous, particularly anterior to base of wings, a dark streak from base of forewing to pronotum; sternum tinged with smoky in median area. Abdomen brown, irregularly paler along lateral edge and on posterior segments ventrally. Forceps and setae deep smoky. Forelegs deep smoky; mid and hind legs lighter brown with the usual smoky streak on each femur. Wings hyaline with a faint tinge of amber along costa; veins and crossveins fine, deep brown, the latter anastomosing as usual in pterostigmatic region.

Female. Head suffused with smoky anterior to antennae; area between ocelli and antennae light ochreous; next the eyes and posterior to ocelli light ruddy brown with a slight median smoky tinge and the vertex in lateral angles slightly ochreous. Otherwise very similar to male, but with slightly paler thorax. Length of body, 12 mm.; of forewing, 15 mm.

Holotype—♂, Faulder, nr. Summerland, B. C., June 27, (A. N. Gartrell) (bred from nymph); No. 3771 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—1 ♂, 4 ♀, same data, June 24, 25, 27, 29; 1 ♂ (in alcohol) June 25.

I have also examined specimens in alcohol from Jasper Park, Alta., which as already noted, I have previously identified as *brunnea* Hag. A single female from Blairmore, Alta., (July 14) is also in the collection. The nymph is a typical *Rhithrogena*; dark brown, with three pale yellowish tails; the large gills are tinged with purplish in dorsal half and the brown femora have a broad pale streak extending from base to beyond half. There is no abdominal pattern visible in the nymphal exuviae other than a pair of very minute subdorsal pale dots on the last four or five segments.

***Rhithrogena futilis* n. sp.**

Scarcely distinguishable except on genital characters from *doddsi* McD. As compared with the type series of this latter species the present one is slightly larger in size and the general color is a deeper brown. The abdomen is very narrowly ringed with light ochreous in the interspaceal area and on dorsum this pale area shows a faint smoky transverse streak. Anterior to the base of forewing is a light ochreous patch tinged with ruddy-brown posteriorly and bisected by a blackish streak. The usual dark streaks are present on the femora.

As compared with those of *doddsi* the male genitalia show narrower and

slightly more divergent penis-lobes apically, the centro-ventral small spine is lacking and in its place we find a small dorsal spine in much the same position; the minute apical spines on outer edge of each lobe which are present in most of the species of the group are somewhat better developed than in *doddsi*, but not as strong as in *morrisoni*. Length of body, 11 mm.; of forewing, 11.5 mm.

Holotype—♂, Gardiner Riv., Yellowstone Nat. Park, Wyo. July 26, 1928, (J. McDunnough); No. 3772 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—24 ♂, 7 ♀, same data.

Besides the type lot I have series before me from Waterton Lakes, Alta., (Aug. 23); Blairmore, Alta., (Aug. 14); and Banff, Alta., (Sept. 1, 4) which agree in genital characters. These are all slightly smaller in size than the Wyoming specimens and the Waterton ones are paler in color. The species I recorded as *doddsi* from Jasper Park, Alta., also belongs here. As far as I am able to judge the flight of the species appears to be at a considerably later date than that of *doddsi*.

***Rhithrogena morrisoni* Banks**

Epeorus morrisoni Banks, 1924, Bull. Mus. Comp. Zool. LXV, 424.

Heptagenia morrisoni McDunnough, 1925, Can. Ent. LVII, 191.

The species was described from material from Reno, Nevada. There is a small series before me from Old Man. Riv. McLeod, Alta., May 14, 1930, (J. H. Pepper) which is our only Canadian record.