

A NEW MAYFLY GENUS FROM NORTH CAROLINA *

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This paper records the capture and rearing of a new genus and species of mayfly from the mountains of North Carolina, to which the name *Oreianthus purpureus* is herewith assigned. The nymph of this new genus has been taken at but two stations. It was first found in Davidson River in Transylvania Co., within the borders of Pisgah National Forest, and near the little town of Pisgah Forest. Davidson River, a tributary of the French Broad River, is a stream of brown water, rather deep and swift, flowing over a rocky bed. In June 1929, three nymphs were collected here, and two more were taken in June 1930. Repeated and long-continued search in the same stream at the place where the nymphs were first found, as well as at other points above and below, failed to yield more than the five mentioned. All of these were mature at the time of capture, and from them one female subimago and one female imago were reared.

In October 1929, two immature nymphs of the same genus and species were taken from a branch of Mitchell River near the town of Mountain Park, in Surry Co. Mitchell River is likewise a brown water stream with a rocky bed, but less deep and swift than Davidson River, and is tributary to the Yadkin River.

The nymph of *Oreianthus purpureus* is large and sedentary, with long sprawling legs and body form fitted for walking. In many respects, other than size, it resembles *Caenis*, especially in the possession of elytrid gills on the second segment, which completely cover all succeeding pairs of gills. The mouthparts also are rather similar to *Caenis*. But it is not hairy, and possesses two pairs of well-developed wing-pads. In other respects it bears resemblance to *Ephemerella* nymphs, particularly in the lateral extensions of the abdominal segments, but has one median instead of two lateral spinous dorsal processes. In general appearance, it would be taken at once for a nymph of the subfamily Baetinae (Needham). The wing venation of the adult insect, however, places this genus in the subfamily Ephemerinae, since the cubital and first anal veins are strongly divergent at the base.

Nymphs of *Oreianthus purpureus* from Davidson River were taken in swift water, at a depth of from one and one half to two feet. They were obtained only by moving the large flat or slightly irregular rocks on the stream bed with a rake, meantime holding the screen in the current below, to catch the wash. The swiftness of the current and the large size of the rocks made such collecting no easy task. These nymphs were by no means plentiful, as evidenced by the fact that a four-hour search for them on June 20, 1930, yielded but two nymphs. Other aquatic larvae were more numerous, however, as indicated by the following list of associated forms. These included, among mayflies, five species of *Ephemerella*, two species each of *Ecdyonurus*, *Epeorus*, and *Chironetes*, and one species each of *Heptagenia*, *Baetis* and *Leptophlebia*. Trichoptera were represented by *Hydropsyche*, *Brachycentrus*, and *Rhyacophila*; Odonata by *Lanthus*. The most numerous Plecoptera were of the genera *Perla*, *Perlina*, *Pteronarcys* and *Acronuria*. Many large *Corydalis* and *Chauliodes*, and the crane-fly

*Contributions from the limnological laboratory, Cornell University.

Eriocera, were also present. Of the five nymphs of *Oreianthus purpureus* taken during 1929 and 1930 at this station, three were males, all of which failed to transform. One female subimago transformed on June 22, 1929, and a female imago on June 30, 1930.

Oreianthus n. Gen.

In fore wing, first anal and first branch of Cu strongly divergent at the base. Cu₂ definitely branching from Cu₁, not appearing to arise from the stem of first anal, as is the case in *Rhoenanthus*. Long intercalary vein between Cu₁ and Cu₂. First anal forked about halfway to wing margin. In hind wing, costal angulation similar to *Rhoenanthus*. Cubitus vein (Morgan; median vein of Tillyard) forked somewhat more than halfway to margin. (Fig. 11). Claws unlike each to each, on all legs. Foreleg of female 7/16 the length of the body. Tarsus equal to 3/5 of femur, tibia slightly longer than femur. In second and third legs, femur and tibia equal. Last tarsal joint longest, on each leg. (Figs. 12-14). Pleural folds on segments 1-9 developed into expanded plates. The posterior lateral angles of these, on segments 8 and 9, produced into backward-projecting spinous processes. Tails equal in size and length. In subimago, slightly longer than body (broken in imago). Ninth sternite of female with backwardly-directed median extension on posterior margin. Lateral ocelli slightly larger than the median one. Prosternum produced into a median carina. Anterior portion of mesosternum with a smaller and more rounded prominence. Forceps of male with one short distal joint (Fig. 6, genitalia of mature male nymph).

Nymph—Head almost twice as wide as long. Second joint of antenna almost as long as first, but more slender. Compound eyes of male nymph not contiguous dorsally. Prothorax slightly longer than head medially, considerably longer on lateral margins. Mesothorax with semicircular lobe at front of thin lateral margin. Body widest at greatest width of mesothorax, just anterior to base of metathoracic legs. In mature nymph, covers of first pair of wings extend backward to middle of sixth abdominal segment. Metathorax almost concealed dorsally by wing covers of first pair. Second pair of wings project slightly from beneath first pair. Short median backward-projecting spine on posterior margin of metathorax. Legs long, finely-haired throughout their length. Claws simple. Hind legs longest, equal in length to abdomen. On first abdominal segment, small upturned gill. On second segment, elyroid gill covers, cemented together on median line, covering all succeeding pairs of gills. Lateral margins of segments 3-9 prolonged into flattened processes, not prominent on segments 3-5, very pronounced on 6-9. Lateral angles becoming progressively more acuminate on 6-9, the projection on 9 quite large. Median spines on segments 1-2, 6-8, and a rounded projection on 10. Spines most prominent on 1 and 2, least prominent on 8. Abdomen narrows gradually back of 6th segment.

Type of this genus, *Oreianthus purpureus* n. sp.

Oreianthus purpureus n. sp.*Measurements*

	Body	Tails	Foreleg	Forewing
Male nymph (3 specimens)	14-15 mm.	10-10.5 mm.		
Female nymph (2 nymph sloughs)	16-17	10.5		
Female subimago (1 specimen)	14	15	6	15
Female imago (1 specimen)	16	Broken	7	17

NYMPH, (figs. 1-5, 7-10, and 15.). Large elongated form, legs very long and sprawling.

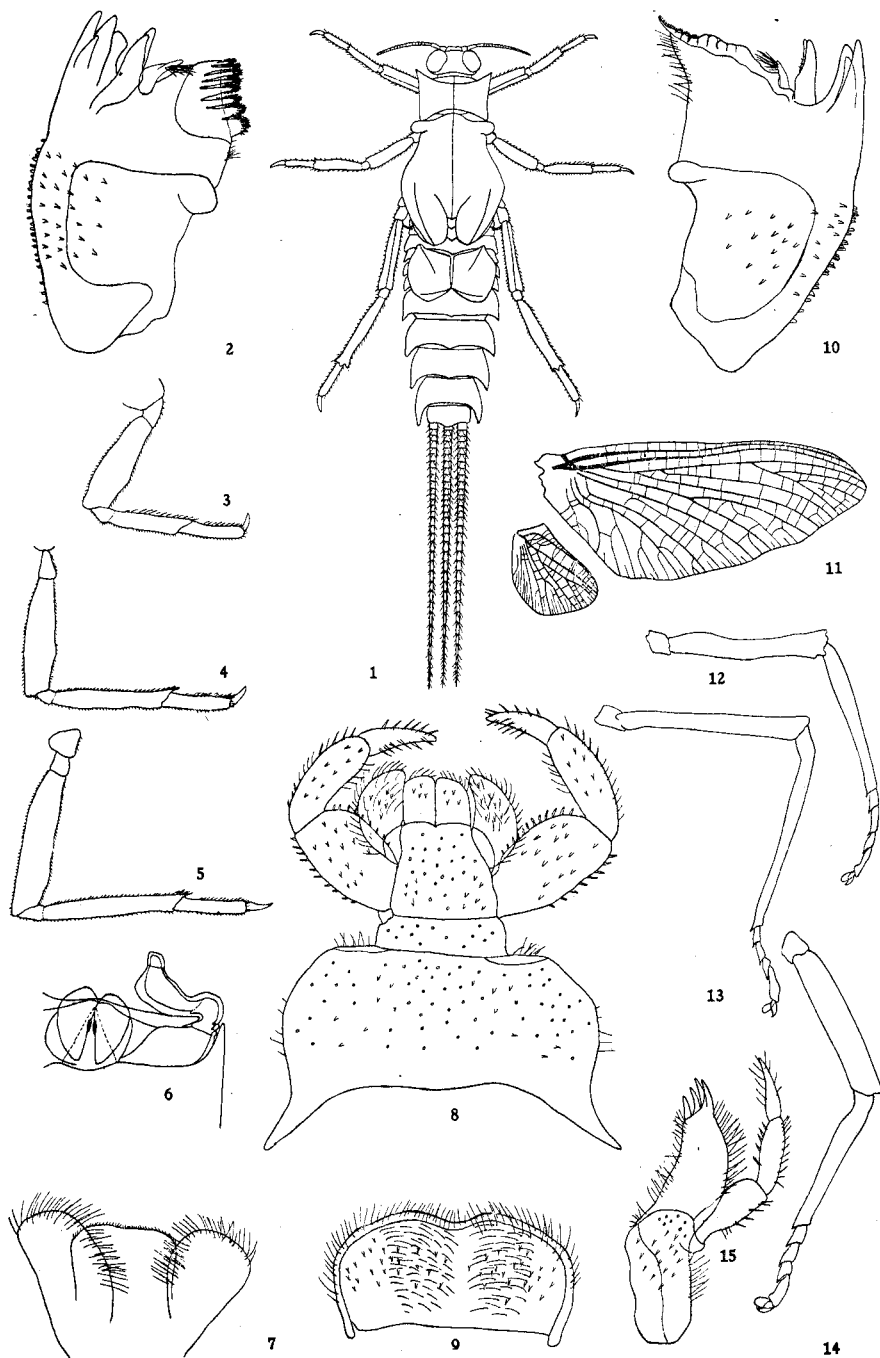
Head—a few very short hairs on each antennal joint, just below each joining. Ocelli not readily seen. Front of clypeus with many upwardly-directed short spines. Similar short spines directed outward and downward on frons, vertex and occiput. Head dark brown, antennae lighter brown.

Mouthparts—Labrum indented on anterior margin, its dorsal surface beset with upward-projecting spines. Mandible with four outer and two inner canines. Lacinia curved, brush of hairs extending out from one side near tip. Outer margin curving sharply outward from base and gently inward to canines; its lower two-thirds serrated or set with spines. Molar surface of right mandible with fine hairs. Base of mandible with inwardly-directed spines. Inner margin with thumblike projection. Maxilla bears four stout spines on its crown. Both margins closely set with long hairs and bristles. Rather distinct division between galea-lacinia and stipes. Maxillary palp longer than galea-lacinia, its palpifer well-defined. Proximal and second joints equal in length, distal joint somewhat shorter than either of others. Hypopharynx, median lobe squarish, its free margin almost straight; slightly shorter than lateral lobes. Labium, glossae and paraglossae definitely separated from ligula. Labial palp well developed, its proximal joint expanded, its distal joint terminating in a point. Entire palp longer than paraglossa. Labium set with short spines.

Thorax—Lateral margins of prothorax twice its median length, due to forward and backward projections of the anterior and posterior angles. Anterior angle sharp at tip, posterior angle rounded. Prothorax distinct from mesothorax. Thorax dark brown; flattened margins light red-brown. Wing cases black in mature nymph, dark brown in younger forms. Venter but little lighter than dorsal sclerites.

Legs—No spines or teeth on claws. At proximal end of each tibia, joint is narrowed and then dilated into rounded enlargement, giving appearance of a shorter extra joint. Tibia increases in length from first to third leg in greater proportion than femur or tarsus. Length of the leg segments as follows;

	Femur	Tibia	Tarsus
1st leg	2¼ mm.	2 mm.	1¼ mm.
2nd leg	2½ mm.	2¾ mm.	1¾ mm.
3rd leg	3⅛ mm.	3¼ mm.	1½ mm.



Oreianthus purpureus n. sp.

Fig. 1—Mature nymph, dorsal aspect. Figs. 2 and 10—Left and right mandibles of nymph. Figs. 3, 4, and 5—1st, 2nd, and 3rd legs of nymph. Fig. 6—Genitalia of male subimago, dissected out from mature nymph. Fig. 7—Hypopharynx of nymph. Fig. 8—Labium of nymph. Fig. 9—Labrum of nymph. Fig. 11—Wings of female imago. Figs. 12, 13, and 14—1st, 2nd and 3rd legs of female imago. Fig. 15—Maxilla of nymph.

Femur of first leg considerably more flattened than on other legs. Legs brown in color, flattened. Femur of foreleg margined on sides and at each end with red-brown. Enlarged portion of tibia at femoro-tibial joint and at each tarsus, light yellow-brown. Claw yellow-brown, tipped and margined with red.

Abdomen—Lengths of abdominal segments, (in eighths of millimeters,) are to each other as; 6; 5; 5; 5; 5; 8; 10; 12; 5. Elytroid gill cover on segment 2 extends backward over anterior one-third of segment 3, covering gills on segments 3-6 completely. Ridge or carina on this elytrid gill, from anterior outer angle slanting toward center. Elytroid gill finely ciliated on lateral and posterior margins. Abdominal segments 3-9 finely ciliated on pleural margins. Posterior margin of 9th sternite produced backward into median spinous process, equal in length to lateral projections. On each side of this long median process is a smaller rounded lobe. Color of abdomen dark brown above, red-brown ventrally. Flattened lateral margins lighter red-brown. Anterior of each sternite irregularly mottled with dark brown. Indistinct small black spot on each side of sternites 1-8, at anterior margin about midway between median line and pleural fold.

Tails—Dark brown on proximal half, light red-brown on distal half (in young nymphs, light red-brown for entire length). Narrow black band across base of all three tails, near body.

FEMALE SUBIMAGO. Head and thorax dark purplish-brown. Pronotum and edges of mesonotum very dark, rest of mesonotum tinged with chestnut brown. Compound eyes very dark grey; bases of ocelli black. Light band on each side of head, from inner margin of compound eye to median of vertex. Legs dark purplish-brown, claws light brown. Wings dark sepia-brown, veins black or very dark brown. Abdomen purplish, tinged with brown. Tails very dark purplish brown or black.

FEMALE IMAGO. Body stout, especially at mesothorax. Head relatively small. General color purplish, except mesothorax, which is brown.

Head—Antennal sclerites and ocelli white. Compound eyes dark grey. Light mark from inner margin of compound eye to vertex, as in subimago. Antennae and remainder of head purplish-brown.

Thorax—Pronotum carved out widely on median posterior margin, forming an arcuate indentation into which the mesonotum fits. Pronotum purplish brown, mesonotum light brown, becoming chestnut-brown on its posterior projection. Metanotum light purplish-brown. Pleura light tan with brown-purple markings. Prosternum and anterior portion of mesosternum light grey mottled with purple. Remainder of thoracic sternites purplish brown.

Legs—First and second leg purplish-brown. Femur grey at jointing with trochanter. Tibia light yellow-brown at each jointing. Each tarsal jointing with yellow mark on inner margin. Claws purple-brown, yellow at base; pointed claw also yellow at tip. Third leg light brown, marked at joints with purple-brown.

Wings—Transparent. Veins, particularly costa, subcosta and radius, dark purple. Tip of costal angulation of hind wing purple. Membranes at bases of wings grey-white.

Abdomen—Reddish purple, lighter ventrally. Pleural folds dark purplish-brown. Tergites 1, 2 and the anterior half of 3 lighter than remainder of abdomen, and with indistinct brown mottling. On median line of 1 and 2, a dark bar. Tergites 3-5 uniform purple, with light streak at median line. On each, a ramifying white or grey line arising from the anterior inner margin of the pleural fold and extending, with its branches, almost to the median line. Similar light lines on remaining tergites, but much more branched. Light grey spot in pleural fold of tergites 1-7; oblong on 1, round on 3-5, very small on 6 and 7. Tergites 6-10 purple-brown with light purple mottling. At median line of 6, irregular brown pattern. Sternites 1-5 very light purple mottled with light brown. Sternites 6-9 similarly mottled, but with background of purplish-brown. Dark purplish spot near pleural fold, at anterior margin of each sternite except 8 and 9, in which it extends the length of the sternite, and 10, from which it is absent. Sternite 10 grey marked with purple.

Tails—Very dark purplish brown or black. Second, third, fifth and sixth proximal joints shorter than others. Short hairs along entire length of each joint, slightly longer hairs at each joining.

Holotype—♀ imago. Reared from nymph taken in Davidson River, N. C. June 30, 1930. No. 975.1 in Cornell University Collection.

Paratype—♀ subimago. Same location, June 22, 1929. No. 975.2 in Cornell University collection. Two mature nymphs, male, same location, June 19, '29, and June 20, '30. No. 975.3 and 975.4 in Cornell collection.

In 1871, Joly described and figured a nymph from the Garonne River, near Toulouse, as *Caenis maxima*. In 1873, 1875 and 1876 he refers again to this nymph, repeating his original figures in the two latter papers. Eaton had suggested (in private correspondence) the possibility that this nymph might be a young *Tricorythus*. But in 1881 he writes that, after examining other specimens in a better state of preservation, he thinks it "more likely to be a real *Caenis*". In 1883-87, however, he refers this species tentatively to *Tricorythus*, "provisionally" describing it as such, with detailed figures of the nymph and its structures. He adds; "I am disposed to suspect that this nymph has been too hastily referred to *Tricorythus*; the adult may be of a genus at present unknown; but I could not distinguish the venation of the wings satisfactorily in the nymph, and therefore this is only a conjecture". Vayssiere, 1882, makes this nymph the basis for his study of the genus *Tricorythus*, figuring and describing it in detail, and mentioning the small second pair of wings. Lestage, in 1917, after a considerable discussion of the nymph and a brief resume of its characters, decides it is really a *Caenis*. Rousseau, 1921, treats it as the only European species of *Tricorythus*, yet expresses a doubt as to whether or not it really belongs to that genus.

A comparison of the published figures of *Caenis maxima* Joly with the figures of the nymph of *Oreianthus purpureus* leaves no reason to doubt that Joly's nymph belongs, neither to *Caenis* nor to *Tricorythus*, but to the new genus *Oreianthus*. Eaton was therefore quite correct in his idea that the adult of this nymph might be of an unknown genus.

Joly's nymph, on the basis of the structure of the elyteroid gills, could not be a *Tricorythus*, nor do its mouthparts correspond to those of the latter genus.

It differs considerably from *Caenis* in the appearance of the external margin and the canines of the mandibles. Further, the elyteroid gills are grown together on the median line, and the body is not hairy. Finally, the presence of a second pair of wings would ordinarily distinguish this nymph from both *Caenis* and *Tricorythus*. That Joly's nymph is a different species from *Orcianthus purpureus* is evidenced, furthermore, by two characters. First, the size and shape of the pronotum, which in *O. purpureus* is much lengthened on the lateral margins, its anterior angle produced into a sharp point. Second, the median dorsal spines, which in Joly's nymph are present on the first two abdominal segments only, in *O. purpureus* are present also on segments 6-8, not counting the rounded projection on segment 10.

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SUBTERRANEAN INSECTS OF MARSH GRASS (*SPARTINA
MICHAXIANA* HITCHCOCK).¹

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During the summer of 1929 it occurred to the author to collect the subterranean insects of stands of marsh grass (*Spartina Michauxiana* Hitchcock). No large areas of this grass were found in the vicinity of Ames, Iowa. The places of study hence were restricted to a half dozen small spots along the fence lines of tilled fields near Ames. The soil was a black loam and not well-drained at these places. The digging in this tough sod proved rather a slow procedure. With a spade a piece of sod about six by eight inches was loosened at a time and the mass of rootstocks, roots and soil was separated at the side of the road to bring the insects into view. This method did not lend itself to quantitative study.

¹Contribution from the Department of Zoology and Entomology, Iowa State College.