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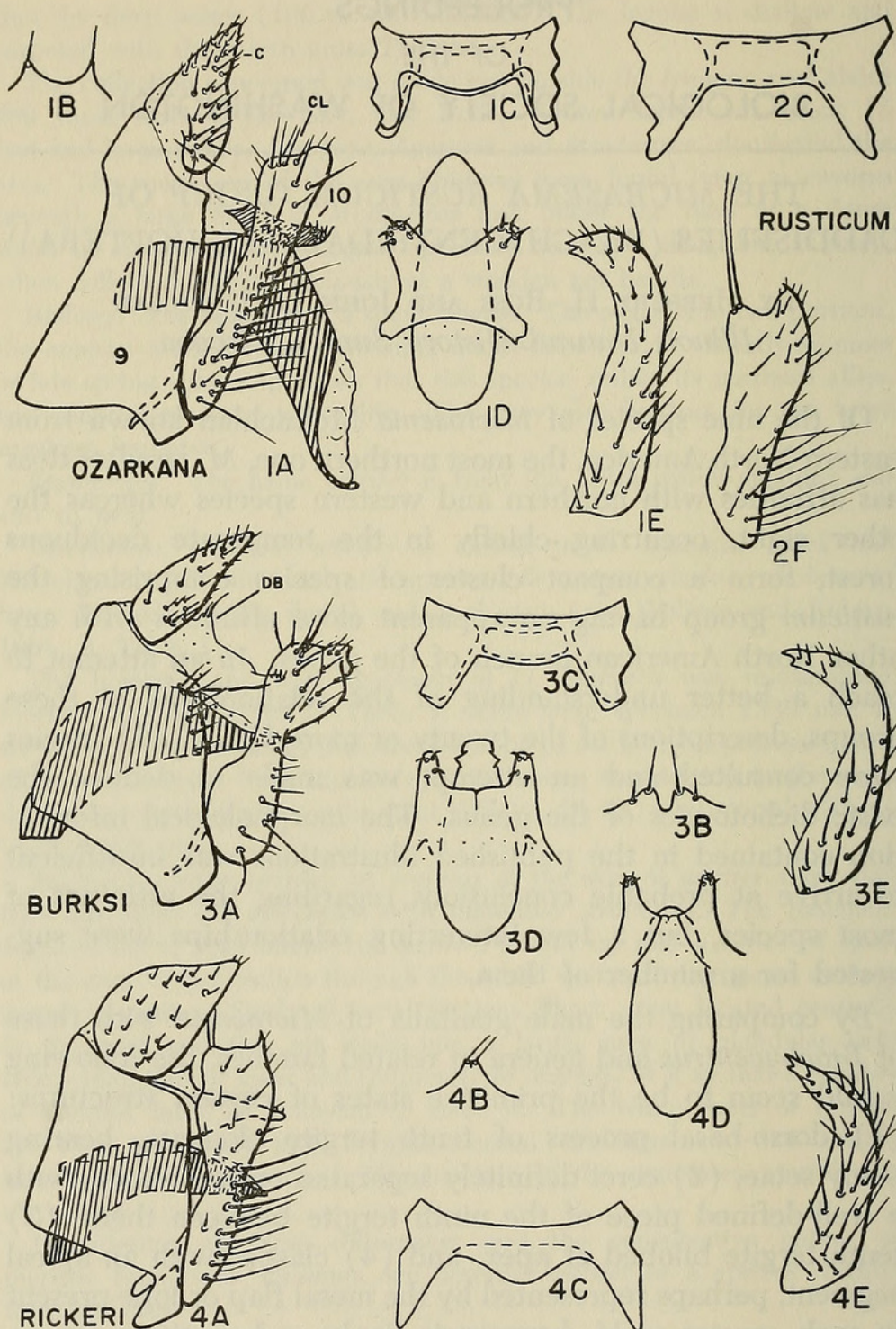
THE *MICRASEMA RUSTICUM* GROUP OF
CADDISFLIES (BRACHYCENTRIDAE, TRICHOPTERA)¹

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Of the nine species of *Micrasema* McLachlan known from eastern North America, the most northern one, *M. sprulesi* Ross has affinities with northern and western species whereas the other eight, occurring chiefly in the temperate deciduous forest, form a compact cluster of species comprising the *rusticum* group having no apparent close affinities with any other North American branch of the genus. In an attempt to reach a better understanding of the relationships of these groups, descriptions of the twenty or more Old World species were consulted and an attempt was made to deduce the basic dichotomies of the genus. The morphological information contained in the published illustrations was insufficient to arrive at probable conclusions regarding the affinities of most species, but a few interesting relationships were suggested for a number of them.

By comparing the male genitalia of *Micrasema* with those of *Brachycentrus* and genera in related families, the following would seem to be the primitive states of certain structures: (1) dorso-basal process of tenth tergite elongate, bearing many setae; (2) cerci definitely separated on the meson, with a well-defined piece of the ninth tergite between them; (3) tenth tergite bilobed at apex; and (4) clasper with an apical segment, perhaps represented by the mesal flap or lobe present in such species as *M. borneensis* Banks and *vestitum* Navas. The Japanese *M. hanasensis* Tsuda has all these characters except the vestige of the apical segment of the clasper, and on this basis represents a primitive surviving branch of the

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FIGS. 1-4. Male genitalia of *Micrasema* species. A, male genitalia, lateral aspect; B, dorsobasal lobes of tenth tergite; C, ninth sternite, ventral aspect; D, tenth tergite and aedeagus, dorsal aspect; E, right clasper, ventral aspect. Abbreviations: 9, 10, ninth and tenth segments; C, cercus; CL, clasper; DB, dorsobasal process.

genus. The Bornean *M. borneensis* possesses all of the above primitive characters except that the cerci are fairly close together at the base. This species also is therefore a good candidate for being one of the most archaic branches of the genus. The remainder of the species we have seen are alike in having the dorsobasal lobe much reduced and, if evident, bearing a maximum of two setae at the apex (Fig. 3B).

In three North American lineages, *M. scissum* McLachlan, *M. sprulesi* Ross, and *M. bactro* Ross and its allies, the dorsobasal process is apparently incorporated as only an indistinct wart of the tenth tergite, and the clasper has one or more additional small lobes on the anterodorsal face near the apex. These three lineages appear to constitute a distinctive monophyletic branch. In the two European species, *M. servatum* Navas and *vestitum* Navas, the dorsobasal process is short, with two apical spines, but the apical segment of the clasper is a well-delineated lobe. In the western North American *M. aspilus* Ross, the apex of the clasper is split; one of the short branches of this fork may represent an apical segment whose delineating sutures are gone.

The group of species containing *M. rusticum* Hagen has many members possessing the small, two-spined dorsobasal process, but lacks any sign of a division of the clasper and the basis of the cerci either touch on the meson, or are actually fused for a short distance. This group can be visualized as an offshoot of the *servatum* branch in which the claspers lost their apical lobe; *M. aspilus* could represent an intermediate step in this evolution. The only indubitably close relative of the *rusticum* group that we have seen is the Japanese *M. quadriloba* Martynov. This differs markedly in having the dorsobasal process fused with the cerci, which are themselves moderately well fused and hoodlike, and in having the tenth tergite produced into a long narrow point, not at all bilobate. It is possible that the European *M. tristellum* McLachlan belongs near *M. quadriloba*. There is some suggestion, further, that the European *M. minimum* McLachlan may be even more similar to *M. rusticum* than are either *M. tristellum* or *M. quadriloba*. At the present, however, the only comparisons that seem reliable indicate only that *M. quadriloba* represents a closely related sister branch of *M. rusticum*.

To translate this information into a pattern of probable dispersals, ecological information must be invoked. The entire *rusticum* branch is confined almost completely to the eastern temperate deciduous forest and *M. quadriloba* plus the two possible European representatives of the branch occur in sufficiently low latitudes that they would appear to be ecological equivalents. This is suggestive that the progenitor of the *rusticum* group spread across the Holarctic region during mid-Tertiary when the temperate deciduous forest was widespread across this entire region. Where in this large area the progenitor of the entire branch

originated is impossible to tell. On the basis of phylogenetic sequence, the *scissum-sprulesi-bactro* branch appears to have originated earlier and to have evolved in western North America. The *scissum* and *sprulesi* branches appear to have evolved as northern boreal elements, but on the evidence at hand no time can be suggested reliably as to when the ancestor of *M. sprulesi* spread to eastern North America.

THE RUSTICUM GROUP

The eight species known for this group appear to constitute three branches. In one branch, comprising *M. charonis* Banks, *scotti* Ross, and *bennetti* Ross, the apex of the clasper has developed a footlike apical projection; *M. burksi* n. sp. has all the appearances of representing an early stage in this development. In another branch, containing only *M. wataga* Ross, the dorsobasal process is elongate, fingerlike, and terminates in a single long spine; the tenth tergite has other distinctive characters. In the third branch, containing *M. rusticum* Hagen, *rickeri* n. sp., and *ozarkana* n. sp., the reduction of the dorsobasal process has become progressively reduced. The entire *rusticum* group has apparently evolved entirely within the confines of the eastern deciduous forest and its northern ecotonal areas.

DESCRIPTIONS OF NEW SPECIES

During the course of this study, three new species of the genus *Micrasema* were discovered. These are described below. The descriptions are of the holotype and allotype specimens. The types are deposited in the collection of the Illinois Natural History Survey.

***Micrasema ozarkana*, new species**

Male: Length, 4.3 mm. Head, thorax, and abdomen brown; antennae, mouthparts, legs below the coxae, and wings light brown. Maxillary palpi 3-segmented. Abdominal tergites uniform in structure. Genitalia as in Fig. 1. Ninth segment broad laterally, narrow above and below. Cerci divergent on the meson, touching near base; triangular in dorsal aspect. Tenth tergite divided into a pair of stout divergent sclerotized lobes, each bearing a group of sharp setae at the apex (Fig. 1D). At the base of the tenth tergite arises a pair of medium-sized dorsobasal semimembranous lobes bearing one seta at each of their apices (Fig. 1B). Aedeagus tubular and simple with tip tapered and blunt (Fig. 1D). Claspers, in lateral aspect, wide basally narrowing in the middle and widening again slightly at the tip (Fig. 1A); in ventral aspect curved inward at the tip (Fig. 1E.) Ninth sternite broadly U-shaped with lateral edges only slightly divergent and anterior edge bowed very little (Fig. 1C). Seventh and eighth sternites with a thick cushion of hairs.

Female: Length 4 mm. Color and general structure similar to male. Ninth tergite triangular; tenth tergite roughly triangular, posterior edge divided into two lobes by mesal incision.

Holotype: Male; Greer Springs, Missouri; 7 June 1937; H. H. Ross.

Allotype: Female; same data as for holotype. *Paratypes*: same data as for holotype, 52 ♀♀; Big Springs, Missouri; 15 July 1964; J. D. Unzicker and T. Yamamoto, 15 ♂♂, 1 ♀; Mammoth Springs, Arkansas; 14 July 1964; J. D. Unzicker and T. Yamamoto, 2 ♂♂, 2 ♀♀.

In Ross' key (1947) this species runs to *M. rusticum*, but differs from *rusticum* in the divergent lobes of the tenth tergite, the shape of the aedeagus in lateral aspect (in *rusticum* it is almost identical with that of *M. burksi*, Fig. 3A), the shape of the ninth segment in lateral aspect (*M. rusticum* as in Fig. 2A), the shape of the clasper in lateral and ventral aspects, the shape of the ninth sternite (*M. rusticum* as in Fig. 2C); and the absence of a well-defined sclerotized band along the posterior edge of the sixth sternite.

Some variation has been noted in *M. ozarkana*. The holotype has one seta on each of the dorsobasal semimembranous lobes at the base of the tenth tergite whereas a number of the paratypes have two setae on each process.

Micrasema burksi, new species

Male: Length 3.5 mm. Color as in *M. ozarkana*. Maxillary palpi 3-segmented. Abdominal tergites and cerci very similar to *M. ozarkana* except that in *M. burksi* the base of the cerci is broader in lateral aspect (Fig. 3A). Genitalia as in Fig. 3. Ninth segment narrow at top and broad at base in lateral aspect (Fig. 2A). Tenth tergite divided into a pair of stout almost parallel sclerotized lobes, each bearing a group of sharp setae at the apex (Fig. 3D). At the base of the tenth tergite there arises a pair of stout dorsobasal semimembranous lobes each bearing a pair of setae (Fig. 3B). Aedeagus tubular, with a blunt end and a pair of small pointed lateral projections just before the tip (Fig. 3D). Claspers in profile narrow at base and increasing in width to the tip (Fig. 3A); in ventral aspect curved sharply inward near tip (Fig. 3E). Ninth sternite broadly U-shaped, with anterolateral edges divergent and anterior edge only slightly bowed (Fig. 3C). Sixth sternite with median posterior projection.

Female: Length 3.25 mm. Color and general structure as in male. Apparently identical to the female of *M. ozarkana*.

Holotype: Male; Parksville, Tennessee; 25 April 1938; H. H. Ross and B. D. Burks. *Allotype*: Female; same data as for holotype. *Paratypes*: same data as for holotype, 11 ♂♂, 1 ♀; Neels Gap, Catta-hoochee National Forest, Georgia; 22 May 1946; P. W. Fattig, 1 ♂, 1 ♀.

M. burksi approaches *M. bennetti* Ross but in *bennetti* the lobes of the tenth tergite are divergent, the aedeagus lacks lateral projections, the apex of the clasper is produced into a well-developed lobe resembling the toe of a boot, the apex of the clasper has four teeth, and the process of the sixth sternite is atrophied.

In *M. burksi* the number of apical setae on the dorsobasal lobes varies. The holotype has two setae on each process while several para-

types have one seta on each lobe. The shape and length of the posterior median process of the male sixth sternite also varies, ranging from short and blunt to medium length and pointed.

***Micrasema rickeri*, new species**

Male: Length 3 mm. Color and general structure as in *M. ozarkana*. Genitalia as in Fig. 4. Ninth segment broad laterally, narrow above and conspicuously constricted below. Cerci divergent, fusing on meson approximately halfway between base and tip; triangular in dorsal aspect, and short and stout and lateral aspect (Fig. 4A). Tenth tergite divided into a pair of rounded slightly divergent sclerotized lobes, each bearing a group of sharp setae at the apex (Fig. 4D). From the base of the tenth tergite arises a pair of short closely appressed dorsobasal semimembranous lobes each bearing one seta (Fig. 4B). Aedeagus tubular and simple. Claspers, in lateral aspect, narrow at base and increasing in width toward the tip which is wide with a posterodorsal projection (Fig. 4A); in ventral aspect clasper curved inward at tip (Fig. 4E). Ninth sternite broadly U-shaped with lateral edges divergent and anterior edge bowed quite strongly (Fig. 4C). Sixth sternite with a short blunt process on the posteromedian edge.

Female: Length 2.75 mm. Color and general structure similar to *M. ozarkana*.

Holotype: Male; Talullah River, north of Clarksville, Georgia; 3 April 1949; W. E. Ricker and D. C. Scott. *Allotype*: Female; Soque Creek, Habersham Co., Georgia; 3 April 1949; W. E. Ricker. *Paratype*: same data as allotype, 1 ♂.

This species is close to *M. rusticum* but differs in the slightly divergent lobes of the tenth tergite; the closely appressed lobes at the base of the tenth tergite; the shape of the ninth sternite; the wide cerci, in lateral aspect; and the shape of the clasper in lateral and ventral aspects.

***Micrasema rusticum* (Hagen)**

Examination of a number of collections has indicated variation in several characters. The male clasper may be shaped as in Fig. 2F, a posterior median process of the male sixth sternite may be present or absent, and the dorsobasal lobes may each bear one or two setae.

KEY TO SPECIES—*MICRASEMA RUSTICUM* GROUP

1. Apex of aedeagus having a pair of pointed, lateral projections (Fig. 3D) **burksi**, n. sp.
 Apex of aedeagus without lateral points 2
2. Lateral aspect of clasper having apex straight, continuing the posterior contour of body of clasper 5
 Lateral aspect of clasper having apex bent to form a posterior projection, the whole looking like an inverted boot (Ross 1947, Fig. 42) 3

3. Cercus nearly V-shaped, with posterolateral margin deeply incised (Ross 1947, Fig. 41A) **scotti** Ross
 Cercus nearly triangular, the posterolateral margin, nearly straight
 (Ross 1947, Fig. 42A) 4
4. Clasper having heel of boot small, toe with only two teeth, these
 on mesal side and hardly visible on lateral aspect .. **charonis** Banks
 Clasper having heel of boot large and rounded, toe with four teeth
 projecting sufficiently to be visible on lateral aspect (Ross 1947,
 Fig. 42) **bennetti** Ross
- 5. Dorsobasal processes of tenth tergite well separated, long and
 fingerlike, each bearing a single, long apical bristle (Ross 1944,
 Fig. 895) **wataga** Ross
 Dorsobasal processes of tenth tergite either each bearing 2 apical
 bristles, or short and conical (Fig. 4B, or Ross 1944, Figs. 893,
 894) 6
- 6. Dorsobasal processes of tenth tergite fused into a single, small
 hump bearing 2 small setae (Fig. 4B) **rickeri**, n. sp.
 Dorsobasal processes of tenth tergite well separated, low, each
 bearing 1 or 2 small setae (Fig. 1B) 7
- 7. Lobes of tenth tergite divergent (Fig. 1D); profile of aedeagus
 sharply angulate (Fig. 1A) **ozarkana**, n. sp.
 Lobes of tenth tergite not divergent (Ross 1944, Fig. 893); profile
 of aedeagus arcuate, much as in Fig. 3A **rusticum** (Hagen)

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