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Studies on the Canadian and Alaskan Fulgoromorpha (Hemiptera) II. The Genus *Megamelus* Fieber (Delphacidae)

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Abstract

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The occurrence of the genus *Megamelus* Fieb. in Canada and Alaska is reviewed. Seven species are shown to be present in the area and these are described, the genitalia illustrated and distribution documented; four species are recorded in Canada for the first time. It is shown that previous records of *M. notula* (Germ.), *M. davisii* (V-D.) and *M. inflatus* Metc. in Canada are in error.

The single genus considered in this paper can be recognized by the following complex of characters: antennae rather long with basal segment at least half length of second; frons broadest in lower half, breadth not more than half its length; vertex distinctly produced anteriorly, about one and one-half times as long as broad; outer keels of pronotum more or less divergent, but reaching posterior margin without curving outwards posteriorly, the distance between posterior ends subequal to length of median keel; male genital capsule with distinct lateral accessory lobes or outgrowths.

All the species so far recognised in Canada and Alaska belong to *Megamelus* and not to the closely related *Megamelodes* Le Quesne (for the latter see Le Quesne 1960a, 1960b). The present paper records seven species from Canada, four for the first time: *M. flavus* Crawford was recorded from Alaska by Beamer (1955), but no new records are available. It is shown that the present records of *M. notula* (Germar), *M. davisii* (Van Duzee) and *M. inflatus* Metcalf in Canada are in error.

Megamelus Fieber

Megamelus Fieber 1866, *Verh. zool. bot. Ges. Wien* 16: 519 [original description].

Megamelus Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 203 [bibliography].

Megamelus Beamer 1955, *J. Kansas ent. Soc.* 28: 29 [key to North American species and description of new forms].

TYPE SPECIES: *Delphax notula* Germar 1830.

The figure of the type species (Fig. 1) illustrates the general appearance of this genus. Characteristics have been noted above. To this should be added the black markings on the lateral parts of the abdominal dorsum, the marks on the vertex being present in most species but not all. Macropterous forms appear more uniform brown in colour and if female, are extremely difficult to identify.

Key to the Canadian and Alaskan *Megamelus*

(Males)

1. Male anal segment with anteriorly projecting ventral processes (Figs. 7c, 8c) 2
- Male anal segment without ventral processes (Figs. 2a, 3a, etc.) 3
2. Apices of aedeagal brace turned ventrally (Fig. 7b); process of anal segment as in fig. 7c; lateral accessory lobes of genital capsule usually black *flavus* Crawford
- Apices of aedeagal brace not distinctly turned ventrally (Fig. 8b); process of anal segment as in Fig. 8c; lateral accessory lobes of genital capsule usually flavescens *lunatus* Beamer

- | | | |
|----|--|---------------------------|
| 3. | Aedeagal brace split or excavate near apex (Figs. 2b, 3b, 6b) | 4 |
| | Aedeagal brace not split or excavate near apex (Figs. 4b, 5b) | 6 |
| 4. | Aedeagal brace with sides of excavation furnished with processes to inside and these curved outwards (Fig. 2a-b) | <i>aestus</i> Metcalf |
| | Aedeagal brace with sides not furnished with processes (Figs. 3a, 6a).... | 5 |
| 5. | Aedeagal brace with sides of excavation almost touching and the apices drawn out into slender processes often intertwined (Figs. 3a-b) | <i>bifidus</i> Beamer |
| | Aedeagal brace with sides of excavation not almost touching, but well separate, the apices recurved ventrally and not intertwined (Figs. 6a-b) | <i>recurvatus</i> Beamer |
| 6. | Apex of aedeagal brace flat or slightly concave (Figs. 4a-b); aedeagus apically not bifid | <i>distinctus</i> Metcalf |
| | Apex of aedeagal brace distinctly convex in middle (Figs. 5a-b); aedeagus apically bifid (Fig. 10) | <i>metzaria</i> Crawford |

In the identification of female insects listed in this paper, the following key has been used: this correlates well with male specimens at present available, but further work may show some other division and separation necessary.

Key to the Canadian and Alaskan *Megamelus*
(Females)

- | | | |
|----|---|---------------------------|
| 1. | Postclypeus brown-black and darker than frons | 2 |
| | Postclypeus not brown-black and not darker than frons | 5 |
| 2. | Gena with fuscous mark below antennal insertion | 3 |
| | Gena without fuscous mark below antennal insertion | 4 |
| 3. | Lateral compartments of vertex with black markings | <i>lunatus</i> Beamer |
| | Lateral compartments of vertex without black markings | <i>bifidus</i> Beamer |
| 4. | Frons and gena rather uniform pale brown | <i>metaria</i> Crawford |
| | Frons and gena ochraceous | <i>distinctus</i> Metcalf |
| 5. | Abdominal dorsum with a distinct flavo-ochraceous central longitudinal streak | <i>flavus</i> Crawford |
| | Abdominal dorsum with central pale longitudinal streak not so distinct | <i>aestus</i> Metcalf |
- Females of *M. recurvatus* Beamer have not been seen or reported.

***Megamelus aestus* Metcalf**
(Figs. 2a-b)

Megamelus aestus Metcalf 1923, *J. Elisha Mitchell sci. Soc.* 38: 202.

Megamelus aestus Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 206.

Megamelus aestus Beamer 1955, *J. Kansas ent. Soc.* 28: 31.

Megamelus aestus Kontkanen 1958, *Ann. ent. fenn.* 24: 142.

COLOUR. Brachypterous form flavescent with a distinct median pale longitudinal stripe; lateral parts of vertex with black markings, postclypeus and gena without distinct fuscous markings; lateral areas of pronotum, scutellum and hemielytra brown; abdominal dorsum with two uneven brown lateral streaks on each side of the median pale streak. Male with accessory lobes of genital capsule flavescent. Macropterous forms with head, pronotum and abdomen as in brachypterous form, but scutellum more uniform brown and hemielytra completely ochraceous.

STRUCTURE. Total length ♂ macropterous 3.63 mm., brachypterous 2.42 mm.; ♀ macropterous 4.07 mm., brachypterous 3.03 mm.

GENITALIA OF MALE. Anal segment without ventral processes; aedeagal brace excavate in centre, sides of excavation to inside with two spinose processes curving ventrally and outwards; parameres widest at base and apically with small knob mesad and acutely angled to outside; process of genital capsule near parameres, slender and slightly wider at base, almost as long as accessory lobes; aedeagus bent in middle with an area of small dentitions just distal of middle, and basally with a rather broad sword-shaped process attached, this widest in middle.

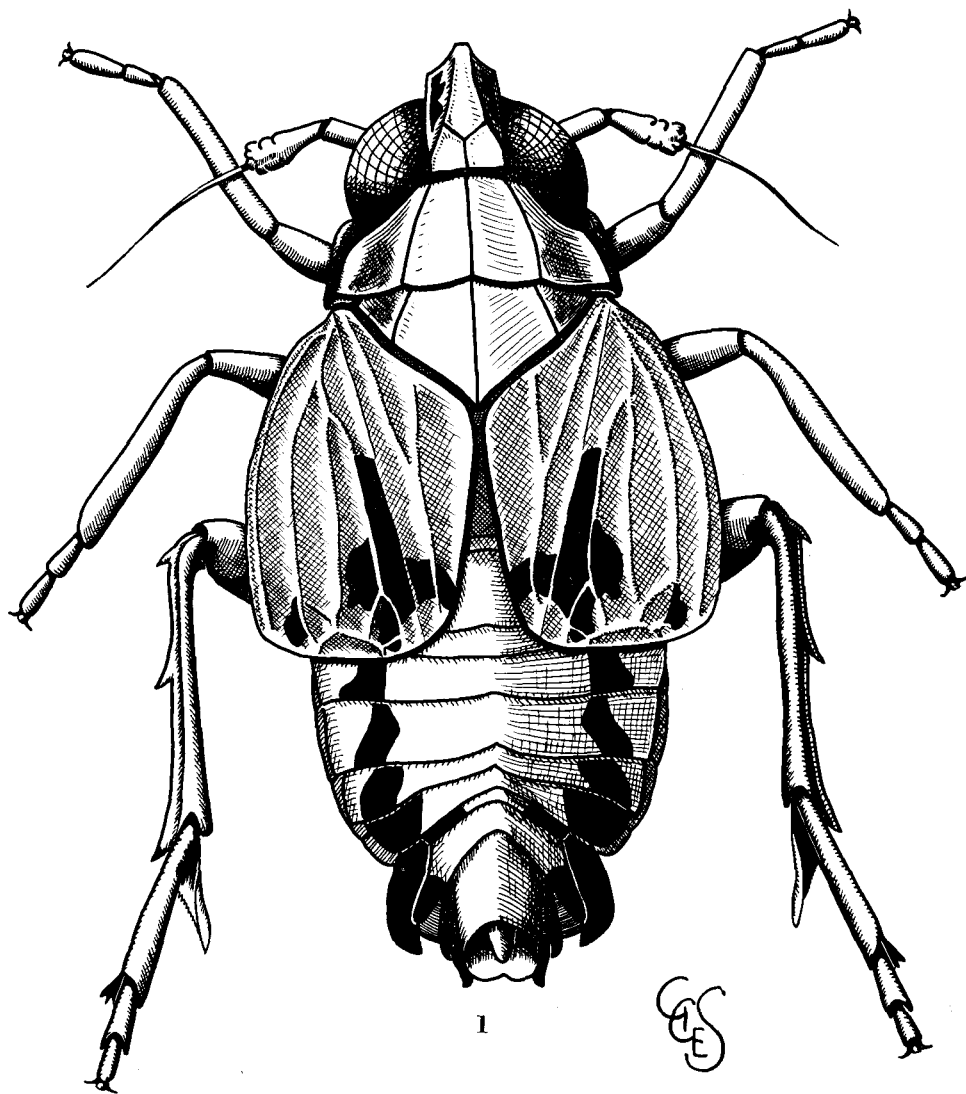


Fig. 1. Dorsal view *Megamelus notula* (Germar)

MATERIAL EXAMINED. 6♂♂ 6♀♀. **Ontario:** Marmora, 2.vii.1952, in dead leaves in wet wood (J. R. Vockeroth) [C.N.C.]; Merivale, 22.viii.1932 (L. J. Milne) [C.A.S.]. **Quebec:** Otter Lake, 6.viii.1931 (G. S. Walley) [C.N.C.] Hudson Heights, 24.vii.1941, 1.viii.1941, 29.vii.1942, 3.viii.1943 (G. A. Moore) [L.M.].

REMARKS. This species is similar to *M. unguatus* Beamer, but the latter has the processes of the aedeagal brace on the outside edges of the terminal processes. The Quebec and Ontario material has been compared with specimens from New Hampshire. Beamer (1955) records the species from this State, the type locality being Carolina Beach, North Carolina. The species has previously been recorded from Quebec by Kontkanen (1958). The specimens from Hudson Heights were recorded as *M. notula* (Germ.) by Moore (1950); this is in error. The majority

of the material from this latter locality is impossible to determine since most specimens are macropterous females. Brachypterous females of *M. aestus* are very difficult to distinguish from *M. flavus* females, but I have not seen *flavus* specimens from Ontario or Quebec in the material at present available.

***Megamelus bifidus* Beamer**

(Figs. 3a-b)

Megamelus bifidus Beamer 1955, *J. Kansas ent. Soc.* 28: 34.

COLOUR. Flavescent; sides of vertex without distinct fuscous markings; frons laterally in front of eyes, mottled and gena with fuscous streak below antennal insertion; base of postclypeus fuscous; apex of antennal segments sometimes slightly fuscous. Lateral parts of pronotum and scutellum fuscous; hemielytra with apical two-thirds black in brachypterous form; abdominal dorsum with lateral fuscous streaks. Male with anal segment ventrally black and aedeagal brace black, rest of genitalia pale.

STRUCTURE. Total length ♂ brachypterous 2.64 mm.

GENITALIA OF MALE. Anal segment without anal processes; aedeagal brace deeply cleft in centre, sides of excavation more or less touching, the drawn out ends long, slender and somewhat intertwined; parameres widest at base, apices truncate; processes of genital capsule near parameres as long as accessory lobes and with distinct acute process between bases; aedeagus long and slender, the apex slightly curved, the base distinctly bent and with very short sclerotized process attached.

MATERIAL EXAMINED. 3 ♂♂. **Ontario:** Prince Edward County, 3.viii.1949, 10.ix.1952 (J. F. Brimley) [B].

M. bifidus is easily recognised by the shape of the aedeagal brace. The Ontario material has been compared with paratype material from New York. It has not previously been recorded from Canada and in the United States is known from Kansas and New York.

***Megamelus distinctus* Metcalf**

(Figs. 4a-b)

Megamelus distinctus Metcalf 1923, *J. Elisba Mitchell sci. Soc.* 38: 201.

Megamelus distinctus Britton 1938, *Bull. Conn. geol. nat. hist. Surv.* 60: 22.

Megamelus distinctus Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 207.

Megamelus distinctus Beamer 1955, *J. Kansas ent. Soc.* 28: 43.

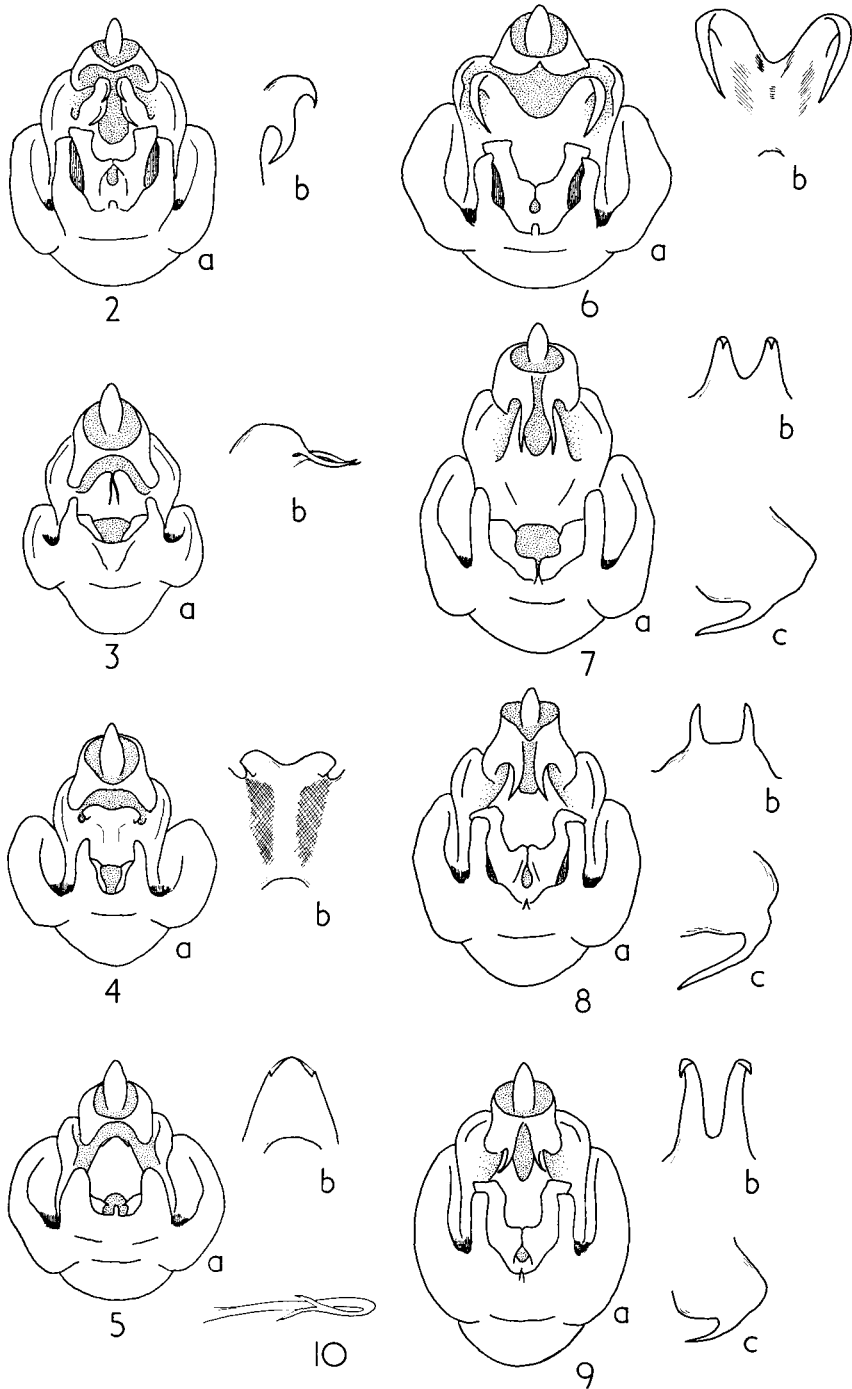
COLOUR. More or less the same as in *M. bifidus*, but without fuscous streak just below antennal insertion, and male with aedeagal brace black only laterally.

STRUCTURE. ♂ brachypterous 2.31 mm.; ♀ brachypterous 2.53 mm.

GENITALIA OF MALE. Anal segment without ventral processes; aedeagal brace not excavate, distal end slightly indented at middle and at sides with very small process sometimes turned ventrally; parameres with apex avicephaliform; processes of genital capsule near parameres almost as long as accessory lobes and with apices not bifid; aedeagus long, slightly sinuate and with a small sclerotized process attached to base.

MATERIAL EXAMINED. 11 ♂♂ 6 ♀♀. **Ontario:** Prince Edward County, on grasses in swamp, 17.x.1955 and 13.ix.1955 (J. F. Brimley) [B]; Maynooth, 5.ix.1953, beaver meadow (J. F. McAlpine); Maynooth, 5.ix.1953, 6.ix.1953 (B. P. Beirne) [C.N.C.]. **Saskatchewan:** Pike Lake, 1.ix.1949 (A. R. Brooks) [C.N.C.].

REMARKS. This species is easily recognised by the shape of the aedeagal brace, which is not excavate in the centre. The above material has been compared with specimens from Kansas and Michigan, but the Saskatchewan record should perhaps remain tentative since it is based on females: males are necessary to make this record certain. *M. distinctus* has been recorded from Illinois and Connecticut, the type locality being Portland, Connecticut. It does not appear to have been reported from Canada previously. In addition to the material listed above, I have seen specimens of *M. distinctus* in the California Academy of Sciences, from Columbus, Ohio.



Figs. 2-10. Male genitalia of *Megamelus*. a, terminal view of genital capsule; b, detail of apex of aedeagal brace; c, side view of anal process; 2, *M. aestus* Metc.; 3, *M. bifidus* Beam.; 4, *M. distinctus* Metc.; 5, *M. metzaria* Crawford; 6, *M. recurvatus* Beam.; 7, *M. flavus* Crawford; 8, *M. luratus* Beam.; 9, *M. notula* (Germ.). 10, *M. metzaria*, apical part of aedeagus. Comparable structures to same scale, but all drawings not so.

Megamelus flavus Crawford

(Figs. 7a-c)

- Megamelus notulus flavus* Crawford, 1914, *Proc. U.S. nat. Mus.* 46: 609.
Megamelus notulus flavus Muir 1919, *Canad. Ent.* 51: 36.
Megamelus uncus Metcalf 1923, *J. Elisha Mitchell sci. Soc.* 38: 204.
Megamelus anticostus Metcalf 1923, *J. Elisha Mitchell sci. Soc.* 38: 204.
Megamelus notula var. *flavus* Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 214.
Megamelus anticostus Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 206.
Megamelus uncus Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 218.
Megamelus uncus Moore 1950, *Contr. Inst. Biol. Univ. Montreal* 26: 31.
Megamelus flavus Beamer 1955, *J. Kansas ent. Soc.* 28: 31.

COLOUR. Flavescent with black markings on vertex laterally, postclypeus and gena with fuscous markings; lateral areas of pronotum and scutellum brown in brachypterous form, but scutellum almost completely brown in macropterous specimens; macropters with uniform ochraceous hemelytra, brachypters with a narrow median longitudinal black stripe and sub-apical margin narrowly black; abdominal dorsum with lateral black longitudinal streaks; male genital capsule with accessory lobes more or less black; genitalia of male from below mostly black.

STRUCTURE. Total length ♂ macropterous 4.40 mm., brachypterous 2.53 mm.; ♀ macropterous 4.62 mm., brachypterous 3.52 mm.

GENITALIA OF MALE. Anal segment with ventral processes and these curved under and projecting anteriorly; aedeagal brace excavate, the apices acute and distinctly curved ventrally at apex; parameres expanded at base, and distally with outer corners acutely pointed and inner angle with knob; processes of genital capsule near parameres not as long as accessory lobes and with distinct spine between bases; aedeagus long, in middle with minute retrorse teeth, and basally with distinct sword-shaped sclerotization attached.

MATERIAL EXAMINED. 72 ♂♂ 120 ♀♀. **Alberta:** Grande Prairie, 25.vii.1961, 26.vii.1961, 26.viii.1961 (A. R. Brooks); High Prairie, 25.vii.1961 (A. R. Brooks); Beaver Lodge, 1.viii.1961 (A. R. Brooks); Stettler, 3.viii.1957, 7.viii.1957 (A. R. & J. E. Brooks); Bull Lake, 12.viii.1961 (A. & M. Brooks); Valleyview, 10.viii.1961 (A. R. Brooks); Castor, 7.viii.1957 (A. R. & J. E. Brooks); Wainright, 27.vii.1957 (A. R. & J. E. Brooks) [C.N.C.]. **British Columbia:** Manning Park, beaver pond, ca. 4000 ft., 27.viii.1961 (G. G. E. Scudder) [U.B.C.]; Pouce Coupe, 14.vii.1961 (A. R. Brooks); Stanley, 2.viii.1949 (R. Stace-Smith) [C.N.C.]. **Manitoba:** Mafeking, 3.ix.1959 (A. & J. Brooks); The Pas, 30.viii.1959 (A. & J. Brooks) [C.N.C.]. **Northwest Territories:** Good Hope, Mackenzie River, 23.-viii.1929 (O. Bryant) [C.A.S.]. **Saskatchewan:** Canora, 6.ix.1959 (A. & J. Brooks); Madge Lake, 18.viii.1958 (A. & J. Brooks); Candle Lake, 19.viii.1959 (A. & J. Brooks); Hudson Bay, 6.ix.1959 (A. & J. Brooks); Whitefox, 22.viii.1959 (A. & J. Brooks) [C.N.C.].

REMARKS. This species is very similar to *M. lumatus*, but can be distinguished by the colour of the postclypeus and the curvature of the processes on the aedeagal brace, the shape of the processes on the anal segment and the colour of the accessory lobes of the genital capsule. The Canadian material has been compared with specimens of *M. flavus* from Colorado. Beamer (1955) records the species from Quebec, Colorado and Alaska. It was recorded from Quebec by Moore (1950) under the name *uncus*.

The type species *M. notula* has not been found in North American material studied by the author. All previous records of the species in the Nearctic refer either to *M. flavus* or *M. lumatus*. *M. notula* can be recognised by the smaller and shorter processes on the anal segment in the male and the greater curvature of the apical part of the processes on the aedeagal brace: in *M. notula* the postclypeus is brown and there is usually a fuscous mark on the gena beneath the antennal insertion, but the frons may be ochraceous with vague brown markings or rather uniform brown and more or less concolorous with the postclypeus.

Specimens of *M. flavus* and *M. lunatus* listed in this paper have been compared with *M. notula* taken by myself in Finland (Tvärminne, 13.viii.1960) and England (Oxfordshire, Wolvercote, 18.viii.1957; Berkshire, Kennington, 15.vii.1960): Figs. 9a-c illustrate the male genitalia of *M. notula*.

***Megamelus lunatus* Beamer**

(Figs. 8a-c)

Megamelus lunatus Beamer 1955, *J. Kansas ent. Soc.* 28: 30.

COLOUR. Flavescent with black markings on vertex laterally, a fuscous streak on gena below antennal insertion and postclypeus fuscous; lateral areas of pronotum and scutellum brown in brachypterous forms, the scutellum also medially brown in macropterous individuals; abdominal dorsum laterally with longitudinal fuscous streaks; hemielytra in brachypters with outer two-thirds predominantly black, hemielytra of macropters ochraceous with base and apex of claval part brownish; accessory lobes of male genital capsule usually flavescent; male genital capsule from below with anal segment brown and aedeagal brace fuscous.

STRUCTURE. Total length ♂ macropterous 3.63 mm., brachypterous 2.53 mm.; ♀ macropterous 3.96 mm., brachypterous 3.30 mm.

GENITALIA OF MALE. Anal segment with ventral processes and these curved under and projecting anteriorly; aedeagal brace excavate in centre, the sides produced, acutely pointed, but not distinctly curved ventrally at apex; parameres expanded at base, apically with outer corner acute and inner corner with knob and slightly turned over; process on genital capsule near parameres not as long as accessory lobes and with spine-like process between bases; aedeagus long and curved distinctly at base and apex, with an area of small dentitions just distal of middle, and with narrow slender sclerotized process attached to base.

MATERIAL EXAMINED. 150 ♂♂ 84 ♀♀. **British Columbia:** Shawnigan, 15.ix.1922 (W. Downes); Saanich Dist., 23.vii.1924 (W. Downes); Duncan, 22.ix.1925 (W. Downes); Cowichan, 22.ix.1925, 30.vii.1925 — tidal meadows (W. Downes); Thormanby Island, 8.viii.1925 (O. Whittaker); Kelsey Bay, Vancouver Island, tidal meadow, 17.vii.1961 (G. G. E. Scudder); Squamish, 27.viii.1961, *in cop.*, (G. J. Spencer) [U.B.C.]; Thormanby Island, 8.viii.1925 (O. Whittaker) [C.A.S.]. **Ontario:** Trenton, to light, 1.ix.1902 (Evans) [C.A.S.]; Prince Edward County, 15.ix.1943, 29.ix.1948 (J. F. Brimley) [B]; Marmora, on wet ground among rushes, 10.vi.1952 (J. R. Voekeroth) [C.N.C.]. **Quebec:** Hudson Heights, 20.vi.1942 (G. A. Moore) [L.M.].

REMARKS. *M. lunatus* is similar to *M. flavus* and can be distinguished by the difference in curvature of the process on the aedeagal brace, the slightly different anal segment and the difference in coloration of the accessory lobes of the male genitalia and colour of the head. The species *lunatus* was described from New York and Kansas: it has not been recorded from Canada before. The material listed above has been compared with paratype material from the type locality South Dayton, New York and with paratypes from Douglas Co., Kansas.

I have spent considerable time comparing the various Canadian specimens and can find no constant structural differences between the British Columbia material and that from eastern North America. The western Canadian insects were all taken in association with tidal meadows or near the sea, but this appears not to be the locality or habitat in the East. On the zoogeographic and ecological data one might suspect that two species are present, but this appears not to be the case. The distribution of *M. lunatus* thus seems to be a disjunct one and the post-glacial history of the area seems to be a contributing factor: many insects of course show a similar pattern, but again, more collecting could produce different results.

***Megamelus metzaria* Crawford**

(Figs. 5a-c, 10)

Megamelus metzaria Crawford 1914, *Proc. U.S. nat. Mus.* 46: 611.

Megamelus metzaria Metcalf 1943, *Gen. Cat. Hemiptera* 4(3): 209.

Megamelus metzaria Beamer 1955, *J. Kansas ent. Soc.* 28: 41.

COLOUR. Flavescent with vertex laterally black, postclypeus dark brown-black and darker than frons, but frons and gena uniform pale brown; lateral areas of pronotum and scutellum brownish, macropters with whole of scutellum brown; hemielytra ochraceous without fuscous markings; abdominal dorsum with lateral areas fuscous, the centre not distinctly flavo-ochraceous.

STRUCTURE. Total length ♂ macropterous 3.85 mm., brachypterous 2.75 mm.; ♀ macropterous 4.00 mm., brachypterous 3.30 mm.

GENITALIA OF MALE. Anal segment without ventral processes; aedeagal brace with distal end not excavate but produced and with margin convex; parameres expanded at base and apex, distally flat; processes of genital capsule near parameres not as long as accessory lobes and with a distinct spatulate process between the bases; aedeagus with apex recurved and bifid, the two apical processes divergent and of equal size and thickness.

MATERIAL EXAMINED. 3 ♂♂ 20 ♀♀. **Quebec:** Choisy pr. Rigaud, 28.vii.1956 (H. Lindberg) [H.].

The males listed above were recorded as *inflatus* Metcalf, and the females as *aestus* Metcalf by Kontkanen (1958).

Megamelus recurvatus Beamer

(Figs. 6a-b)

Megamelus recurvatus Beamer 1955, *J. Kansas ent. Soc.* 28: 34.

COLOUR. Almost uniform brown with vague median pale streak in macropterous form (the only one seen); head uniform brownish with vague black markings on vertex laterally; hemielytra uniform ochraceous; aedeagal brace dark brown.

STRUCTURE. Total length ♂ macropterous 3.73 mm.; Beamer (1955) gives ♂ brachypterous as 3.00 mm.

GENITALIA OF MALE. Anal segment without ventral processes; aedeagal brace excavate distally in centre, the sides produced, apically pointed and curved ventrally along whole length; parameres as in most other species; processes of genital capsule near parameres not as long as accessory lobes, but with acute process between bases; aedeagus slightly sinuate and with area of short dentitions just distal of middle, a short sclerotized process attached to base.

MATERIAL EXAMINED. 2 ♂♂. **Ontario:** Trenton, to light, 13.ix.1903 (Evans) [C.A.S.]; Black Sturg. Lake, 1-15.viii.1956 (H. Lindberg) [H.]. Beamer (1955) also records the species from Manitoba, the data for the holotype being Swan River, Manitoba, 2.viii.1937 (R. H. Beamer).

The male specimen listed above from Black Sturgeon Lake was recorded as '*M. davisi* Van D. ?' by Kontkanen (1958).

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