

A REVIEW OF THE AMERICAN PREDACEOUS MIDGES OF THE *BEZZIA NOBILIS* GROUP (DIPTERA: CERATOPOGONIDAE)

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Abstract.—The *nobilis* Group of species of the predaceous midge genus *Bezzia*, subgenus *Bezzia*, is diagnosed and a key presented for the three known species, which are briefly redescribed and partially illustrated. The North American species, *B. setulosa* (Loew), *B. barberi* (Coquillett), and *B. atlantica* Wirth and Williams, are considered to be new junior synonyms of *B. nobilis* (Winnertz). *Bezzia nobilis* is one of the commonest and most widespread species of *Bezzia* in the world, formerly recorded only from Eurasia, but new distribution records are presented to extend the range from North America south to the islands of the Greater Antilles, in Central America to El Salvador and Honduras, and two discontinuous new records from southern Brazil and Uruguay. The known range of *Bezzia magnisetula* Dow and Turner is extended by new records from Alaska to Manitoba, south to Oregon and Nebraska, where it has been reared from highly alkaline lake and marshland habitats. The third species, *Bezzia fluminensis* Lane, is known only from the type locality in southern Brazil.

This review is one of a series in which additions and corrections are made to the "Revision of the Nearctic Species of the Genus *Bezzia*" by Dow and Turner (1976). One of the natural and healthy results of the publication of any revisionary or monographic work is to bring the systematics of the group into focus in a way not previously possible. Subsequent workers are thus greatly aided in their studies and further progress is made. Further work is now in progress on the North American *Bezzia* species, and two species groups have already been studied in depth since 1976: Grogan and Wirth (1981) on the genus *Amerohelea* Grogan and Wirth which includes *Bezzia frontispina* Dow and Turner; Wirth and Grogan (1982) on the genus *Phaenobezzia* Haeselbarth which includes the midges Dow and Turner treated as *Bezzia* (*Phaenobezzia*) *opaca* (Loew). Each of these groups involves a different set of taxonomic and nomenclatural problems that Dow and Turner in their conservative approach did not adequately address.

Remm (1974a) divided the genus *Bezzia* Kieffer into five subgenera, one of which, *Phaenobezzia* Haeselbarth, merits generic status (see Wirth and Grogan, 1982). Remm's characters for the recognition of *Homobezzia* Macfie as a subgenus are convincing, but his new subgenera *Pygobezzia* Remm and *Sivabezzia* Remm are not readily separable from *Bezzia* s. str. The species of the *nobilis* Group treated herein are readily separable from other groups of *Bezzia* s. str. by color characters, but structurally they are less distinct (see couplet 1 in Remm's (1974b)

key to the USSR species of the subgenus *Bezzia* s. str.) In fact, Remm (p. 113 of the English translation) said of the subgenus *Bezzia* s. str.: "Most divergent from the rest is *B. nobilis*. In color it is more similar to the species of the subgenus *Homobezzia* and would appear to constitute a connecting link between these subgenera, but the structural characters of the male make it necessary to include it in this subgenus."

Four Nearctic species of the *Bezzia nobilis* Group were recognized by Dow and Turner (1976): *atlantica* Wirth and Williams, *barberi* (Coquillett), *magnisetula* Dow and Turner, and *setulosa* (Loew). However, *Bezzia atlantica*, *barberi*, and *setulosa* appear to be conspecific with *Bezzia nobilis* (Winnertz), the only Palearctic member of this group. In the Neotropical Region *B. nobilis* ranges south to southern Brazil and Uruguay, and a second species, *B. fluminensis* Lane, occurs in Brazil.

Taxonomic characters employed for identification of the adults were described by Wirth (1952), Dow and Turner (1976), and Wirth et al. (1977). Wing length is measured from the basal arculus to the wing tip and costal length from the basal arculus to the costal apex. Costal ratio is the value obtained by dividing the costal length by the wing length. Antennal ratio of the female is the sum of the lengths of the elongated distal five flagellar segments divided by the sum of the lengths of the preceding eight. Palpal ratio is the length of the third palpal segment divided by its greatest breadth.

SYNOPTIC KEY TO SUBGENERA AND GROUPS OF NEARCTIC *BEZZIA*

- 1. Male antennal segment 12 no longer than 13, antennal plume weakly developed; (mesonotum dull, occasionally weakly shiny, brownish or grayish with or without vittae; tibiae pale or with a dark medial or basal ring; spines of forefemur stout when present; female with 0–5 pairs of gland rods; males considerably smaller than females; male aedeagus triangular with minute spinules or hairs) (subgenus *Homobezzia* Macfie) 2
- Male antennal segment 12 longest; antennal plume well developed, extending at least to apex of 13th segment; (mesonotum black, shiny or dull or with silvery hairs, if grayish brown with dark vittae, hindtibia yellow in midportion, apex broadly black, and all femora bear spines; tibiae often black; forefemur with spines slender when present; female abdomen with 1–2 pairs of gland rods; males about same size as female; male aedeagus variable but not as above) (subgenus *Bezzia* Kieffer, s. str.) 5

Subgenus *Homobezzia* Macfie

- 2. Larger species, female wing 1.3–3.4 mm long; mesonotum without bristly setae on disc; (forefemur without spines or with 1–4 stout to slender spines of similar lengths, with or without strong basal tubercles; pupal respiratory horn with numerous (25–60) spiracular openings, apex more or less flared, abdominal tubercles well developed) 3
- Small species, female wing 1.2–1.3 mm long; mesonotum with 2 rows of strong bristly setae on disc; (forefemur with 5–7 stout ventral spines of alternating uneven lengths arising from distinct elevations; pupal respiratory horn with only 7–12 spiracular openings, abdominal tubercles small) *dorsasetula* Group

- 3. Forefemur unarmed ventrally *bicolor* Group
- Forefemur armed ventrally with one or more short black spines 4
- 4. Fore- and midfemora entirely dark brown or with dark bands apical ..
..... *cockerelli* Group
- Fore- and midfemora with dark bands subapical *annulipes* Group

Subgenus *Bezzia* s. str.

- 5. Forefemur usually unarmed ventrally; legs brown to black; femora and tibiae usually with narrow pale rings, rarely femora pale at base or tibiae pale *bivittata* Group
- Forefemur armed ventrally with one or more slender black spines; legs brown to black, or if banded the pale bands broad 6
- 6. Legs broadly yellow or with broad yellow median bands on forefemur and tibia *nobilis* Group
- Legs primarily dark brown to black, at most one pair of legs with broad yellowish bands *expolita* Group

Bezzia nobilis Group

Diagnosis.—Medium-size to large species, wing length 1.5–2.6 mm. Mesonotum grayish to whitish pollinose with median brown vitta; scutellum more or less yellowish; large spinelike setae prominent above wing bases. Wing usually whitish with anterior veins yellowish to whitish. Legs more or less yellowish with prominent black bands usually at bases and apices of femora and tibiae; forefemur with 1–6 prominent ventral spines; femora with some prominent spinelike setae at apices, femora and tibiae usually with some scattered spinelike black setae, larger and more numerous in males, especially on dorsal side of hindtibia. Male antennal plume well developed, extending at least to apex of 13th segment; 12th segment longest. Female abdomen with one pair of yellowish gland rods. Male genitalia with moderately broad 9th sternum with shallow caudomedian concavity; basistyle simple, short and moderately stout; dististyle moderately long, tapering to blunt distal point; aedeagus simple, with low basal arch, moderately slender anterolateral arms, distally tapering to slender process with non-spiculate tip; parameres with winglike anterolateral arms, median process in form of a straight rod with rounded tip. Pupa with respiratory horn rather short and only moderately expanded distally, bearing 16–30 spiracular openings around tip and $\frac{1}{4}$ down dorsal side; abdominal spines short, mostly borne on rounded or bluntly-pointed tubercles; caudal segment about as broad as long, posterolateral processes short, pointed, and divergent, with sclerotized tips. Larva with head brown, moderately long and distinctly tapering, about $2.7\times$ as long as greatest breadth; body white without discernible setae, last segment with 8 moderately long anal setae.

Distribution.—Three known species; Holarctic and Neotropical regions.

KEY TO THE SPECIES OF THE *BEZZIA NOBILIS* GROUP

- 1. Large robust species, wing length 2.4–2.6 mm in female; antenna black, segments short (Fig. 4a), in male with blackish plume; legs dusky yellow to brown with less contrasting dark bands, especially in male; female abdomen with prominent dorsal segmental brown spots
..... *magnisetula* Dow and Turner
- Smaller, more slender species, wing 1.5–2.0 mm long in female; antenna

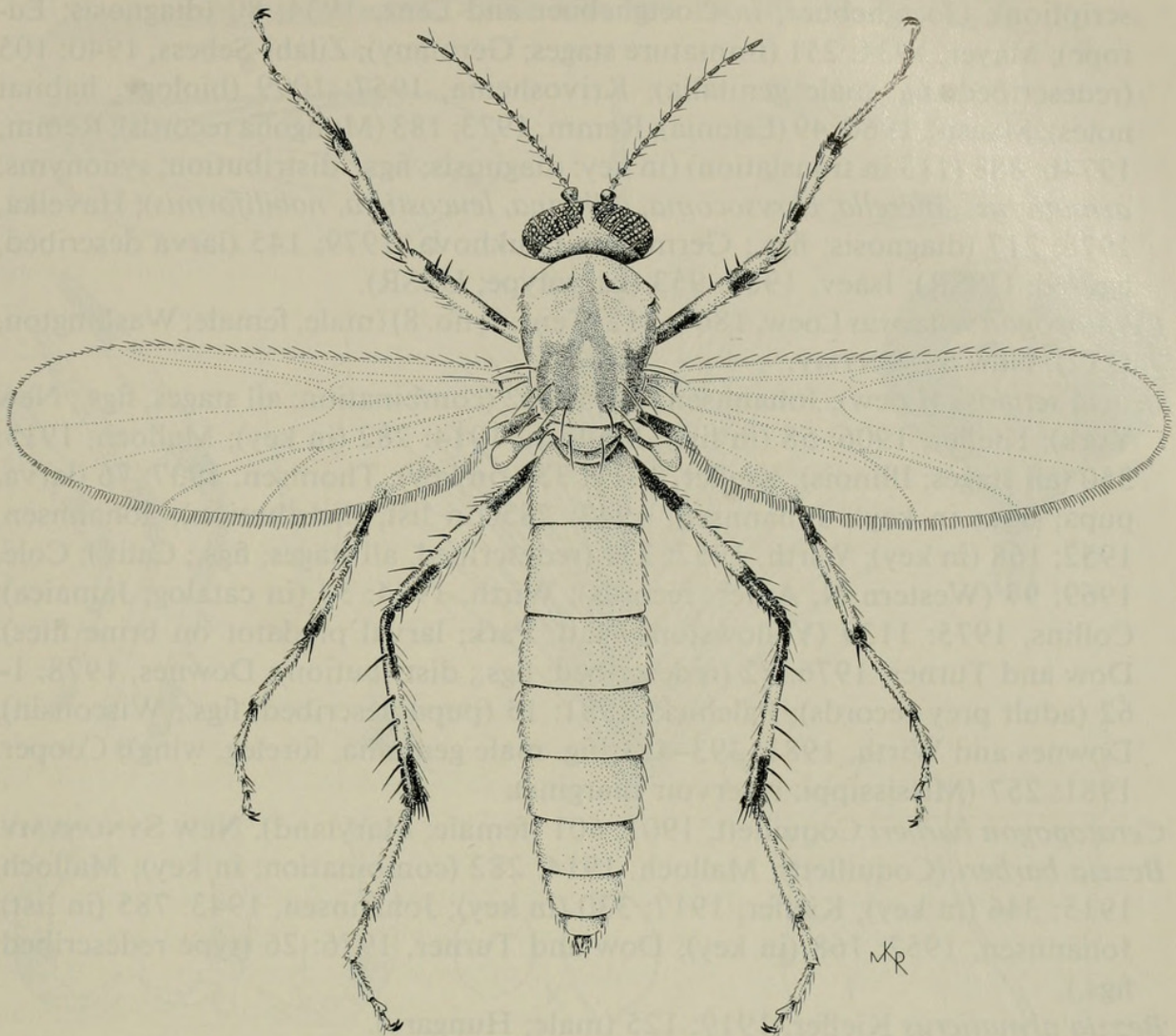


Fig. 1. *Bezzia nobilis*, female habitus.

- with segments longer (Fig. 2a, h), bases of segments pale yellowish, in male with yellowish plume; at least mid- and hindlegs bright yellow with contrasting black bands; female abdomen whitish to somewhat dusky, with or without segmental brown spots 2
2. Hindfemur and tibia with prominent black bands at bases and apices, yellow in midportion; female abdomen without segmental brown spots on terga *nobilis* (Winnertz)
- Hindfemur and tibia yellow proximally, with prominent black bands on apical 1/4; female abdomen with segmental brown spots on terga *fluminensis* Lane

***Bezzia nobilis* (Winnertz)**
Figs. 1, 2, 3c, e, g–m

Ceratopogon nobilis Winnertz, 1852: 79 (female; Germany; fig. wing).
Bezzia nobilis (Winnertz): Kieffer, 1901: 153 (combination; in key); Kieffer, 1919: 116 (in key); Goetghebuer, 1920: 109 (Belgium; fig. thorax); Goetghebuer, 1922: 106 (male redescribed); Kieffer, 1925: 121, 129 (in key; France); Edwards, 1926: 425 (male, female diagnoses; Britain); Edwards, 1929: 428 (correction to de-

scription); Goetghebuer, in Goetghebuer and Lenz, 1934: 80 (diagnosis; Europe); Mayer, 1934: 251 (immature stages; Germany); Zilahi-Sebess, 1940: 105 (redescribed; fig. male genitalia); Krivosheina, 1957: 1099 (biology, habitat notes); Maasik, 1966: 49 (Estonia); Remm, 1973: 183 (Mongolia records); Remm, 1974b: 888 (113 in translation) (in key: diagnosis; figs.; distribution; synonyms: *armaticrus*, *cinerella*, *chrysocoma*, *csikiana*, *leucosticta*, *nobiliformis*); Havelka, 1976: 217 (diagnosis; figs.; Germany); Glukhova, 1979: 145 (larva described, figured; USSR); Isaev, 1982: 953 (karyotype; USSR).

Ceratopogon setulosus Loew, 1861: 312 (Cent. 1, no. 8) (male, female; Washington, D.C.). **NEW SYNONYMY.**

Bezzia setulosa (Loew), Johannsen, 1905: 102 (combination; all stages, figs.; New York); Kieffer, 1906: 58 (in list); Malloch, 1914: 282 (in key); Malloch, 1915: 350 (all stages; Illinois); Kieffer, 1917: 330 (in key); Thomsen, 1937: 76 (larva, pupa; figs.; in key); Johannsen, 1943: 785 (in list; distribution); Johannsen, 1952: 168 (in key); Wirth, 1952: 231 (redescribed, all stages; figs.; Calif.); Cole, 1969: 97 (Western N. Amer. records); Wirth, 1974: 53 (in catalog; Jamaica); Collins, 1975: 1139 (Yellowstone Natl. Park; larval predator on brine flies); Dow and Turner, 1976: 72 (redescribed; figs.; distribution); Downes, 1978: 1–62 (adult prey records); Palchick, 1981: 15 (pupa described; figs.; Wisconsin); Downes and Wirth, 1981: 393–421 (fig. male genitalia, foreleg, wing); Cooper, 1981: 257 (Mississippi; reservoir margins).

Ceratopogon barberi Coquillett, 1901: 601 (female; Maryland). **NEW SYNONYMY.**

Bezzia barberi (Coquillett); Malloch, 1914: 282 (combination; in key); Malloch, 1915: 346 (in key); Kieffer, 1917: 330 (in key); Johannsen, 1943: 785 (in list); Johannsen, 1952: 168 (in key); Dow and Turner, 1976: 26 (type redescribed; figs.).

Bezzia armaticrus Kieffer, 1919: 125 (male; Hungary).

Bezzia cinerella Kieffer, 1919: 124 (female; Hungary).

Bezzia csikiana Kieffer, 1919: 126 (male; Russia).

Bezzia leucosticta Kieffer 1919: 124 (female; Russia).

Bezzia chrysocoma Kieffer, 1922: 355 (male; Silesia); Thienemann, 1928: 603 (larva), 606 (pupa); Tokunaga, 1940: 164 (Manchuria; redescr.).

Bezzia atlantica Wirth and Williams, 1957: 13 (male; female; Bermuda). **NEW SYNONYMY.**

Bezzia nobiliformis Clastrier 1962: 74 (male, female; France; figs.).

Diagnosis.—A medium-sized, pollinose gray species with yellowish legs and broad black bands at or near bases and apices of femora and tibiae; yellowish scutellum with 4 long marginal setae, pale halteres and whitish abdomen; antenna elongate, bases of segments pale, male plume yellowish. Wing length 1.5–2.0 mm.

Head: Eyes (Fig. 2i) broadly separated. Female antenna (Fig. 2a) brown, bases of flagellar segments narrowly pale; lengths of flagellar segments in proportion of 18-10-10-12-12-12-12-20-20-20-25-25, antennal ratio 1.12. Male antenna with lengths of flagellar segments in proportion of 25-14-14-14-14-15-15-19-26-63-26-28-31; plume (Fig. 2h) yellowish to golden. Palpus (Fig. 2 b, c) short and slender, 3rd segment with clump of 4–5 sensilla. Female mandible (Fig. 2f) with 9–16 coarse teeth.

Thorax: Brown, pollinose grayish. Mesonotum (Fig. 1) with prominent brownish to blackish median vitta splitting and broadening posteriorly, and ending a

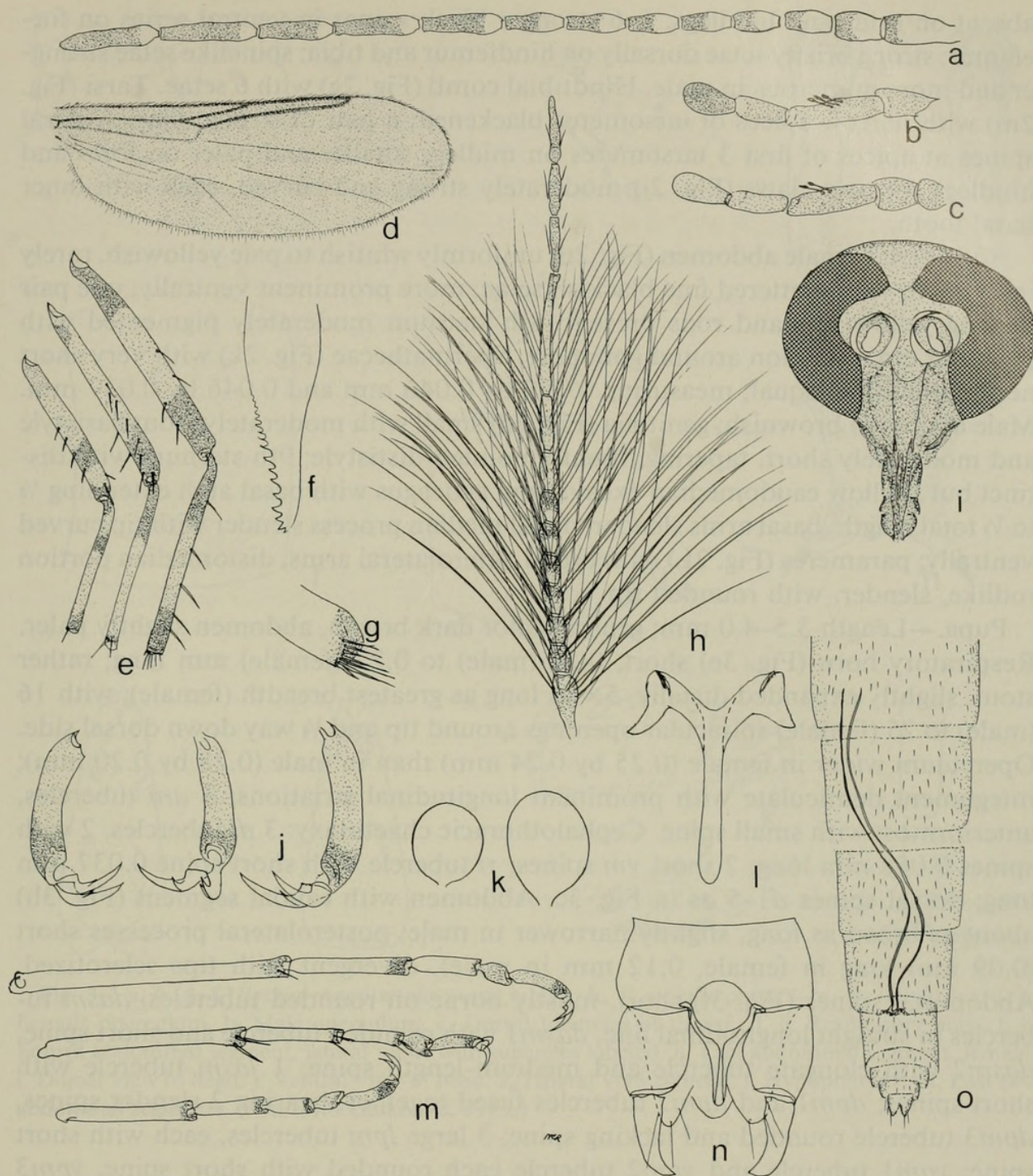


Fig. 2. *Bezzia nobilis*. a-b, d-g, i-k, m, o, Female. c, h, l, n, Male. a, h, Antenna. b, c, Palpus. d, Wing. e, Fore-, mid-, and hind- (left to right) femora and tibiae. f, Mandible. g, Hindtibial comb. i, Anterior view of head. j, Fifth tarsomere and claws of fore-, mid-, and hindlegs (left to right). k, Spermathecae. l, Parameres. m, fore-, mid-, and hindtarsi (bottom to top). n, Male genitalia, parameres removed. o, Female abdomen, dorsal view, showing gland rods (drawn by Niphan Ratanaworabhan).

variable distance before scutellum; humeral corners and sides also with variable brownish to blackish patches. Scutellum yellowish, with 4 strong marginal setae. Wing (Fig. 2d) whitish, anterior veins yellowish, not prominent; costal ratio 0.66–0.75. Halter pale, sometimes slightly infuscated. Legs (Fig. 2e) yellow, both ends of femora and tibiae broadly blackish except the bands subapical on forefemur and subbasal on foretibia; stout, spinelike setae at apices of femora, sometimes

absent on mid- and hindlegs; 1–6 stronger black spines in ventral series on forefemur; strong bristly setae dorsally on hindfemur and tibia; spinelike setae stronger and more numerous in male. Hindtibial comb (Fig. 2g) with 6 setae. Tarsi (Fig. 2m) with narrow apices of tarsomeres blackened; a pair of strong, black ventral spines at apices of first 3 tarsomeres on midleg, smaller and paler on fore- and hindlegs. Female claws (Fig. 2j) moderately strong and curved, each with inner basal tooth.

Abdomen: Female abdomen (Fig. 2o) uniformly whitish to pale yellowish, rarely infuscated; with scattered fine blackish setae, more prominent ventrally; one pair of long yellowish gland rods present; 8th sternum moderately pigmented with posterior emargination around gonopore. Spermathecae (Fig. 2k) with very short necks; slightly unequal, measuring 0.059 by 0.046 mm and 0.046 by 0.037 mm. Male abdomen brownish; genitalia (Fig. 2n) small with moderately stout basistyle and moderately short, tapering, bluntly pointed dististyle; 9th sternum with distinct but shallow caudomedian excavation; aedeagus with basal arch extending $\frac{1}{4}$ to $\frac{1}{3}$ total length, basal arms slender, distal median process slender with tip curved ventrally; parameres (Fig. 2l) with broad anterolateral arms, distomedian portion rodlike, slender, with rounded tip.

Pupa.—Length 3.5–4.0 mm; general color dark brown, abdomen slightly paler. Respiratory horn (Fig. 3e) short, 0.22 (male) to 0.27 (female) mm long; rather stout, slightly expanded distally, $5\times$ as long as greatest breadth (female); with 16 (male) to 25 (female) spiracular openings around tip and $\frac{1}{4}$ way down dorsal side. Operculum wider in female (0.25 by 0.24 mm) than in male (0.28 by 0.20 mm); integument denticulate with prominent longitudinal striations; 3 *am* tubercles, anteriormost with small spine. Cephalothoracic chaetotaxy: 3 *dl* tubercles, 2 with spines 0.068 mm long; 2 short *vm* spines; *vl* tubercle with short spine 0.037 mm long; dorsal spines *d1*–*5* as in Fig. 3c. Abdomen with caudal segment (Fig. 3h) about as broad as long, slightly narrower in male; posterolateral processes short (0.09 mm long in female, 0.12 mm in male), divergent with tips sclerotized. Abdominal spines (Fig. 3f) short, mostly borne on rounded tubercles; *dasm* tubercles in straight longitudinal line, *dasm1* with rounded tubercle and short spine, *dasm2* with elongate tubercle and medium-length spine; 1 *lasm* tubercle with short spines; *dpm1* and *dpm2* tubercles fused together, bearing 2 slender spines, *dpm3* tubercle rounded and lacking spine; 3 large *lpm* tubercles, each with short spine; *vpm1* tubercle and *vpm2* tubercle each rounded with short spine, *vpm3* truncate, medium length, with slender spine.

Larva (from Thomsen, 1937: 76, figs. 40, 46; Glukhova, 1979: 145, fig. 45).—About 7.0 mm long; white with brown head; each eye with 2 contiguous spots. Head (Figs. 3i–k) long and tapering, $2.7\times$ as long as greatest breadth, rather slender anteriorly, with chaetotaxy as figured. Labrum rounded, about $\frac{1}{4}$ breadth of head, with 2 pairs of minute apical papillae. Mandibles curved, stout at base and slender distally. Hypopharynx (Fig. 3l) with 1 broad hyaline comb. Body segments entirely devoid of setae except last segment with 8 moderately long setae arranged in dorsal and ventral pairs of 2 setae each; last segment (Fig. 3m) $2.5\times$ as long as basal breadth.

Geographic range.—*Bezzia nobilis* is the commonest and most widespread species of the genus in North America (Malloch, 1915; Wirth, 1952). I have examined

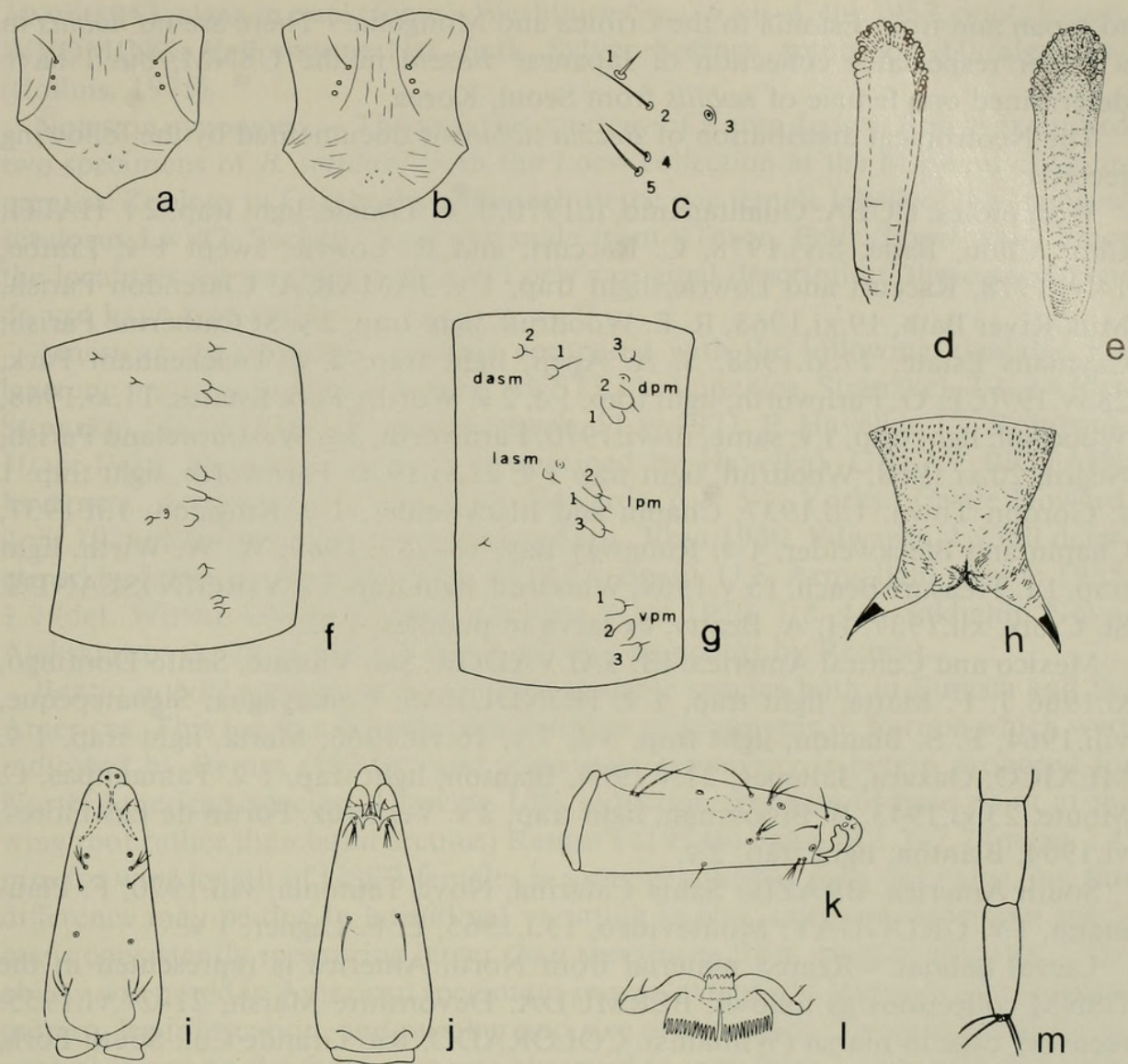


Fig. 3. a, b, d, f, *Bezzia magnisetula* pupa. c, e, g, h, *B. nobilis* pupa. i–m, *B. nobilis* larva. a, Female operculum. b, Male operculum. c, Dorsal tubercles of thorax. d, e, Respiratory horn. f, g, Fourth abdominal segment, lateral view, with tubercles labeled. h, Last abdominal segment, female. i, Dorsal view of head. j, Ventral view of head. k, Lateral view of head. l, Hypopharynx. m, Last two abdominal segments. (i–m from Glukhova, 1979.)

410 slides and 450 pinned North American specimens in the National Museum (USNM) collection from nearly every state in the contiguous United States, from Alaska, southern Canada to Nova Scotia, and south through Mexico to El Salvador and Honduras, and through the Bahamas, Cuba, and Jamaica to Haiti in the West Indies. There is an apparent gap in distribution from Nicaragua and the Lesser Antilles to southern Brazil, but the species shows up again with two USNM records from Santa Catarina, Brazil, and Uruguay. The related species, *Bezzia magnisetula* Dow and Turner, replaces *nobilis* in saline and alkaline habitats in the northwestern United States, western Canada, and Alaska. The other related species, *Bezzia fluminensis* Lane, has been found in only one locality in subtropical southern Brazil. Apparently no closely related species is known from Eurasia, according to Remm (1974b) who gives the Old World distribution of *B. nobilis* as “France

to Japan and from Estonia to the Crimea and Mongolia." There are no *nobilis* in a rather respectable collection of Japanese *Bezzia* in the USNM, but I have determined one female of *nobilis* from Seoul, Korea.

The Neotropical distribution of *Bezzia nobilis* is documented by the following records:

West Indies. CUBA: Guantanamo, ii.1970, J. E. Tisdale, light trap, 2 ♀. HAITI: Chou Chou, Baile, 8.vi.1978, C. Raccurt, and R. Lowrie, swept 1 ♀; Limbe, 14.vi.1978, Raccurt and Lowrie, light trap, 1 ♀. JAMAICA: Clarendon Parish, Milk River Bath, 19.xi.1968, R. E. Woodruff, light trap, 2 ♀. St Catherine Parish, Caymans Estate, 17.xi.1968, S. A. Apeji, light trap, 5 ♀; Twickenham Park, 28.iv.1970, E. G. Farnworth, light trap, 1 ♂, 2 ♀; Worthy Park Estates, 11.xi.1968, Woodruff, light trap, 1 ♀; same, iii-vi.1970, Farnworth, 3 ♀. Westmoreland Parish, Negril, 20.xi.1968, Woodruff, light trap 3 ♀; 22.vi.1970, Farnworth, light trap, 1 ♀. Gordon Town, 1.ii.1937, Chapin and Blackwelder, 1 ♀. Kingston, 1.ii.1937, Chapin and Blackwelder, 1 ♀. Runaway Bay, 16-28.ii.1969, W. W. Wirth, light trap, 1 ♀. Treasure Beach, 15.v.1969, Woodruff, light trap, 1 ♀. VIRGIN ISLANDS: St. Croix, xii.1937, H. A. Beatty, ex larva in puddles, 1 ♀.

Mexico and Central America. EL SALVADOR: San Vicente, Santo Domingo, xi.1966 J. F. Matta, light trap, 1 ♀. HONDURAS: Comayagua, Siguatepeque, viii.1964, F. S. Blanton, light trap, 3 ♂, 7 ♀; 16.vii.1966, Matta, light trap, 1 ♀. MEXICO: Oaxaca, Jaltepec, 21.v.1964, Blanton, light trap, 1 ♀. Tamaulipas, C. Monte, 23.xi.1943, B. Brookman, light trap, 2 ♀. Veracruz, Fortin de Las Flores, vi.1964, Blanton, light trap, 2 ♀.

South America. BRAZIL: Santa Catarina, Nova Teutonia, viii.1970, F. Plau-mann, 1 ♀. URUGUAY: Montevideo, 15.i.1965, E. F. Legner, 1 ♀.

Larval habitat.—Reared material from North America is represented in the USNM collections as follows: BERMUDA: Devonshire Marsh, 21-27.vi.1955, recovery cage in marsh (Williams). COLORADO: Rio Grande Co., South Fork, 11,000 ft, 23.vi.1972, reared Beaver Creek Meadows (Wirth). FLORIDA: Alachua Co., Gainesville, 20.iv.1967, pond margin (Wirth). Palm Beach Co., Lake Worth, viii.1951, margin Congress Road Canal (Wirth). ILLINOIS: St. Joseph, margin of Salt Fork (Malloch, 1915). MARYLAND: Montgomery Co., Plummers Island, vi-vii.1976, sand, mud, and stream vegetation (Grogan). Prince George's Co., Lakeland Pond, 23-27.v.1975, pond margin (Grogan); Patuxent Wildlife Res. Center, 8.v.1958, pond margin (Wirth and Scanlon); same, 20.vii.1976, sphagnum and muddy leaves (Grogan); 24.v.1977, vegetation at pond margin (Navai). MICHIGAN: Cheboygan Co., Douglas Lake, 6-31.vii.1954, emergence trap in Bryants Bog (Williams). NEW YORK: Newcomb, Fishing Creek, 28.v.1958, sand, mud at stream edge (Jamnback). North Sea, Cow Neck salt marsh, 19.iv.1956 (Jamnback). Lewis Co., Independence River, Glenfield, 22.vi.1963, river margin (Wirth). Tompkins Co., Ithaca, Renwick Swamps (Johannsen, 1905). OKLAHOMA: Payne Co., Lake C. Blackwell, 12.x.1955, lake margin (Jones). ONTARIO: Algonquin Park, 8.vi.1960, reared from marsh (Wirth). SOUTH DAKOTA: Lawrence Co., Spearfish Creek, 14.vi.1969, creek margin (Wirth). TEXAS: Brewster Co., Big Bend Nat. Park, Hot Springs, 7.v.1956, margin Tornillo Creek (Jones). Gillespie Co., Pedernales River, 7.viii.1956, river margin (Jones). Kerr Co., 20.ii.1956, margin spring creek (Jones). UTAH: Utah Co., Moark Jctn., 31.v.1958, pool margin (Jones). WISCONSIN: Bayfield Co., Fish Creek,

30.vii.1953, algae in pool (Jones). Washburn Co., 16.vii–4.viii.1952, pool (Jones). WYOMING: Yellowstone Nat. Park, Sylvan Springs, summer 1960, algal mat (Collins, 1975).

Notes on synonymy.—Through the courtesy of Karen Jepson I have examined two specimens of *B. setulosa* from the Loew collection at the Museum of Comparative Zoology in Cambridge, Massachusetts: one female labelled “Pa./setosus/setulosus Lw./O. Sacken,” and one male from “Texas, Belfr./Loew coll.” Since the localities are not mentioned in Loew’s original description, these specimens do not have type status.

American material was carefully compared with the following available Palearctic material of *Bezzia nobilis*: AUSTRIA: Lunz (leg. Strenzke), 2 ♂, 2 ♀ (det. Strenzke). GERMANY: Rohrwiesenbach, 11.vi.1971, P. Havelka, 1 ♀. Rombach, 10.vii.1975, Havelka, 1 ♀ (both determined by Havelka). GREAT BRITAIN: Inverness, Aviemore, vi.1931, F.W. Edwards, 6 ♂, 5 ♀. Yorks., Castle Howard, 2.vii.1926, Edwards, 2 ♂, 2 ♀; Malham Tarn, 30.vi.1930, Edwards, 1 ♀ (all determined by Edwards, from BMNH). KOREA: Seoul, U.S. Army light trap, vi.1955, 1 ♀ (det. Wirth). USSR: Estonia, Myniste, 9.vii.1970, 1 ♂, 4 ♀. Sakhalin, Novo-Aleksandrovska, 29.vi.1970, 1 ♂, 1 ♀ (all det. as *nobilis* by Remm).

Bezzia nobilis appears to be a rather variable species both in Eurasia and the Americas. This led to a considerable number of synonyms in Europe which were indicated by Remm (1974b), and some new synonymy is herein proposed for North American species. Allowing 10% reduction (because of base point at the wing root rather than basal arcus) Remm’s (1974b) value of 1.7–2.7 (mean 2.4) mm for wing length of USSR females is somewhat higher than our value, but this difference may be due to latitudinal variation in size, northern American specimens consistently measuring larger than specimens from warmer climates. Variability was noted in American specimens in size, extent and intensity of mesonotal pattern, leg infuscation, and number and size of leg spines. The number of strong ventral spines on the forefemur was observed to vary from 1 to 6, with 3–4 being the usual number present. Variation in spinosity was independent of variation in intensity and extent of leg or mesonotal markings or of size. No differences were found in the male or female genitalia including spermathecae. No consistent characters could be found to separate American and Eurasian material, and *Bezzia setulosa* (Loew) is therefore considered to be a junior synonym of *B. nobilis*.

Wirth (1952) and Dow and Turner (1976) separated *B. barberi* (Coquillett) from *setulosa* on the basis of its having only one spine on the forefemur, less distinct leg markings, more prominent mesonotal stripe, and darker abdomen. Re-examination of the holotype of *barberi* shows that the color differences are less marked than described and well within the range for *nobilis*. The presence of only one forefemoral spine is not unusual in otherwise typical *nobilis*. For these reasons *B. barberi* (Coquillett) is considered to be a junior synonym of *B. nobilis*.

Wirth and Williams (1957) separated *Bezzia atlantica* from *setulosa* on the basis of its darker legs with more extensive dark markings, brownish halteres, pyriform spermathecae, and gland rods extending through 3.5 rather than 4.5 segments. Re-examination of the types of *atlantica* shows the spermathecae to be more ovoid than pyriform in shape (well within the range of those of *nobilis*), and the gland rods extend through 4–4.5 segments as in *nobilis*. A considerable number of *nobilis* specimens from the mainland USA, especially coastal localities,

show the legs and halteres considerably darker than the average, and these specimens are not separable from Bermuda material of *atlantica*. For these reasons *B. atlantica* is considered to be a junior synonym of *B. nobilis*.

***Bezzia magnisetula* Dow and Turner**

Fig. 3a-b, d, f, 4

Bezzia magnisetula Dow and Turner, 1976: 48 (male, female; Manitoba, Alberta; figs.).

Diagnosis.—A large, robust brown species with grayish pollinose thorax, brown vittae on mesonotum, yellowish scutellum with 8 marginal setae, yellowish-brown legs with black bands at or near bases and apices of femora and tibiae, whitish abdomen with segmental brown spots forming a narrow median interrupted vitta on female abdomen; male antenna short, plume entirely blackish.

Female.—Wing length 2.23–2.60 mm; breadth 0.76–0.97 mm.

Head: Dark brown including antenna and palpi. Eyes (Fig. 4g) separated by a distance of 0.07 mm. Antenna (Fig. 4a) with lengths of flagellar segments in proportion of 25-16-16-16-16-16-17-24-25-25-30-32, antennal ratio 1.00; segments 3–10 with short, stiff verticils. Palpus (Fig. 4b) with lengths of segments in proportion of 8-12-30-14-17; 3rd segment slender (palpal ratio 3.7), with sensilla borne in a clump near middle. Mandible (Fig. 4d) with 11–12 coarse teeth, those in midportion of series largest.

Thorax: Brown; scutellum yellowish brown, with about 8 long black setae. Mesonotum (Fig. 4e) grayish pollinose with a narrow median brown vitta and smaller brown spots on anterior 0.6; 10–15 strong black setae above each wing base. Legs stout, yellowish to yellowish brown with blackish bands as in Fig. 4L; tarsi yellowish, narrow apices of tarsomeres 1–3 and all of 4–5 brown. Forefemur with 1–3 black ventral spines; strong bristly setae at apices of femora and tibiae and in a series dorsally on hindtibia; claws (Fig. 4f) stout and curved, each with inner tooth. Wing (Fig. 4c) pale gray to somewhat milky due to strong macrotrichia, anterior veins yellowish; costal ratio 0.72–0.77. Halter whitish, sometimes slightly infuscated when seen by transmitted light.

Abdomen: Whitish to pale brownish; terga with segmental brown spots as in Fig. 4h. One pair of amber-colored gland rods as long as 4 segments; sterna with dense dark setae, usually each arising from a brown-pigmented integumental spot. Genital sclerotization (Fig. 4i) with 8th sternum brownish, with strong setae. Spermathecae (Fig. 4j) two, ovoid with short stout neck; slightly unequal, measuring 0.070 by 0.052 mm and 0.058 by 0.048 mm.

Male.—Wing length 1.8–2.2 mm; breadth 0.67–0.70 mm. Similar to female with the usual sexual differences. Color darker, mesonotum dark brown with scarcely any indication of vittae, scutellum brownish; abdomen uniformly grayish brown. Antenna blackish; lengths of segments in proportion of 34-16-16-16-16-16-18-22-30-47-34-36-38; proximal segments stout, almost cylindrical; plume dense, blackish, arising from segments 3–12. Vertex, clypeus, and palpi with numerous long bristly black setae. Scutellum with 10 long black bristles; a patch of 20–25 long black bristles arising above each wing base. Leg bands more diffuse than in female, femora especially brownish rather than yellowish in midportion; femora and tibiae with numerous large spinelike black setae dorsally; ventral spines on forefemur longer. Genitalia (Fig. 4m) as figured. Aedeagus slightly longer

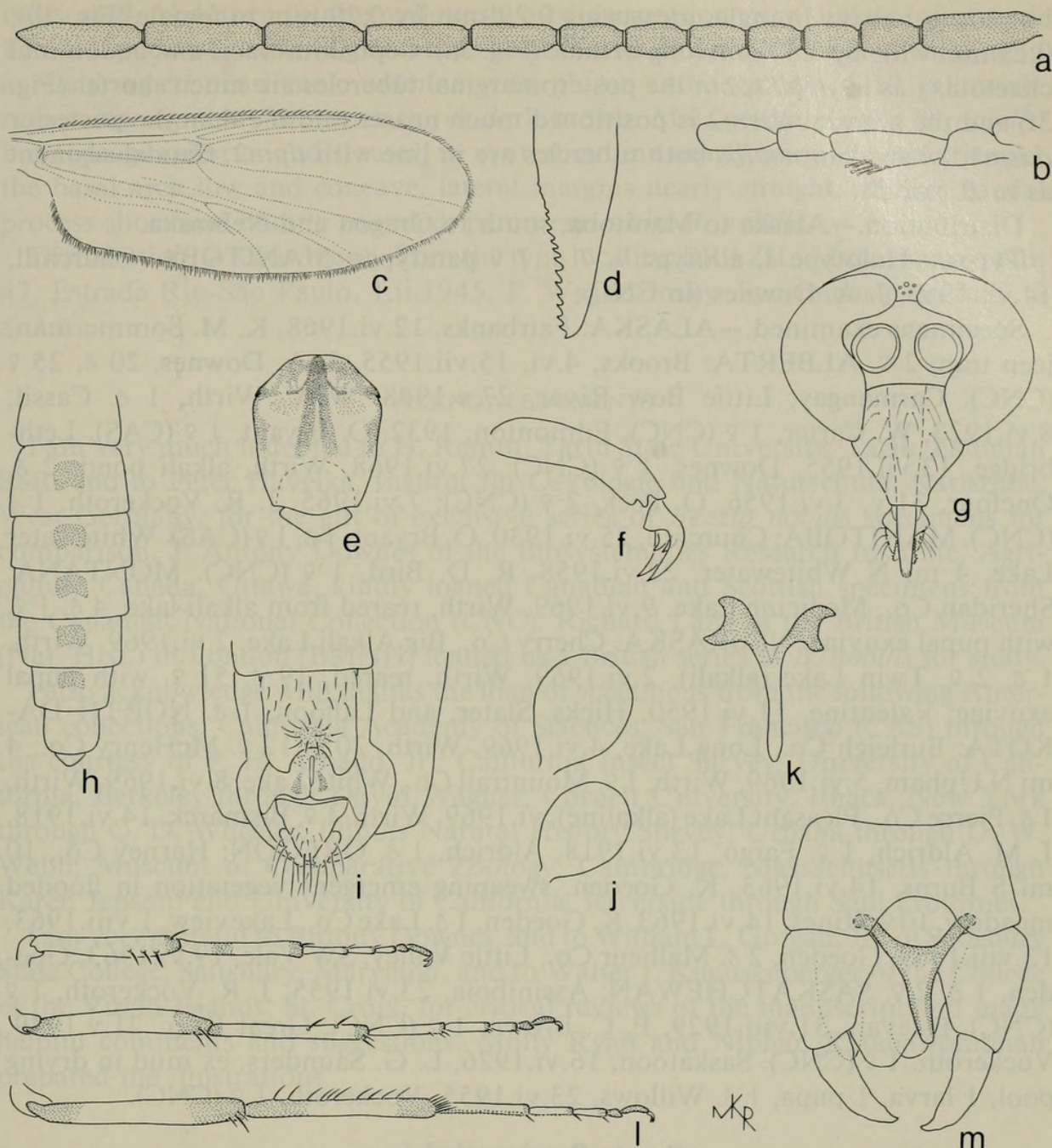


Fig. 4. *Bezzia magnisetula*. a-j, l, Female. k, m, Male. a, Antenna. b, Palpus. c, Wing. d, Mandible. e, Dorsal thoracic pattern. f, Fifth tarsomere and claws. g, Front view of head. h, Color pattern of abdominal terga. i, Genital sclerotization. j, Spermathecae. k, Parameres. l, Femora (left) and tibiae (right) of (top to bottom), fore-, mid-, and hindlegs. m, Genitalia, parameres removed.

than basal breadth (32/30), basal arch to $\frac{1}{4}$ total length, basal arms and distal process slender. Parameres (Fig. 4k) with anterolateral arms expanded, winglike with 2 short processes on each; distal process straight and slender with rounded tip.

Pupa.—Length 4.8 mm (male) to 5.2 mm (female); general color dark brown. Respiratory horn (Fig. 3d) short, resembling that of *B. nobilis* but apex slightly more expanded, bearing 25–30 spiracles (male and female) in a row much more undulating than in *nobilis*; horn in female 0.35 mm long, 3.8× as long as greatest breadth; in male 0.28 mm long, 4.3× as long as broad. Operculum as in *nobilis*

but not as narrow in male, measuring 0.29 mm by 0.29 mm in female (Fig. 3b), 0.29 mm wide by 0.31 mm long in male (Fig. 3a). Cephalothoracic and abdominal chaetotaxy as in *nobilis*, but the posteromarginal tubercles are much shorter (Fig. 3f) and the anterior *dasm2* is positioned much nearer midline than the posterior *dasm1*, whereas in *nobilis* both tubercles are in line with *dpm2*. Caudal segment as in *B. nobilis*.

Distribution.—Alaska to Manitoba, south to Oregon and Nebraska.

Types.—Holotype ♂, allotype ♀, 7 ♂, 7 ♀ paratypes, MANITOBA, Churchill, 14.vii.1953, J. A. Downes (in CNC).

Specimens examined.—ALASKA: Fairbanks, 12.vi.1968, K. M. Sommerman, jeep trap, 2 ♀. ALBERTA: Brooks, 4.vi, 15.vii.1955, J. A. Downes, 20 ♂, 25 ♀ (CNC). Carmangay, Little Bow River, 27.v.1968, W.W. Wirth, 1 ♂. Cassil, 8.vi.1923, W. Carter, 1 ♀ (CNC). Edmonton, 1932, O. Bryant, 1 ♀ (CAS). Lethbridge, 13.vii.1955, Downes, 1 ♀ (CNC); 27.vi.1968, Wirth, alkali pond, 2 ♂. Onefour, 31.v, 3.vi.1956, O. Peck, 2 ♀ (CNC); 7.vi.1965, J. R. Vockeroth, 1 ♂ (CNC). MANITOBA: Churchill, 25.vi.1930, O. Bryant, 1 ♂, 1 ♀ (CAS). Whitewater Lake, 4 mi N Whitewater, 22.vi.1958, R. D. Bird, 1 ♀ (CNC). MONTANA: Sheridan Co., Medicine Lake, 9.vi.1969, Wirth, reared from alkali lake, 4 ♂, 1 ♀, with pupal exuviae. NEBRASKA: Cherry Co., Big Alkali Lake, 2.vi.1969, Wirth, 1 ♂, 2 ♀, Twin Lake (alkali), 2.vi.1969, Wirth, reared, 19 ♂, 51 ♀, with pupal exuviae; Valentine, 11.vi.1950, Hicks, Slater, and Laffoon, 1 ♂. NORTH DAKOTA: Burleigh Co., Long Lake, 4.vi.1969, Wirth, 20 ♂, 12 ♀. McHenry Co., 4 mi N Upham, 5.vi.1969, Wirth, 1 ♀. Mountrail Co., White Lake, 8.vi.1969, Wirth, 1 ♂. Pierce Co., Pleasant Lake (alkaline), vi.1969, Wirth, 1 ♀. Bismarck, 14.vi.1918, J. M. Aldrich, 1 ♀. Fargo, 13.vi.1918, Aldrich, 1 ♂. OREGON: Harney Co., 10 mi S Burns, 14.vi.1963, K. Goeden, sweeping emergent vegetation in flooded meadow, 10 ♀; Hines, 14.vi.1963, K. Goeden, 1 ♂. Lake Co., Lakeview, 1.viii.1963, 13.viii.1969, Goeden, 2 ♂. Malheur Co., Little Valley, SW Vale, 19.vi.1963, Goeden, 1 ♂, 2 ♀. SASKATCHEWAN: Assiniboia, 23.vi.1955, J. R. Vockeroth, 1 ♀ (CNC). Estevan, 31.viii.1929, P. C. Brown, 1 ♀ (CNC). Great Deer, 21.v.1949, Vockeroth, 1 ♀ (CNC). Saskatoon, 16.vi.1926, L. G. Saunders, ex mud in drying pool, 1 larva, 1 pupa, 1 ♂. Willows, 23.vi.1955, Vockeroth, 1 ♀ (CNC).

Bezzia fluminensis Lane

Bezzia fluminensis Lane, 1948: 236 (female; Brazil); Lane, 1958: 31 (male; fig. genitalia).

Diagnosis.—Wing length 1.70 in female and male; costal ratio 0.77 in female, 0.68 in male. Thorax brown; mesonotum with whitish pollinosity, a double median vitta and some lateral spots brownish; scutellum yellow with 4 marginal setae. Legs yellow, coxae and trochanters brown; forefemur brown with faint narrow subapical yellowish band; foretibia with faint, narrow, basal and apical, and broad subbasal, brownish bands, more extensive in male; midfemur faintly brownish at base, distal ¼ dark brown; midtibia with proximal ¼ and narrow apex dark brown; hindfemur and tibia each with distal ¼ dark brown; narrow apices of tarsomeres 1–3 faintly brownish, all of tarsomeres 4–5 pale brown; forefemur with 2–3 stout brown ventral spines; in both sexes apices of femora with 1–2 stout brown setae, dorsal side of hindtibia with several yellowish to brownish, spinelike bristles. Wing whitish including radial veins; halter slightly

infuscated. Abdomen shining yellowish, median spots on terga slightly infuscated. Female spermathecae and gland rods not examined. Female antennae missing in available specimens; male antenna with plume and segments 4–12 yellowish, remaining segments brownish, torus dark brown. Male genitalia as in *B. nobilis*, but aedeagus shorter and stouter, in ventral outline nearly an equilateral triangle, the basal arch low and concave, lateral margins nearly straight, median caudal process short and bluntly rounded; parameres as in *B. nobilis*.

Distribution.—Known only from the type locality: BRAZIL, Mun. Itaguay, Km 47, Estrada Rio-São Paulo, 1.ii.1945, P. Wygodzinsky. Specimens examined, 3 ♂, 2 ♀.

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