Review of the Nearctic species of *Anaphothrips* (Thysanoptera: Thripidae)

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Abstract: Seventeen species of *Anaphothrips* are here recorded and reviewed from the Nearctic Region. Six new species, *A. helvolus*, *A. luteus*, *A. mexicanus*, *A. paludicola*, *A. trimaculatus*, and *A. univittatus*, and 11 nominal species are described. A key to the females of 17 species and to males of 11 species is provided. *Anaphothrips flavocastaneus* Johansen is reassigned to *Oxythrips*, *A. ripicola* Hood is revived as a good species, *A. sandersoni* Stannard is treated as a junior synonym of *A. decolor* Hood, and *A. sudanensis* Trybom is reported from Mexico.

Key Words: Thysanoptera, Thripidae, *Anaphothrips*, Nearctic, review, new species.

Members of the *Anaphothrips* are normally found on plants of the grass family, Poaceae. About 80 species are listed under several subgenera in Jacot-Guillarmod's (1974) Thysanoptera catalog of the World, and are reported from all continents except Antarctica. *Anaphothrips* was formerly a paraphyletic group until critically reviewed by Bhatti (1978), who elevated subgenera *Agalmothrips*, *Anaphothrips*, *Dictyothrips*, *Hyalopterothrips*, *Proscirtothrips* and *Tamaricothrips* to generic status, synonymized subgenus *Neophysopus* with *Anaphothrips*, described seven new genera to accomodate species excluded from *Anaphothrips*, and retained eight Nearctic species in *Anaphothrips*. This review of the Nearctic *Anaphothrips* treats 11 nominal species and six species new to science, of which five are from the United States and one from Mexico.

Historical Review

Anaphothrips was first used in the Nearctic Region by Hinds (1900:85) when he assigned *Thrips striata* (Osborn 1883:155) to the genus. He also concluded that *Limothrips poaphagus* Comstock (1875:120) was an invalid name because a description was not published, and a species later described as *Limothrips poaphagus* in Comstock's "Introduction to Entomology" (1888:127) was a junior synonym of *A. striata*. Hood (1914:166)) synonymized *striata* with *A. obscurus* (Müller), an adventive European species. The first endemic *Anaphothrips* species, *Euthrips cameroni* Bagnall (1919:271), was described from Saskatchewan, Canada.

Although several major faunistic studies have been published, a comprehensive review of the Nearctic species has never been published. Bailey (1957) treated eight species [*A. longipennis* Crawford, *A. minutus* Moulton, *A. obscurus*, *A. orchidii* (Moulton), *A. reticulatus* (Moulton), *A. secticornis* (Trybom), *A. stanfordii* (Moulton), and *A. tricolor* Moulton] for California, of which only *A. obscurus* is retained currently in the genus. In a study of the thrips of Illinois, Stannard (1968) treated five species [*A. cameroni* (Bagnall), *A. catawba* Hood, *A. nanus* Hood, *A. obscurus* and *A. sandersoni* Stannard], and synonymized *A. ripicola* Hood with *A. cameroni*. Chaisson (1986) listed *A. cameroni*, *A. obscurus* and *A. stanfordii* from Canada and *A. lunbecki* Ritcher and *A. postumus* (Ritcher) from Greenland. The location of the types of *A. lunbecki* and *A. postumus* are unknown and the identities of these two species cannot be established from the literature. Thus, they are excluded from this study.

Of the approximately 32 species assigned previously to *Anaphothrips* in the Nearctic Region, only nine native and one adventive species are consid-

ered here as valid members of the genus. The following former *Anaphothrips* species in the Nearctic Region are assigned to other genera, treated as junior synonyms, or are invalid names:

arizonensis Morgan 1913:12 = *Baileyothrips arizonensis*, (Kono & O'Neill 1964:2).
albus Jones 1912:16 = *Scirtothrips albus*, (Karny 1912:334)
apteris Daniel 1904:295 = *Apterothrips apteris*, (Nakahara 1988:508).
bicolor Moulton 1926a:24 = *Odontanaphothrips tricolor* (Moulton), (Bailey 1957:160).
crawfordi Priesner 1932:152 = *Proscirtorthrips zeae* (Moulton), (O'Neill 1955:241).
enceliae Moulton 1926a:24 = *Odontanaphothrips tricolor* (Moulton), (Bhatti 1978:100).
flavocastaneus Johansen 1981:327 = *Oxythrips flavocastaneus* (*New Combination*).
hesperus Moulton 1911:17 = *Proscirtothrips zeae* (Moulton), (Jacot-Guillarmod 1974:580).
longipennis Crawford 1910:150 = *Proscirtothrips zeae* (Moulton), (O'Neill 1955:241).
monotropae Watson 1927:29 = *Pseudothrips inequalis* (Beach) (Stannard 1968:338)
minutus Moulton 1929:127 = *Baileyothrips arizonensis* (Morgan) (Kono & O'Neill 1964:2).
nanus Hood 1941:141 = *Hemianaphothrips nanus* (Bhatti 1978:94).
orchidii Moulton 1907:52 = *Chaetanaphothrips orchidii* (Priesner 1926:204).
orchidaceus Bagnall 1909:33 = *Aurantothrips orchidaceus* (Bhatti 1978:90).
priesneri Moulton 1926b:123 = *Psilothrips priesneri* (Bailey 1935:166).
reticulatus Moulton 1907:50 = *Prosopoanaphothrips reticulatus* (Bailey 1935:165).
sandersoni Stannard 1957:172 = *Anaphothrips decolor* Hood (New Synonymy).
secticornis Trybom 1896:620 = *Apterothrips secticornis* (Priesner 1949:120).
stanfordii Moulton 1907:52 = *Apterothrips apteris* (Daniel) (Nakahara 1988:508).
striata Osborn 1883:155 = *Anaphothrips obscurus* (Müller) (Hood 1914:166).
tricolor Moulton 1911:41 = *Odontanaphothrips tricolor* (Bhatti 1978:100).
zeae Moulton 1911:15 = *Proscirtothrips zeae* (O'Neill 1955:241).

The holotype of *Anaphothrips flavocastaneus* Johansen collected at Poza Rica, Vera Cruz, Mexico, has one pair of pronotal posteroangular setae, 9-segmented antenna with segments six and seven separated by intersegmental membrane, two pairs of postocular setae posterior to caudal margin of eye, and lacks a posteromarginal comb on abdominal tergite VIII. It keys to *Oxythrips* in the article on New World genera of Thripidae with 9-segmented antennae by Palmer and Mound (1985).

Anatomical Structures

The species in this genus have rather few anatomical structures that are of specific value when compared to other genera such as *Thrips*. Some of the specific structures used in this study are indicated on the following figures. Head: figures 16, 17, 19. Metanotum: figure 25. Forewing: figure 27. Abdominal tergites: figures 30, 31, 34-36, 39. Abdominal sternite I: figure 43. Abdominal tergite IX of male: figures 46, 47.

Methods

The measurements are given in microns and the body length in millimeters. When several types are measured for a new species, the measurement of the holotype is given first and followed by the measurements of the paratypes in parentheses. Measurements for nominal species include values for both types and identified material. Mandibles are measured from the extreme base to the apex without correction for curvature. Length of the microtrichia of the posteromarginal comb on tergite VIII are measured from the base of the triangular part. Setae are measured from the extreme base in the setal socket and without adjustments for curvature or deviations from the horizontal plane.

Postal abbreviations are used for provinces in Canada and states in the United States.

The acronyms of the depositories of examined material are as follows: FSCA = Florida State Collection of Arthropods, Gainesville; INHS = Illinois Natural History Survey, Champaign; NHM = Natural History Museum, London; SMF = Forschungsinstitut und Naturmuseum, Frankfurt; UNAM = Instituto Biologia, Universidad Nacional Autonoma de Mexico, Mexico City; and USMM = US National Museum of Natural History, Washington D.C.

Anaphothrips Uzel

Anaphothrips Uzel 1895:142. Type species: *Thrips obscura* Müller by subsequent designation by Hood (1914:36).
Neophysopus Schmutz 1913:1016. Type species: *Neophysopus medioflavus* Schmutz by monotypy (synonymized by Bhatti 1978:87).

Female: Antenna 8- or 9-segmented (i.e. with partial or complete division of segment VI (Figs. 16, 17)

but not separated by intersegmental membrane); segments III-IV with short forked trichomes, segment VII pedicellate at base. Head produced anterior of eyes, with shallow anteromedial groove on vertex; 3 pairs of ocellar setae; 3-4 pairs of postocular setae somewhat transversely aligned posterior of eyes (Fig. 5); eye with 6 pigmented facets in 1-6 pattern (Fig. 8); maxillary palps 3-segmented. Pronotum without developed major setae, with short discal and posteromarginal setae (Fig. 24). Mesothoracic sternal spinula present, absent from metathoracic sternum. Forewings macropterous or brachypterous; setae short, those on fore and hind veins irregularly spaced; posterior fringe cilia wavy; scale usually with 5 setae. Abdomen without posteromarginal flange; median setae on tergites far apart, reduced, short anteriorly, larger posteriorly (Fig. 34); tergite VIII with complete posteromarginal comb (Figs. 36, 39); dorsal setae on tergite IX short (Figs. 39-42); pleurites with posteromarginal microtrichia or teethlike projections; sternal discal setae absent; sternite I with anteromedian setae (Fig. 43); II with 2 pairs of posteromarginal setae, III-VII with 3 pairs of posteromarginal setae (cf. Fig. 49).

Male: Abdominal tergite VIII with complete posteromarginal comb; tergite IX with 2 pairs of stout, spindle-shaped B1-B2 setae on tuberculated bases, B1 setae anterior and larger than B2 setae (Figs. 46, 47); sternites with glandular areas (Figs. 48-56) of various shapes.

Key to Nearctic species

(Males of *amoenus*, *grandioculus*, *mexicanus*, *obscurus*, *paludicola* and *tenebrosus* are unknown)

1. Antenna 8-segmented, segment VI not divided (Fig. 18) 2
   Antenna 9-segmented, segment VI partially or completely divided (Figs. 16, 17, 19) 10

2(1) Female 3
   Male 7

3(2) Body brown with abdominal segments III to V or VI yellow, prothorax brown or yellow; short brown band in basal 1/3 of forewings; Mexico ..... *sudanensis* Bagnall
   Body with different color pattern 4

4(3) Body brown, head brown anterior of eyes and submarginally posterior of eyes, light yellow medially (Fig. 10); median sensilla on abdominal tergites anterior of posterior margin by 3-5 times their diameter ..... *.trimaculatus* n. sp.
   Body yellow, a few abdominal tergites may be partially light brown; position of median sensilla on abdominal tergites various 5

5(4) Median sensilla on abdominal tergites II-VII anterior of posterior margin by 3 or 4 times their diameter; abdominal tergite IX with B1 setae 74-86 long ..... *.mexicanus* n. sp.
   Median sensilla on abdominal tergites II-VII anterior of posterior margin by 1 to 2 times their diameter (Fig. 30); B1 setae on abdominal tergite IX 94-111 long 6

6(5) Abdominal tergites completely sculptured with transverse striae (Fig. 30) ..... *catawba* Hood
   Abdominal tergites IV-VIII without striae between median setae and sensilla (Fig. 31) ..... *.helvolus* n. sp.

7(2) Brachypterous; abdominal sternites III-VIII with a large C-shaped glandular areas (Fig. 48) 8
   Macropterous; abdominal sternite VIII without glandular area, present on sternites III-VII .. 9

8(7) Body yellow; median sensilla on abdominal tergites III-VII anterior of posterior margin by about their diameter (Fig. 31 ..... *helvolus* n. sp.
   Body yellow with abdominal segments IX-X brown, or head, thorax and abdominal segments I-II and VIII-X completely or partially brown; median sensilla on abdominal tergites III-VII anterior of posterior margin by 4 or 5 times their diameter (cf. Fig. 35) ..... *sudanensis* Trybom

9(7) Body brown, head brown anterior of eyes and submarginally posterior of eyes, light yellow medially (Fig. 10); abdominal sternites with V, U, or C-shaped glandular areas (Figs. 54, 55; Cf. Fig. 56) ..... *trimaculatus* n. sp.
   Body yellow; abdominal sternites with C-shaped glandular areas (Cf. Fig. 45) ..... *catawba* Hood

10(1) Female 11
   Male 22

11(10) Forewings with brown band along posterior margin (Fig. 29); basal 1/3 of antennal segment VI yellow or yellowish brown ..... *univittatus* n. sp.
   Forewings without brown band along posterior margin; color of antennal segment VI various 12

12(11) Posteriormargin of tergite VIII with 15 or fewer microtrichia, 2-7 long, sparse, irregularly spaced or absent (Fig. 38); head longer than than pronotum; abdominal segment IX elongate, 124-136 long, longer than VIII ..... *spartina* Hood

Posteromarginal comb complete on abdominal tergite VIII with more than 22 microtrichia, rather regularly spaced, longest 7-24 long (Figs. 36, 37, 39); abdominal segment IX about as long as VIII; head-pronotum length ratio various.... 13

13(12)B1 setae on abdominal tergite IX stout, 57-64 long, distinctly shorter than tergite X (Fig. 39); antennal segment VI with subtruncate base (Fig. 19); pronotum yellow with grayish brown shading; most of antennal segments III-V yellow, base of VI yellow ..... *grandioculus* Watson

B1 setae on tergite IX more than 70 long; other charactersvarious 14

14(13)Microtrichia of posteromarginal comb on tergite VIII short, 7-12 long, occasionally up to 15 long (Fig. 36); B1 setae on tergite IX 72-82 long, about as long as tergite X; body yellow with posterior margin of head usually brown, brown maculations usually on thorax and abdominal tergites; macropterous and brachypterous forms; widely distributed ..... *obscurus* (Müller)

Microtrichia of posteromarginal comb on tergite VIII longer (Fig. 37); other characters various 15

15(14)Body completely yellow except tip of mouthcone and abdominal segment X brown..... 16

Body predominantly brown, or yellow with more abdominal tergites partially or completely brown 17

16(15)Abdominal tergites completely sculptured, striae maybe weak medially (Fig. 32); setae on terminal abdominal segments yellowish brown .... *luteus* n.sp.

Abdominal tergites III-VIII not sculptured medially; setae on terminal abdominal segments yellow ..... *decolor* Hood

17(15)Antennal segment VI rather abruptly narrowed to subtruncate base (cf. Fig. 19), segment III strongly convex distal to somewhat narrow base (Fig. 23); body brown ..... *zizania* Hood

Antennal segment VI not subtruncate at base, sides of segment III gradually convex distal of base or subparallel; body color various 18

18(17)Antenna about 150 long, margins of segment III convex, 2.0-2.4 times longer than wide (Figs. 16, 21); B1 setae on abdominal tergite IX less than 95 long; body predominantly brown 19

Antenna 170 long or longer, margins of segment III subparallel, 2.6-3.2 times longer than wide (Fig. 19); B1 setae on abdominal tergite IX normally longer than 95; body predominantly brown or yellow 20

19(18)Head with 4 small anteromedial tubercles anterior of foreocellus (Fig. 1); mandible about 110 long; antennal segment V mostly yellow and yellowish brown..... *amoenus* Hood

Head without anteromedial tubercles anterior of fore ocellus; mandible 140-148 long; antennal segment V brown or slightly yellowish brown . ..... *tenebrosus* Hood

20(18)Mouthcone broadly conical, apex subtruncate or rounded, mandible less than 140 long (Fig. 15); B1 setae on abdominal tergite IX 110-121 long; anterior part of head yellow, antennal segment I pale yellow ..... *ripicola* Hood

Mouthcone conical, apex pointed, mandible about 148 long or longer (Fig. 13); B1 setae on abdominal tergite IX 96-110 long; antennal segment I light brown; other characters various 21

21(20)Head yellow with posterior margin pale gray, several submarginal brown spots present or absent; thorax and abdomen predominantly yellow with pale brown spots or larger maculations ..... *paludicola* n. sp.

Head predominantly brown, pronotum yellow with medial area brown or with brown spots; pterothorax and abdomen predominantly brown .... *cameroni* (Bagnall)

22(10)Abdominal sternites III-VI with large C- or horseshoe- shaped glandular areas (Figs. 56)..... 23

Abdominal sternites III-VI with small, circular, oval or crescent-shaped glandular areas (Figs. 49-53) 26

23(22)Forewings with pale brown transverse band between hindvein and posterior margin (Fig. 29) ..... *univittatus* n. sp.

Forewings without pale brown transverse band between hindvein and posterior margin, or brachypterous 24

24(23)Antennal segment III subglobular distal of narrow base, IV subglobular distal of pedicel (Fig. 22); bodybrown; brachypterous ..... *zizania* Hood

Antennal segment III and IV with sides subparallel or slightly convex (Figs. 17, 20, 21); body partially yellow and brown; macropterous... 25

25(24)Basal 1/2 of antennal segment VI light yellow, body completely light yellow ..... *decolor* Hood

Antennal segment VI brown, body yellow with brown maculations ..... *spartina* Hood

26(22)Abdominal tergites completely sculptured (Fig. 32); body pale yellow; macropterous and brachypterous ..... *luteus* n. sp.

Abdominal tergites without median sculpturing; body partially yellow and brown; macropterous 27

27(26) Mouthcone broadly conical, extending to between procoxae, apex subtruncate or rounded (Fig. 15); mandible 86-100 long ..... *ripicola* Hood
Mouthcone conical, apex pointed, extending to posterior margin of prosternum or beyond (Fig. 13); mandible 120-128 long .... *cameroni* (Bagnall)

Anaphothrips amoenus Hood
(Figs. 1, 16)

Anaphothrips amoenus Hood 1940:555.

Female (macropterous). Body generally brown, head brown; tarsi and tibiae yellow, femora yellowish brown; ocellar crescent red; body setae brown; forewings pale yellow, setae pale yellow. Antennal segment I-II brown, III-IV light yellow, V light yellow basally, gradually yellowish brown distally to gray brown at apex, basal 1/2 of VI lighter brown, rest brown, VII-VIII brown.

Body length 1.2 (distended 1.4) mm long (Hood 1940:555). Antenna 249 long, 9-segmented, segment VI partially divided (Fig. 16); segment III with slightly convex margins, about 2.2 times longer than wide. Head slightly longer than wide (Fig. 1), occiput reticulated in brown posterior area; 4 small anteromedian tubercles anterior of fore ocellus (Fig. 1A); mouthcone conical, extending to between procoxae, mandible about 110 long. Pronotum slightly shorter than head, weakly sculptured. Abdominal tergites III-VIII without sculpturing between median setae; submarginal striae with indistinct microtrichia; median sensilla about 3 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII with 23 microtrichia, longest 20 long; B1 setae on IX 77-82 long, somewhat stout, about as long as tergite X.

Male: Unknown.

Material Examined: Holotype female, St. Lawrence Co., New York, grasses and sedges, 29-VIII-39, J.D. Hood (Hood No. 1501) (USNM).

Distribution: United States (NY).

Hosts: Grass.

Comments: This species is based on an unique specimen. The small anteromedian tubercles on the head, brown body with pale forewings and legs, incompletely divided antennal segment VI and short B1 setae on abdominal tergite IX distinguish *A. amoenus* from its congeners.

Anaphothrips cameroni (Bagnall)
(Fig. 13)

Euthrips cameroni Bagnall 1919:271.
Anaphothrips cameroni: Watson 1924:45; Stannard 1968:277; Heming 1985:22; Huntsinger et al. 1982:23; Chaisson 1986:50.

Female (macropterous or hemimacropterous): Body predominantly brown, with bright yellow internal pigments; head color variable: brown with area around eyes yellow; posterior and lateral parts of occiput brown, yellow anteriorly to brown vertex or ocellar area brown to apex of head; pronotum yellow with medial brown area or spots; mesonotum brown with yellow or yellowish brown area posterior of submedial setae; abdomen completely brown or tergites mostly brown with marginal parts and pleurites yellow; legs yellow except outer margins of femora and tibiae shaded brown; ocellar crescent red; setae on posterior abdominal segments brown; forewings pale yellowish gray to pale yellowish brown, veins darker. Antenna brown, segment I paler brown than II, III light grayish yellow, or pale yellow in basal 1/3 with distal 2/3 light brown or most of distal 2/3 light grayish yellow, IV with basal 1/4 pale yellow, distal 3/4 brown or yellowish brown, V with basal 1/4 pale yellow or yellowish brown.

Body length 1.45-1.66 mm (distended). Antenna about 290 long, 9-segmented, segment VI completely divided; segment III subparallel or margins slightly convex, 2.7-3.0 times longer than wide (cf. Fig. 17). Head wider than long (Fig. 13), occiput with transversely anastomosing sculpturing; mouth cone elongate conical, bluntly pointed, extending to posterior margin of prosternum or beyond, mandible 148-161 long (Fig. 13A). Pronotum longer than head, transversely sculptured. Abdominal tergites III-VIII without sculpture between median setae (cf. Fig. 34); submarginal sculpture lines with indistinct microtrichia; median sensilla 3-4 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII complete with about 31 close-set microtrichia, longest about 20 long (cf. Fig.

37); B1 setae on tergite IX 101-111 long, longer than tergite X.

Male (macropterous or brachypterous): Abdominal tergites shaded grayish brown, pleurites yellow, segments IX and X grayish brown; otherwise similar to female in color and most morphological characters, smaller. Mouthcone conical, mandible 110-128 long. Abdominal sternites III-VII each with small oval or almost round glandular area (cf. Fig. 49).

Material Examined: Alaska, Circle City, 1 female, 21-VI-45, J.C. Chamberlin; Matanuska, 2 females, 2 males, chickweed or shepherd's purse, 27-VIII-43, J.C. Chamberlin. Iowa, Sioux City, 17 females, 1 male, swept from alfalfa, C.N. Ainslie; 1 female, 6 males, swept from oats, 13-VI-16, C.N. Ainslie. Minnesota, Roseau, 9 females, 7 males, Kveen bluegrass, 13-VI-63, A.G. Peterson. North Dakota, Bismarck, 5 females, wheat, VI- & VII-08, E.O.G. Kelly; Fargo, 5 females, 1 male, barley, VI-08, E.O.G. Kelly; Huron, 1 female, 1 male, wheat, VI-08, E.O.G. Kelly; Mott, 18 females, *Hordeum* sp., VII-18, C.N. Ainslie; Northwood, 1 female, roadside sod, 26-XI-60, G.H. Olsont & R.L. Post. South Dakota, Elk Point, 1 male, oats, C.N. Ainslie. Tennessee, Clarksville, 3 females, blooms of *Cercis canadensis* L., 11-IV-19, P.J. Wyatt, Jr. (Examined specimens in USNM).

Distribution: Canada (AB, BC, MB, ON, SK), United States (AK, IA, IL, MN, ND, SD, TN).

Hosts: *Avena sativa* L., *Capsella bursa-pastoris* (L.) Medik., *Cercis canadensis* L., grasses, *Hordeum jubatum* L., *H. vulgare* L., *Medicago sativa* L., *Phleum pratense* L., *Poa* sp., *Secale cereale* L., sedges, *Stellaria media* (L.) Villars, *Triticum aestivum* L.

Comments: This species resembles *A. paludicola* and *A. ripicola*. The differences are discussed in the comments under these species.

Anaphothrips catawba Hood

(Figs. 2, 25, 30)

Anaphothrips catawba Hood 1938a:348.
Anaphothrips (Neophysopus) catawba: Stannard 1968:277; Beshear 1979:210.

Female (macropterous). Body and legs light yellow, except tip of mouthcone and inner part of tibiae brown; ocellar crescent red; setae pale yellow; forewings pale grayish brown; antennal segments I pale yellow, lighter than head and segment II, II light yellow, III pale yellow except apex shaded gray, IV-V pale yellow in basal 1/2, light grayish brown distally, VI pale yellow or yellowish brown basally, brown distally, VII-VIII brown.

Body length 1.23 (distended 1.46) mm (Hood 1938). Antenna 8-segmented, about 243 long; segment III constricted near base, sides of segment slightly convex, 2.4-2.6 times longer than wide. Head about as long as wide, occiput strongly sculptured, striae transverse or anastomosing (Fig. 2); mouthcone conical extending to between procoxae, mandible 86-100 long. Metanotum with rather large median reticles, longer transversely in contrast to closer, longitudinal sculpture lines laterally (Fig. 25). Abdominal tergites completely sculptured with transverse striae divided into broad reticles (Fig. 30); submarginal microtrichia or teeth on tergites and posterior margins; median sensilla on III-VII anterior of posterior margin by about their diameter; posteromarginal comb on tergite VIII complete, about 29-32 close-set microtrichia, 17-20 long; tergite IX with B1 setae 82-101 long, about as long as tergite X.

Male (macropterous): Similar to female in color and most morphological characters, smaller. Abdominal sternites III-VII each with a large C-shaped glandular area (cf. Fig. 56).

Material Examined: Holotype female, Rocky Pt., North Carolina, in heads of broom-sedge, 20-X-37, J.D. Hood (Hood no. 945) (USNM). Connecticut, Mt. Higby Res., Hartford Co., 4 females, soil sample under white pine, 14-X-50, P. Bellinger (INHS). Illinois, Herod, 5 females, 2 males, *Andropogon* sp. sod, 17-VIII-51, Ross & Stannard (INHS). Kansas, 10 miles NE of Manhattan, Pottawatomie Co., 5 females, *Andropogon* clump, 7-VI-63, Ross & Ross (INHS). Maryland, Seneca, 4 females, grass, 17-VIII-41, J.C. Crawford (USNM). Massachusetts, W. Midway, 3 females, *Andropogon scoparius* Michx., 21-I-55, E.A. Chapin (USNM). Virginia, Falls Church, 1 female, sedge, 31-X-43, F. Andre (USNM).

Distribution: United States (CT, GA, IL, KS, MA, MD, NC).

Hosts: *Andropogon glomeratus* (Walt.) B.S.P., *A. virginicus* L., *Andropogon* sp., grasses, *Schizachyrium scoparium* (Michaux) Nash (=*Andropogon scoparius* Michx.), sedge, soil sample.

Comments: *Anaphothrips catawba* differs from two other yellow species with 8-segmented antennae, *A. helvolus* and *A. mexicanus*, by the females having completely sculptured abdominal tergites, and the macropterous males having six large C-shaped glandular areas on abdominal sternites. The females of *A. helvolus* and *A. mexicanus* lack medial sculpturing on the abdominal tergites and the brachypterous male of *A. helvolus* has seven C-shaped glandular areas. The male of *A. mexicanus* is unknown.

Anaphothrips decolor Hood
(Figs. 3, 20)

Anaphothrips decolor Hood 1925:101.
Anaphothrips sandersoni Stannard 1957:172; 1968:280 (*New Synonymy*).

Female (macropterous). Body generally whitish yellow, apex of abdominal segment X brown or posterior 3 segments pale brown, apex of mouthcone brown; body setae pale yellow; forewings colorless or pale yellow; antennal segments I pale yellow, II pale grayish yellow, III-IV pale yellow, V pale yellow basally, shaded brown apically, VI-IX brown.

Body length about 1.3 mm (Hood 1925b). Antenna 9-segmented, 262-269 long, segment VI completely divided; antennal segment III with slightly convex margins, about 2.2 times longer than wide (Fig. 20). Head about as long as wide, occiput with anastomosing sculpturing (Fig. 3); ocellar setae I cephalad of fore ocellus by about a diameter of ocellus; mouthcone conical (cf. Fig. 13), extending to posterior margin of prothorax or further posteriorly, mandible about 160 long. Pronotum about as long as head. Abdominal tergites III-VIII without sculpturing medially; median sensilla 2-4 times their diameter anterior of posterior margin on tergites III-VII, by about their diameter on tergite VIII; posteromarginal comb complete, 27-31 close-set microtrichia, about 20 long; B1 setae on tergite IX 100-106 long, about as long as tergite X.

Male (macropterous). Basal 1/2 of antennal segment VI and body completely yellow; otherwise similar to female in color and most morphological structures, smaller. Abdominal sternites III-VII each with large C-shaped glandular area (cf. Fig. 48).

Material Examined: *Anaphothrips decolor* Hood, female holotype, 1 female paratype, Golden, Colorado, miscellaneous, 20-VI-18, L.O. Jackson (USNM). *Anaphothrips sandersoni* Stannard, allotype male, 1 female paratype, Lawrence, Douglas Co., Kansas, sweeping Prairie, 31-VIII-52, S.C. & M.W. Sanderson (INHS). Alberta, Cyprus Hills, 1 female, host unknown, 14-VII-80, G. Gibson (USNM).

Distribution: Canada (AB), United States (CO, IA, IL, KS, MO).

Hosts: *Andropogon* sp., grasses, *Polygonum* sp., *Salix* sp., *Spartina* sp.

Comments: *Anaphothrips decolor* and *A. luteus* are similar in coloration and most morphological characters. The differences are discussed in the comments for *A. luteus*.

The description of the male is based on the allotype of *A. sandersoni*, which is treated here as a junior synonym of *A. decolor*.

Anaphothrips grandioculus Watson
(Figs. 19, 39)

Euthrips grandioculus Watson 1921:36.
Anaphothrips grandioculus: Watson 1924:45.

Female (macropterous): Body generally brown, head lighter yellowish brown medially with vertex and lateral parts of occiput darker brown; pronotum light yellow with grayish brown shade; intermediate abdominal tergites lighter yellowish brown in medial areas; legs yellow with femora and mid- and hindtibiae shaded brown on outer margin; ocellar crescent red; setae on terminal abdominal segments dark brown; forewings light grayish yellow. Antennal segments I-II brown, III yellow, IV yellow except light gray at apex, V mostly yellow with distal 1/3 shaded grayish brown, VI yellow or yellowish brown in basal 1/2, brown distally, VII-IX brown.

Body length 1.32 mm (Watson 1921). Antenna 226 long, 9-segmented, segment VI completely divided; segment III slightly convex at sides, about 2.3 times longer than wide; VI rather abruptly narrowed at

base thus appearing subtruncate, pedicel 10-12 wide (Fig. 19). Head wider than long, occiput transversely sculptured, striae rather far apart; mouthcone conical, extending to between procoxae, apex subtruncate or rounded, mandible about 124 long. Abdominal tergites III-VIII without sculpture lines between median setae; median sensilla 3-5 times their diameter anterior of posterior margins; submarginal sculpture lines with microtrichia; posteromarginal comb on tergite VIII complete, 23-27 close-set microtrichia, longest about 17 long; tergite IX (Fig. 39) with short, stout B1 setae, 57-64 long, shorter than tergite X.

Male: Unknown.

Material Examined: 3 female paratypes, Moore Haven, Florida, grass, 13-VI-20, J.R. Watson (USNM); Gainesville, 1 female, grass, 13-VI-54, M.J. Westfall & J.D. Hood (USNM).

Distribution: United States (FL).

Host: Grass.

Comments: This species apparently is rarely collected. The rather abruptly narrowed subtruncate base of antennal segment VI with a wide pedicel, short B1 setae on abdominal tergite IX, the yellowish gray pronotum in constrast to the brown body and yellow antennal segments III-VI differentiate *A. grandioculus* from its congeners.

***Anaphothrips helvolus*, new species**
(Figs. 4, 14, 31, 44, 48)

Female (macropterous): Body completely light yellow except for tip of mouthcone brown; legs light yellow with inner part of tarsi brown; ocellar crescent red; setae light grayish yellow; forewings shaded pale grayish brown, distally pale; antennal segments I-II light yellow, III almost completely light yellow with apex shaded gray, basal 2/3 of IV yellow, distally light grayish brown, basal 1/3 of V light yellow, distally grayish brown, base of VI yellowish brown, rest brown, VII-VIII brown.

Body length from interantennal process 1.58 (1.47-1.50) mm distended, 1.41 mm normal.

Antenna: 8-segmented; segment III 2.4 (2.0-2.6) times longer than wide, sides slightly convex, segments III-IV slightly constricted distally, each with forked trichome 15-17 long, inner sense cone on VI 22-24 long, extending to about midlength of VII. Total length 255 (228-260); length and width of segment I 22 (17-22), 30 (27-30); II 35 (31-37), 27 (27); III 44 (40-44), 20 (17-20); IV 42 (35-40), 20 (17); V 37 (32-40), 20 (17); VI 50 (47-52), 17 (17-20); VII 10 (10), 7 (7); VIII 15 (15-17), 5 (5).

Head (Fig. 4): About as long as wide, 148 (136-143) long, slightly produced anterior of eyes; occiput transversely striate or anastomosing, shorter than eyes, cheeks slightly arched. Fore ocellus about 12 wide. Ocellar setae I 15-20 long, anterior of fore ocellus by more than the diameter of ocellus, separated by about twice the diameter of the ocellus; ocellar setae II anterolaterad of fore ocellus, 12-17 long, near mesal margin of eye; ocellar setae III posterolaterad of fore ocellus, 17-22 long, outside ocellar triangle, occasionally one seta further mesad. Postocular setae 3 pairs, POi submedial, posterior of level of eye, about 15 long, POii-iii aligned laterad of POi. Mouthcone broadly conical, apically rounded, short, mandible 86 (86-91) long (Fig. 14).

Pronotum: Subequal or slightly longer than head, transverse; discal setae few, short; posteromarginal setae 4-6 on each side, median pair 15-17 long. Mesonotum: Completely reticulated; 2 anteromedian sensilla present; submedian setae anterior of level of lateral setae; mesosternum with well developed spinula. Metanotum: Reticulated medially, reticles polygonal or axis of reticles transverse, lateral sculpture lines longitudinally aligned; median setae 17 long, positioned in about anterior 1/3 of notum, 2 sensilla in midlength of notum.

Forewing: Rather straight, pointed apically, 742 (613-741) long, 57 (47-54) wide at midlength; 24-26 (19-27) costal setae, those in medial area about 1/3 as long as width of wing at midlength; 22-23 (16-23) anterior fringe cilia straight although a few occasionally slightly wavy; forevein with 7-8 (5-8) setae in proximal 1/2, 3-4 (3) setae in distal 1/2; hindvein with 7-9 (7-9) setae; scale with 5-6 veinal setae, discal seta absent.

Abdomen: Tergites III-VIII without sculpture medially (Fig. 31); microtrichia or teeth submarginally on striae and posterior margins. Median sensilla on tergites IV-VII anterior of posterior margin by about their diameter. Tergites with 2 minute, median pores (cf. Fig. 35). Posteromarginal comb on tergite VIII complete, 27 (25-30) close-set microtrichia, 15-

22 long. Tergite IX with 2 pairs of sensilla; about as long as X or slightly longer, B1 setae 111(104-117) long, B2 setae 117(111-119) long. Tergite X completely divided by dorsal split, B1 setae 82(86-94) long. Pleurotergites with microtrichia on striae, microtrichia or sharp teeth on posterior margins; pleurosternites with larger apically pointed or rounded teeth. Sternites completely sculptured, submarginal striae with microtrichia; sternite I with 1-3 anteromedian setae (cf. Fig. 43); sternite VII with B1 setae anterior of posterior margin.

Male (brachypterous): Similar to females in color and most morphological characters, smaller. Body length from interantennal process 0.92 (0.92) mm. Antenna: Total length 204; length and width () of segment I 17 (24), II 27 (24), III 35 (17), IV 32 (17), V 32 (17), VI 42 (17), VII 10 (17), VIII 12 (5). Forewings oval, 124 (148) long, with 4-6 setae on margins, 3 veinal setae. Abdominal tergites completely reticulated; posteromarginal comb on tergite VIII complete. Tergite IX (Fig. 44) with B1-B2 setae spindle-shape, short, stout; B1 setae anterior and larger than B2 setae, 12 (15) long, 4.5 wide; B2 setae posterior and farther apart than B1 setae, 5 long, 2 wide; dorsal setae bristlelike, anterolaterad of B1 setae, 69 long; posterolateral seta thickest, 67 (74) long; a short setae between B2 and posterolateral setae about 10 long; midlateral setae 50 (62-69) long; a sensillum between B1 and dorsal setae, another pair closer to anterior margin of tergite. Sternites III-VIII with large C-shaped glandular areas, on sternite VI 74 (82) wide, 37 (44) long, gland on VIII smallest (Fig. 48).

Material Examined: Holotype female, 1 female paratype (USNM); Decatur Co., Georgia, *Panicum agrostoides*, 9-VI-54, J.D. Hood. Other paratypes (USNM): Kansas: Riley Co., 1 female (antennal segments III-VIII absent) and 2 males, *Setaria* sp., 23-VI-54, R.H. Painter (54-6962); Sheridan Co., 1 female, wild grasses, 20-VIII-51, T.L. Harvey (51 8901); Hays, 1 female, volunteer wheat, 23-VIII-51, T.L. Harvey (51 8902); Trego Co., 1 female (antennal segments III-VIII absent), volunteer wheat, 27-VIII-51, T.L. Harvey (51 8902). Minnesota: Ramsey Co. (university farm), 1 female, corn, 6-VII-53, M.E. Warters (54 2051).

Distribution: United States (GA, KS, MN).

Hosts: Grass, *Panicum agrostoides*, *Setaria* sp., *Triticum aestivum* L., *Zea mays* L.

Etymology: Specific epithet derived from Latin "helvolus" (pale yellow), which is the color of the body.

Comments: *Anaphothrips helvolus* closely resembles *A. catawba* and is distinguished by the absence of median tergal sculpturing on the abdomen and brachypterous male with 6 C-shaped glandular areas on abdominal sternites III-VIII. The abdominal tergites of *A. catawba* are completely sculptured and the macropterous male has 5 C-shaped glandular areas on the abdominal sternites III-VII. From *A. mexicanus*, another pale yellow species with 8-segmented antenna, it differs by having the median tergal sensilla on the abdomen positioned about their diameter anterior of the posterior margin and longer B1 setae on tergite IX. The tergal sensilla of *A. mexicanus* are positioned 3 to 4 times their diameter anterior of the posterior margin.

Anaphothrips luteus, new species
(Figs. 5, 24, 32, 45, 49)

Female (macropterous and brachypterous). Body yellow except apex of abdominal segment IX and mouthcone; legs yellow; major setae on posterior abdominal segments yellowish brown; ocellar crescent not seen; forewings pale yellowish gray; antennal segment I-II pale yellow like head, III pale yellow with apex pale gray, IV pale yellow becoming gradually brown at apex, basal 1/5 of V pale yellow with pedicel brown and rest of segment gradually darker brown at apex, VI brown with basal part paler, VII-IX brown.

Body length from interantennal process 1.60 mm, distended 1.70 (1.53-1.72) mm.

Antenna: 9-segmented, division between segments VI-VII slightly diagonal; segment III 2.2-2.4 times longer than wide, sides slightly convex, segments III-IV each with a short, 15-17 long, V-shaped trichome; inner sense cone on VI extending almost to apex of VIII, 27-30 long. Total length 252 (258-273); length and width of segment I 20 (20-22), 30; II 32 (35-40), 27 (27-30); III 42 (42-44), 20; IV 37 (40-44), 20 (19-21); V 40 (40-42), 20; VI 42 (42-44), 20; VII 12, 15; VIII 10, 7; IX 17, 5.

Head (Fig. 5): Slightly longer than wide at occiput, 161(titled) (143-156) long, slightly prolonged anterior of eyes; eye bulging; occiput almost as long as

eyes, sculptured with transverse and broad anastomosing striae, cheeks nearly straight. Fore ocellus about 12 wide. Ocellar setae I 12-15 long, laterad and aligned with cephalic part of fore ocellus to slightly anterolaterad, separated by 2-2.5 times diameter of fore ocellus; ocellar setae II laterad of fore ocellus near mesal margin of eye, about 12 long; ocellar setae III anterior of posterior ocelli, outside ocellar triangle, 12-15 long. Postocular setae 3 pairs, about 12 long, POi-POii aligned transversely, POi submedial, posterior of eyes. Minute, medial pores, normally 2, between POi setae, 2 slightly posterior of posterior ocelli. Mouth cone elongate conical, extending to posterior margin of prothorax, mandible (148-165) long.

Pronotum (Fig. 24): Nearly as long as wide, 161(168) long, longer than head; sculpturing weak, striae transverse and anastomosing; discal setae short, 10-12 long, arranged along margins, and in medial area; 2 minute medial pores near posterior margin; posteromarginal setae 6 pairs, medial pair 10-12 long. Mesonotum: Completely reticulated; 2 anteromedian sensilla present; submedian setae anterior of posterior margin; mesosternal spinula well developed. Metanotum (cf. Fig. 26): Polygonally reticulated in median 1/3, longitudinal striae laterally; median setae about 12 long, posterior of anterior margin; pair of sensilla on about midlength of notum.

Forewing (macropterous): Rather straight, pointed at apex, 692 (677-721) long, 50 (47) wide at midlength; 25 (24) costal setae, 18 (17-20) fringe cilia, straight; forevein with 7 setae in proximal 1/2, 3 distal setae; hindvein with 7 (7-8) setae; scale with 5 marginal setae. Brachypterous: 207 long; 5-6 costal cilia and setae, 1 on posterior margin, 2 veinal setae.

Abdomen: Tergites completely sculptured, reticulated sculpture on tergite I distinct, sculpture on II-VIII transverse or anastomosing (Fig. 32), strongly indicated submarginally with microtrichia on striae and posterior margin of tergite, weakly indicated in median 1/2, IX transversely sculptured with striae rather close. Median sensilla usually 3-5 times their diameter from posterior margin. Minute median pores, 1 or 2 close-set, slightly posterior of median setae on tergites II-VIII (cf. Fig. 35). Posteromaginal comb on tergite VIII complete, close-set, 24 microtrichia 17-20 long. Tergite IX with 2 pairs of sensilla (cf. Fig. 41); B1 setae 99 (99-101) long, longer than tergite and tergite X, B2 setae 96 (101-109) long. Tergite X nearly divided by dorsal split, B1 setae 86 long. Pleurotergites with microtrichia on sculpture lines and posterior margin. Sternite I with 3 or 4 anteromedian setae (cf. Fig. 43); B1 setae on sternite VII anterior of posterior margin.

Male (macropterous and brachypterous). Body length from interantennal process 1.25 mm, distended 1.35 (1.20-1.23) mm. Similar to female in color and most morphological characters, smaller.

Antenna: Total length 240-250; length and width of segment I 20, 27; II 30-32, 27; 40-44, 17; IV 37-40, 17; V 37-40, 20; VI 40, 18; VII 11-12, 13; VIII 10, 7; IX 15, 5. Forewing (macropterous): 660 long, 42 wide at midlength; 21-19 costal setae, 16-17 fringe cilia; forevein with 6-7 setae in proximal 1/2, 3 distal setae; hindvein with 7-8 setae. Brachypterous: 119-126 long, 2-4 costal setae, 1-2 setae on posterior margin, 2-3 setae and 1 pore on dorsal vein.
Abdomen: tergite VIII with complete posteromarginal comb, 22-24 close-set microtrichia 12-15 long. Tergite IX (Fig. 45) with stout B1-B2 setae on tubercles, B1 12-17 long, 5 wide, anterior to B2 setae, B2 10-12 long, about 3 wide; other setae bristle-like: dorsal setae 59-64 long, laterad of B1 setae; lateral setae 62-67 long, midlateral setae 64-77 long; a sensillum between B1 and D1 setae. Sternites III-VII with small circular to oval glandular areas, 7-15 wide (Fig. 49).

Material Examined: Macropterous female holotype and 6 paratypes (USNM): 2 macropterous female and 1 male, and 1 brachypterous female and 2 male; Cape May, New Jersey, grasses, 9-X-1919, J. D. Hood.

Distribution: United States (NJ).

Host: Grass.

Etymology: Specific epithet derived from Latin "luteus" (yellow). This species has a yellow body.

Comments: The mouthcone of the holotype is strongly titled and a reasonable measurement of the mandible was not possible; thus the measurements given are those of two paratypes. The long pronotum in comparison with the length of the head, the completely sculptured abdominal tergites, and the oval glandular areas on abdominal sternites III-VII of the males will distinquish this

species from *A. decolor*, which is similar in color. The pronotum of *A. decolor* is about as long as the head, sculpturing is absent from the median area of abdominal tergites III-VIII and the male has C- or horseshoe-shaped glandular areas on sternites III-VII.

***Anaphothrips mexicanus*, new species**
(Figs. 6, 27, 28)

Female (macropterous): Body yellow, thorax with orange tinge, tip of abdominal tergite X shaded grayish brown, tip of mouthcone brown; legs yellow, inner side of tarsi brown; ocellar crescent red (Fig. 6A); setae grayish yellow; forewings pale grayish brown, lighter distally, scale pale grayish brown; hindwing with median longitudinal gray stripe; antennal segment I light yellow, II light grayish brown, III mostly yellow, shaded pale grayish brown distally, IV yellow in basal 3/4, shaded light grayish brown distally, V yellow in basal 2/3, shaded light grayish brown distally, VI darker grayish brown with base yellowish brown, VII-IX grayish brown.

Body length from interantennal process 1.39 (1.45-1.56 distended).

Antennae: 8-segmented, segment III 2.5 (2.4-2.5) times longer than wide, sides slightly convex, slightly constricted distally, segments III-IV each with a short trichome 17-20 long, V-shaped; inner sense cone on segment VI 27-30 long, almost extending to apex of VII. Total length: 250(248); length and width of segment I 20(17), 27(27); II 35(35), 27(27); III 44(42-44), 17(17-20); IV 37(37-44), 17(17); V 40(40), 20(18-20); VI 50(50-52), 17(17); VII 10(10), 7(17); VIII 14(15), 5(5).

Head (Fig. 6): About as long as wide, 131(124-138) long from interantennal process, slightly produced anterior of eyes, occiput transversely striated or anastomosing, slightly shorter than eyes, cheeks rather straight. Ocellar setae I about 12 long, cephalad of fore ocellus by about twice diameter of ocellus, separated by about 2.5 times diameter of ocellus; ocellar setae II anterolaterad of fore ocellus, about 12 long, near mesal margin of eyes; ocellar setae III 15 long, posterolaterad of fore ocellus, outside ocellar triangle. Postocular setae 4 pairs, POi seta submedially positioned caudad to level of posterior margin of eyes, POii-iii usually aligned transversely with POi. Mouthcone conical, extending posteriorly between procoxae; mandible 96(91-109) long.

Pronotum: About as long as head, wider than long; sculpturing transverse or anastomosing; 6 pairs of short posteromarginal setae, median pair about 10 long. Mesonotum: completely reticulated, 2 anteromedian sensilla present; submedian setae anterior of posterior margin; mesosternum with well developed spinula. Metanotum (cf. Fig. 26): polygonally reticulated medially, laterally with longtudinal lines; median setae short, 12 long, in anterior 1/3 of notum; 2 sensilla in about midlength of notum; metasternum without spinula.

Forewings (Fig. 27): Rather straight, pointed apically; 668(680-754) long, 40(44-47) wide at midlength; 15 (16-19) costal setae, those at medial area about 1/2 as long as width at midlength; 18-19 (20-21) anterior fringe cilia, those in proximal 1/2 wavy (Fig. 28); forevein with 6 (5-6) setae in proximal 1/2, 2 (3-4) setae in distal 1/2; hindvein with 7 (8-9) setae, irregularly spaced; scale with 5 (4-5) marginal setae, discal seta absent.

Abdomen: Sculpture lines on abdominal tergites III-VII absent medially. Microtrichia on submarginal sculpture lines and posterior margin, minute on anterior tergites, slightly longer on posterior tergites (cf. Fig. 35). Median sensilla positioned 3-4 times their diameter from posterior margin. Tergite VIII with well developed posteromarginal comb, 29 (30-32) close-set microtrichia, 15-20 long. Tergite IX with 2 pairs of sensilla (cf. Fig. 42); B1 seta 89(74-86) long, not extending beyond apex of tergite X, B2 seta 91(91-101) long. Tergite X completely divided by dorsal split, B1 seta 79(79-82) long. Pleurotergite with microtrichia on sculpture lines and posterior margin; pleurosternite with a broad flange with minute teeth on posterior margin. Sternites completely sculptured transversely, sculpture lines with microtrichia. Sternite I with 2 anteromedian setae (cf. Fig. 43); B1 setae on sternite VII anterior of posterior margin.

Male: Unknown.

Material Examined: Holotype female and 3 female paratypes (USNM); Mexico, Xochimilco, *Bromus catharticus* Vahl, 4-IV-91, R. Pena & M.B. Stoetzel. 1 female paratype, Mexico, *Majorana* sp., 3-I-79, L. Holquin, in quarantine at El Paso (El Paso 9196) (USNM).

Distribution: Mexico (Xochimilco, D. F.)

Hosts: *Bromus catharticus* Vahl, *Majorana* sp.

Etymology: Species named for the country of Mexico.

Comments: The differences between *A. mexicanus* and two other yellow species with 8-segmented antenna, *A. catawba* and *A. helvolus*, are discussed in the comments for the latter two species.

Anaphothrips obscurus (Müller)
(Figs. 7, 33, 36)

Thrips obscura Müller 1776:96.
Limothrips poaphagus Comstock 1875:120 (nomina nudum), 1888:127: Hinds 1900:85.
Thrips striata Osborn 1883:155: Hood 1914:166.
Anaphothrips striata: Hinds 1900:85.
Anaphothrips striatus: Hinds 1902:161.
Anaphothrips obscurus (Müller): Hood 1914:166; Bailey 1957:161; Stannard 1968:278; Beshear 1973:8; Huntsinger et al. 1982:23; Chaisson 1986:50.

Female (macropterous): Color yellow except brown as follows: head with posterior part brown, often extending to lateral part of occiput (Fig. 7); pronotum with brown discal spots; mesonotum with anterior and lateral areas brown; metanotum with 2 lateral longitudinal brown bands; abdominal tergites with medial brown area of varying sizes, tergite I almost completely brown, terminal 2-3 tergites without brown color; legs yellow or femora and tibiae shaded brown on outer margin; ocellar crescent red; setae on terminal abdominal segments brown; forewings grayish yellow; antenna brown with segment I yellow, segments III-V lighter brown.

Body length about 1.5 mm long distended. Antenna 9-segmented, 272-294 long, V1 completely or partially divided; segment III with sides convex, about 2.5 times longer than wide. Head slightly wider than long, sculpturing on occiput reticulate or anastomosing (Fig. 7); mouthcone conical, extending to between procoxae, mandibles 128-148 long. Pronotum about as long as head, transversely striated. Abdominal tergites completely sculptured, median striae weaker than those on submargin (Fig. 33); submarginal striae with microtrichia; median sensilla 3-5 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII complete, 26-30 microtrichia 7-12 long, occasionally up to 15 long (Fig. 36); B1 setae on tergite IX 72-82 long, about as long as tergite X.

Female (brachypterous): Similar to macropterous forms, usually brown maculations reduced or body completely yellow; forewings reduced to oval pads.

Male: Not seen.

Material Examined: Identified specimens from various states, countries and hosts deposited in the USNM.

Distribution: Canada (NS to BC), United States (widely distributed), Mexico, Chile, Europe, Russia, Azores, Egypt, Morocco, India, Japan, Australia, New Zealand, Kiribati.

Hosts: Infests various members of the Poaceae.

Economic Importance: Pest of cereal crops (barley, *Hordeum vulgare* L., corn, *Zea mays* L., oats, *Avena sativa* L., rye, *Secale cereale* L., wheat, *Triticum aestivum* L.) and grasses such as bentgrass, *Agrostis stolonifera* L., bluegrass, *Poa pratensis* L., and fescue, *Festuca* sp. (Bailey 1948, Stannard 1968, Lewis 1973, Ananthakrishnan 1984).

Comments: The median tergal striations on the abdomen are difficult to observe on specimens that are not adequately macerated. Usually the striations on cleared specimens can be observed on the median brown areas without phase constrast.

The short posteromarginal comb, rather short B1-B3 setae on tergite IX, brown coloration on posterior part of the head, and the completely sculptured abdominal tergites will diferentiate this from other predominantly yellow species with 9-segmented antenna.

According to Priesner (1960), the male is known only from the United States and was never described properly. Stannard (1968) states that "Shull (1909) described what he thought was the male of *obscurus* under the synonymous name *striatus*. The two specimens he described were from Huron County, Michigan. I have seen one of these males, deposited in the British Museum (Natural History), and it is the male of *sandersoni*, not *obscurus*. Hood (1938a) made reference to the male of *obscurus*...". Stannard further stated that "Certainly the male of this species, if it exists in North America, is rare ". A male collected on October 4, 1909 at Urbana, Illinois and determined by Hood as *obscurus* is a

misidentification of *A. decolor*. A few males determined as *A. striata* from Iowa in the USNM proved to be *A. cameroni*. I have not seen any males in the material that I have examined and thus there appears to be no valid record for the male of *A. obscurus*.

Anaphothrips paludicola, new species
(Figs. 8, 26)

Female (macropterous). Body generally yellow; head completely yellow or with posterior margin light brownish gray, occasionally with small, brown submarginal spots posterior of eyes (Fig. 8); pronotum yellow with series or small, brown discal spots; metanotum light brown with median area light yellow; abdominal tergites I shaded brown, tergites II-VIII shaded brown medially, II-VII with submarginal oval brown spot on each side, most of IX and all of X light brown, sternites II-VII with submarginal oval spot on each side; legs yellow with tibiae and femora shaded light yellowish brown on outer margin; setae on posterior abdominal segments yellowish brown; forewings light yellowish brown; antennal segment I pale grayish brown, paler than II, II brown with yellowish tinge, III light yellow with apex gray, IV light yellow in basal 1/4, light brown distally, V-IX brown.

Body length from interantennal process about 1.46 mm (1.66-1.74 distended).

Antenna: 9-segmented, segment VI completely divided; segment III subparallel to slightly convex, 2.5-3.0 times longer than wide (cf. Fig. 17); forked trichomes on III-IV short, those on IV about 20 long; inner sense cone on segment VI about 30 long, extending to midlength of segment VIII. Total length 274 long; length and width of segment I 24, 32; II 37, 20, III 50 (52), 20 (17); IV 40 (44), 17 (20); V 42 (40), 22; VI 44 (40), 21 (20); VII 12, 6; VIII 10, 7; IX 15, 6.

Head (Fig. 8): About as long as wide, 161 long, slightly produced anterior of eyes, cheeks almost straight, occiput slightly shorter than eye, with transversely anastomosing sculpture. Fore ocellus about 12 wide. Ocellar setae I anterior of fore ocellus by about diameter of ocellus, separated by twice diameter of ocellus, 10-15 long; setae II anterolaterad of fore ocellus near mesal margin of eye, 12-15 long; setae III anterior of posterior ocelli, 15-17 long, outside ocellar triangle. Postocular setae 3 pairs, POi about 15 long, positioned submedially and slightly posterior of level of eye. Minute median pores 4, between POi setae and posterior ocelli. Mouthcone conical, extending to posterior margin of prosternum, mandible 167 (151-156) long.

Pronotum: About as long as head, wider than long, striae more strongly indicated submarginally than medially; 2 minute median pores near posterior margin; 6 pairs of posteromarginal setae, median pair 15-17 long. Mesonotum: Completely reticulated; 2 anteromedian sensilla present; submedian setae anterior of posterior margin, about level with lateral setae; mesosternal furca and spinula well developed. Metanotum (Fig. 26): Polygonally reticulated in median 1/3, longitudinally striate laterally; median setae in anterior 1/4 of sclerite, about 15 long; 2 sensilla in about midlength of sclerite.

Forewing: Rather straight, pointed apically, about 664 long, 50 wide at midlength; costal setae 21, those at midlength shorter than width of wing; anterior fringe cilia 15, straight; forevein with 7 setae in proximal 1/2, 3 setae in distal 1/2; hindvein with 10 setae; scale with 6 marginal setae.

Abdomen: Tergites III-VIII without sculpturing medially, submarginal sculpturing reticulate, striae extending slightly mesad of D2 setae (cf. Fig. 31). Dentate or spinelike microtrichia on submarginal striae and posterior margins. Median sensilla anterior of posterior margin by 2-4 times their diameter. Minute pores 2, usually almost touching, between or slightly posterior of median setae on tergites I-VIII (cf. Fig. 35). Posteromarginal comb on tergite VIII with 25-26 microtrichia, close-set, 15-22 long. Tergite IX with 2 pairs of sensilla, B1 setae 109-111 (96-109) long, about as long to slightly longer than tergite X, B2 setae 109-121 (11-117) long (cf. Fig. 42). Tergite X completely divided by dorsal split, B1 setae 91 (86-89) long. Pleurotergites with microtrichia on sculpture lines and posteromargin; pleurosternites with 3-4 large teeth on posterior margin. Sternites with transverse striae submarginally, absent medially. Sternite I with 3 or 4 anteromedian setae (cf. Fig. 43); sternite VII with B1 setae anterior of posterior margin.

Male: Unknown.

Material Examined: Holotype female and 2 female paratypes (USNM); Massachusetts, Cape Cod,

Great Sippewisset Salt Marsh, 31-I-75, I. Valiela (76 5227).

Distribution: United States (MA).

Host: Unknown.

Etymology: Specific epithet derived from a combination of Latin "paludis" (marsh) and "cola" (inhabitant). This species is known only from a salt marsh.

Comments: This species is closest morphologically to *A. cameroni* and closely resembles *A. ripicola* in coloration. The longer mouthcone and mandible and grayish brown antennal segment I differentiate *A. paludicola* from *A. ripicola*, and the predominantly yellow color differentiates *A. paludicola* from *A. cameroni* which is predominantly brown. The decision to treat *A. paludicola* as a new species instead of a color variation of *A. cameroni* was based on *A. paludicola* being collected in January when overwintering thrips adults are darkest. Adults collected in other seasons of the year probably will not be darker and the color difference between *A. cameroni* and *A. paludicola* should be reliable.

The description of the forewing is based on one wing of a paratype. The other forewings are twisted and could not be measured or described.

Anaphothrips ripicola Hood, revised status
(Figs. 15, 17, 40, 50-53)

Anaphothrips ripicola Hood 1940:553: Stannard 1968:277 (as synonym of *A. cameroni*).

Female (macropterous): Abdomen yellow, gray median area on tergites I-VII with X light brown, submarginal oval brown spot on each side present or absent, or tergites mostly brown with terminal segments darker brown; thorax yellow, shaded light gray or brown; head yellow with posterior part normally shaded light gray, ocellar area may have pale gray shading; legs yellow, femora and tibiae often slightly shaded light brown; ocellar crescent red; major setae on terminal segments brown; forewings light brownish yellow. Antennal segment I pale yellow; II brown, paler apically and basally than laterally; III yellow, shaded light gray apically or distal 2/3 shaded light gray; IV yellow basally, shaded darker grayish brown apically, occasionally completely grayish brown with yellow pedicel; V brown with basal 1/3 pale yellow; VI-IX brown.

Body length 1.3 mm (fully distended, 1.6 mm) (Hood 1950:553). Antenna about 280 long (Fig. 17); segment III subparallel, 2.8-3.2 times longer than wide. Head longer than wide, occiput with transverse anastomosing sulpture; mouthcone broadly conical, apex subtruncate or broadly rounded, extending to between procoxae, mandible 111-136 long (Fig. 15). Pronotum slightly shorter than head, disc weakly striated. Mesonotum reticulated. Metanotum polygonally reticulated. Abdominal tergites III-VIII without distinct sculpturing between median setae; median sensilla 2-4 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII complete, with 27-31 close-set microtrichia, longest about 17-22 long; B1 setae on tergite IX 111-121 long, longer than tergite X (Fig. 40).

Male: Abdominal tergites I-VIII shaded gray medially, IX and X gray, pronotum shaded gray medially, otherwise similar to females in color and most morphological characters, smaller. Mouthcone broadly conical, apex subtruncate or rounded, mandibles 86-100 long. Abdominal sternites III-VII each with a small, almost round, oval, subtriangular or crescent shaped glandular areas (Figs. 50-53).

Material Examined: Holotype, allotype, 8 female and 7 male paratypes, St. Lawrence Co., New York, grass and sedge, 29-VIII-39, J.D. Hood (Hood no. 1500) (USNM). Illinois, Lake Villa, 1 female, *Scirpus* sp., 5-VIII-59, Evers, Mockford & Stannard; Zion, 7 females, *Carex* sp., 27-VII-60, Smith, Ross & Cunningham (INHS).

Distribution: United States (IL, NY).

Host: *Carex* sp., grass, *Scirpus* sp.

Comments: Although Stannard (1968) treated *A. ripicola* as a junior synonym of *A. cameroni*, I consider *A. ripicola* to be a valid species. These two species are similar morphologically and in color and can be difficult to differentiate. The females of *A. ripicola* vary in color from predominantly yellow to most of the abdominal segments brown, the anterior part of the head is yellow, antennal segment I is pale yellow, the mouthcones are broadly conical with the apex subtruncate or rounded and the mandible is 111-136 long (Fig. 15). Females of *A. cameroni* are brown or predominantly brown except the pronotum is yellow with brown median shading and the anterior part of the head is brown, antennal seg-

ment I is light brown, the mouthcone is elongate, apex bluntly pointed, and the mandible is 148-161 long (Fig. 13). Males of *A. ripicola* also have shorter mandible, 86-100 long in contrast to 120-128 long of *A. cameroni*.

The mouthcone and mandible are difficult structures to use in taxonomic studies because they often are distorted by the slidemounts and accurate measurements or descriptions are difficult to obtain.

Anaphothrips ripicola closely resembles *A. paludicola* in color. The shape and lengths of the mouthcone separate these two species. The mouthcone of *A. paludicola* is conical, extending to the posterior margin of the prosternum and the mandible is 151-167 long.

Anaphothrips spartina Hood
(Figs. 9, 38)

Anaphothrips spartina Hood 1939:562.

Female (macropterous): Body generally yellow; head with lateral brown area posterior of eye (Fig. 9), pronotum with gray spots, mesonotum with U shaped gray area bordering yellow medial and posterior area, metanotum with brown longitudinal band laterally, abdominal tergites I-VII with grayish brown medial areas, usually with submarginal brown spot; legs yellow; ocellar crescent red; setae on posterior abdominal segment brown; forewings uniformily yellowish brown; antennal segment I yellow, II grayish brown, III-IV yellow, IV darker distally than III, V yellow in basal 1/4, brown distally, VI-IX brown.

Body length about 1.6 (fully distended 2.0) mm long (Hood 1939: 562). Antenna about 287 long, 9-segmented with segment VI completely divided; segment III subparallel (cf. Fig. 17), 2.7-3.0 times longer than wide. Head large (Fig. 9), strongly produced anterior of eyes, longer than wide, longer than pronotum and almost as wide; sculpture on occiput transverse and anastomosing, cheeks almost straight; mouthcone conical, apex pointed, mandible about 160 long. Pronotal disc smooth or weakly sculptured. Abdominal tergites III-VIII without median sculpturing, submarginal striae with microtrichia; median sensilla 3-4 times their diameter anterior of posterior margin; posterior margin of tergite VIII without comb or with short (longest about 7), sparse (up to about 15), irregularly spaced microtrichia (Fig. 38); tergite IX 124-136 long, longer than tergite VIII, with B1 setae 100-114 long, about as long as tergite X.

Male: Similar to female in color and most morphological characters, shorter. Abdominal sternites III-VII each with a large, C-shaped glandular area (cf. Fig. 56).

Material Examined: Holotype, allotype, 4 female and 4 male paratypes, Palacios, Texas, *Spartina alterniflora* var. *glabra* (Muhl.) Fern., 31-III & 2-IV-39, J.D. Hood (USNM).

Distribution: United States (TX).

Hosts: *Spartina alterniflora* var. *glabra* (Muhl.) Fern.

Comments: The large head, microtrichia absent or a few, short, irregularly spaced ones present on posterior margin of abdominal tergite VIII, brown maculations on body, uniformly yellowish brown forewings and male with C-shaped glandular areas distinquishes this species from other congeners with predominantly yellow body and 9-segmented antenna.

Anaphothrips sudanensis Trybom

Anaphothrips sudanensis Trybom 1911:1; Mound 1963:21; Jacot-Guillarmod 1974:572; Bhatti 1978:87.

Female (macropterous). Body brown, except prothorax yellow or light brown, abdominal segments III-V yellow, VI partially to completely yellow; legs yellow except femora and tibiae with or without medial brown shaded area on outer margin; ocellar crescent red; setae brown; forewings colorless except light brown band between basal 1/4 to about midlength; antenna brown except III-IV yellow, V yellow basally, distally light grayish brown.

Body length 1.02-1.05 mm (1.2-1.5 distended). Antenna 8-segmented, 227-270 long; segment III slightly convex marginally, 2.1-2.6 times longer than wide. Head slightly produced anterior of eyes, wider than long; occiput transversely striate or amastomosing, cheeks almost straight; mouthcone conical, apex pointed, extending to between procoxae, mandible about 110 long. Pronotum about as long as head. Abdominal tergites III-VIII without median sculpture, submarginally sculptured, microtrichia on submarginal striae and posterior mar-

gin; median sensilla 4-5 times their diameter anterior of posterior margin; posteromarginal comb with 26-31 close-set microtrichia, mostly 20-24 long; tergite IX with B1 setae 100-110 long, longer than tergite X.

Male (brachypterous): Body pale yellow except abdominal segments IX-X brown; antennal segments I-IV pale yellow or colorless, V colorless at base, distally light brown, VI-VIII brown; or head brown, pronotum yellowish brown, pterothorax yellow, abdomen yellow except brown in posterior part of tergite I and all of II and VIII-X. Similar to female in most morphological characters, smaller. Abdominal tergites completely sculptured; abdominal sternites III-VIII each with a rather large C-shaped glandular areas.

Material Examined: Mexico, Xochimilco D.F., 5 females, *Bromus catharticus* Vahl, 4-IV-91, R. Pena & M.B. Stoetzel (USNM). Other identified females and males from Hong Kong, India, Iran, Nepal, Okinawa, Sudan, Taiwan, Thailand, Turkmenistan, Zimbabwe (INHS, USNM).
Distribution: New World: Mexico (Xochimilco, D.F.), Panama, Trinidad, Puerto Rico, Cuba. Africa: Morocco, Egypt, Sudan, Somalia, Mozambique, South Africa, Zimbabwe. Asia: Israel, Iran, Uzbekistan, Turkmenistan, India, Nepal, Sri Lanka, Indonesia, Hong Kong, Taiwan, Okinawa. Other areas: Australia, New Caledonia (Jacot-Guillarmod 1974:575).

Hosts: Polyphagous.

Economic Importance: Pest of corn (*Zea mays* L.), cumbu (*Pennisetum glaucum* (L.) R. Br.), paddy rice (*Oryza sativa* L.), ragi (*Eleusine coracana* (L.) Gaertner), sugarcane (*Saccharum officinarum* L.), and wheat (*Triticum aestivum* L.) in India (Anandhakrishnan 1984). According to Mound (1968), the adults and larvae live within the leaf sheaths of grasses and the feeding injury appears as reddish brown longitudinal marks on the expanded leaves.

Comments: The bicolored body distinguishes the females of this species from its congeners. The males have a large C-shaped glandular area on abdominal sternites VIII which is also present on sternite VIII of *A. helvolus* male but is absent from the other congeners examined in this study. The coloration and position of the tergal median sensilla separates the males of these two species.

Although Priesner (1960) states that *A. sudanensis* has simple sense cone on antennal segments III-IV, all material examined has forked trichomes. The pronotal coloration of the females varies from yellow to light brown (Mound 1968). Pitkin (1978) found differences in the color and sex ratio between males from Australia, India and North Africa and he suggested that the current concept of *A. sudanensis* may include more than one species.

Anaphothrips tenebrosus Hood
(Figs. 21, 34)

Anaphothrips tenebrosus Hood 1938b:359.

Female (macropterous): Body generally brown, posterior abdominal segments darker brown, head brown in posterior 1/4, yellowish brown in anterior 3/4 except for margins; legs yellow, femora and tibiae shaded brown on outer margin; ocellar crescent red; setae in terminal abdominal segments brown; forewings pale yellowish brown; antennal segment I paler brown than II, III-IV yellowish brown, darker distally, V light brown, darker distally, VI-IX brown.

Body length about 1.19 (fully distended 1.29) mm long (Hood 1938: 360). Antenna about 251 long, 9-segmented, segment VI completely divided; segment III with convex sides, 2.0-2.4 times longer than wide (Fig. 21). Head wider than long, occiput reticulated in brown area; mouthcone conical, extending to posterior margin of prosternum, apex pointed; mandible about 148 long. Pronotum slightly longer than head. Abdominal tergites III-VIII without median sculpturing (Fig. 34); submarginal striae with minute or indistinct microtrichia, microtrichia apparently absent from posterior margin; median sensilla 3-5 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII complete, 24-27 microtrichia, longest about 20 long; tergite IX with B1 setae 84-91 long, slightly longer than tergite X.

Male: Unknown.

Material Examined: Holotype, 1 female paratype, Leonia, New Jersey, sweeping sedges and cattails, 13-V-16, E. R. Kalmbach (USNM); 2 paratypes, Bennings, D.C., sweeping marsh, 7-IX-13, J. D. Hood (USNM).

Distribution: United States (DC, NJ).

Hosts: Sedges, *Typha* sp.

Comments: This species resembles *A. cameroni* but differs by having a brown pronotum, shorter antenna, antennal segment III about 2.0-2.4 times longer than wide, and shorter B1 setae on abdominal tergite IX. The pronotum of *A. cameroni* is yellow with brown median maculation, and antennal segment III is usually subparallel, 2.7-3.0 times longer than wide.

***Anaphothrips trimaculatus*, new species**
(Figs. 10, 18. 35, 37, 41, 43, 46, 54, 55)

Female (macropterous): Body generally brown, pronotum lighter brown, head lighter yellowish brown medially, vertex and lateral parts posterior of eyes darker brown (Fig. 10), posterior margin dark brown; all tarsi yellow, tibiae brown medially, apices and bases yellow, femora brown with apices and usually bases yellow; major setae on abdomen brown, other setae yellowish; ocellar crescent orange-red; forewings completely pale with yellow tinge, veins distinct, setae grayish yellow, cilia light brown; antenna brown except segments III-V yellowish brown with apical parts shaded light grayish brown, basal 1/3 of VI yellowish brown.

Body length from interantennal process 1.39 (1.30-1.38) mm, distended.

Antenna (Fig. 18): 8-segmented; segment III 1.75-1.9 times longer than wide, sides slightly convex, slightly narrowed distal of subapical setae, segments III and IV each with a short V-shaped trichome; inner sense cone on VI extending to apex of VII. Total length 225 (209-217); length and width of segment I 22 (20), 27 (27); II 35 (30-32), 27 (27); III 37 (35), 20 (17-20); IV 32 (30-32), 18 (17-20); V 35 (32-35), 20 (17-19); VI 44 (40-44), 20 (17-20); VII 8 (7-10), 7 (7); VIII 12 (12-14), 5 (5).

Head (Fig. 10): Prolonged slightly anterior of eyes, about 146 long from interantennal process, as long as, to slightly longer than width of occiput; occiput with broad anastomosing or transverse sculpture, cheeks nearly straight. Fore ocellus about 12 wide. Ocellar setae I short, about 12 long, laterad and aligned with anterior margin of fore ocellus, separated by about twice the diameter of ocellus; ocellar setae II short, laterad of anterior ocellus near mesal margin of eyes; ocellar setae III short, 12 or slightly longer, anterior of posterior ocelli, outside ocellar triangle. Postocular setae short, 3 dorsal pairs aligned in somewhat transverse line. Mouthcone conical, rounded at apex; mandible 110(106-119) long.

Pronotum: 1.4-1.5 times wider than long, shorter than head; few short discal setae, 6 pairs of short posteromarginal setae, median pair about 17 long. Mesonotum: With transverse sculpture lines; anteromedian sensilla present; submedian setae far anterior of posterior margin, aligned with lateral setae. Metanotum (cf. Fig. 26): Polygonally reticulated in median 1/2; median setae short, on about anterior 1/4 of notum, 2 sensilla at about midlength. Mesothoracic sternal spinula developed.

Forewing: rather straight, apex pointed, 652 (575-635) long, 44 (40-44) wide at midlength; 18 (13-17) costal setae, those at medial area about 1/2 as long as width of forewing; 19 (15-21) anterior fringe cilia considerably longer than costal setae, straight; forevein with 4 (4-6) short setae on proximal 1/2, 4 (3-4) distal setae; hindvein with 6 (4-5) setae irregularly and widely separated; scale with 5 short marginal setae.

Abdomen: Tergites II-VIII sculptured submarginally, striae extending to D2 setae or between D2 and median setae, absent medially (Fig. 35); microtrichia submarginally on striae and posterior margin. Median sensilla 3-5 times their diameter from posterior margin. Pair of median micropores, almost touching, between or slightly posterior of median setae on tergites II-VIII (Fig. 35A). Posteromaginal comb on tergite VIII well developed, 23-28 microtrchia close-set, 15-22 long, as long as or longer than median setae on tergite (Fig. 37). Tergite IX (Fig. 41) with 2 pairs of sensilla, B1 setae rather thick, 67 (62-64) long, about as long as tergite X, B2 setae rather thick, 67 (62-67) long. Tergite X almost divided by dorsal split, B1 setae 67 (67-72) long. Pleurotergites with posteromarginal microtrichia; pleurosternites with 3-4 posteromarginal teeth. Sternite I with 4 anteromedian setae (Fig. 43). Medial posteromarginl setae on sternite VII anterior of posterior margin.

Male (macropterous). Body length from interantennal process 0.98-1.06 mm distended. Similar to females in color and most morphological structures, smaller.

Antenna: Total length 192 (181-194); length and width of segment I 15-20, 24; II 27-30, 30; III 30-35, 17; IV 25-30, 17; V 24-30, 17; VI 37-40, 17; VII 7, 6; VIII 10-12, 5. Forewing: 462-543 long, 35-40 wide at midlength; 9-15 costal setae, fringe cilia 14-17; forevein with 4-6 setae in proximal 1/2, 3 distal setae; hindvein with 4-6 setae.

Abdomen: Tergite VIII with well developed, complete posteromarginal comb, microtrichia close-set. Tergite IX (Fig. 46) with B1-B2 setae stout, on tubercles, B1 setae 17-22 long, about 6 wide; B2 setae 17-20 long, about 3 wide, posterior of and farther apart than B1 setae; dorsal setae bristlelike, 40-52 long, laterad of B1 seta; a sensillum between B1 and dorsal seta; thick posterolaterad setae 35-50 long, 5 or 6 wide; midlateral ventral setae thick, 27-35 long. Sternites III-VII each with U- or V-shaped glandular area (Fig. 54), occasionally C-shaped (cf. Fig. 56), or on sternite VII, small, oval or subtriangular (cf. Fig. 55).

Material Examined: Holotype female (USNM), 14 female and 5 male paratypes: Bristol, Florida, *Panicum hemitomon* Schultes, 11-VI-54, J.D. Hood; 1 female paratype, Gainesville, Florida, grass, 13-VI-54, M.J. Westfall; 1 male paratype, Land-O-Lakes, Florida, grass, 3-VIII-54, J.D. Hood. Paratypes deposited in FSCA, INHS, NHM, SMF, UNAM, USNM).

Distribution: United States (FL).
Host: Grass, *Panicum hemitomon* Schultes.

Etymology: Specific epithet is a combination of Latin "tri" and "maculatus". This species has three darker brown areas on the head.

Comments: From the four other species with 8-segmented antennae in the Nearctic Region, *trimaculatus* is readily differentiated by the completely brown abdomen.

***Anaphothrips univittatus*, new species**
(Figs. 11, 29, 42, 47, 56)

Female (macropterous). Body generally yellow, pronotum with several submedial brown spots, often coalesced; mesonotum with submarginal part brown, metanotum brown except for medial longitudinal yellow area, abdomen yellow except tergites I-II mostly brown with posterior and lateral parts yellow, posterior tergites with median brown areas extending laterally in anterior part, gradually reduced to small anteromedial brown area on tergites VI, VII or VIII; legs yellow; major setae brown; ocellar crescent red; forewings (Fig. 29) pale yellow with transverse pale brown band between hindvein and posterior margin, terminating before apex and base of wing; scale pale brown; antennal segment I pale yellow like head, II pale yellowish brown, III-V mostly pale yellow with apices pale grayish brown, basal 1/3 of VI yellowish, rest of VI and VII-VIII brown.

Body length from interantennal process 1.44 (1.19-1.54) mm, distended.

Antenna: 9-segmented, segment VI completely divided; segment III about 2.4 times longer than wide, sides slightly convex, slightly constricted distally of subapical setae, segments III-IV each with a short V-shaped trichome, 15-17 long; inner sense cone on VI 24-30 long, extending to about midlength of VIII. Total length 232 (213-248); length and width of segment I 22 (17-22), 27 (27-30); II 32 (32-35), 27 (24-27); III 40 (37-44), 17 (16-18); IV 35 (32-40), 17 (17); V 35 (32-37), 18 (18-20); VI 36 (34-40), 17 (17-20); VII 11 (10-12), 12 (12); VIII 8 (7-10), 7 (6-7); IX 15 (12-15), 5 (5).

Head (Fig. 11): 131 (124-153) long from interantennal process, about as long as wide, slightly prolonged anterior of eyes; occiput about as long as or slightly shorter than eye, with sculpturing transverse or anastomosing, striae rather far apart, cheeks almost straight. Fore ocellus about 12 wide. Ocellar setae I about 12 long, slightly cephalad of fore ocellus, separated by about 2 times diameter of ocellus; ocellar setae II short, about 12 long, laterad of anterior ocellus, near mesal margin of eyes; ocellar setae III about 15 long, anterior of posterior ocellus, outside ocellar triangle. Postocular setae 3 pairs, short; mouthcone conical, apex rounded or subtruncate, mandible 110 (99-101) long.

Pronotum: About 1.28 times wider than long, shorter than head; few short discal setae; 5-6 pairs of short posteromarginal setae, medial pair about 15 long. Mesonotum: Completely sculptured; with 2 anteromedian sensilla; submedian setae anterior of posterior margin, aligned with lateral setae; mesosternal spinula developed. Metanotum (cf. Fig. 26): Reticulated polygonally in median 1/3, laterally with longitudinal sculpture lines; median setae

short, about 12 long, on about anterior 1/3 of notum, 2 sensilla on about midlength.

Forewing (Fig. 29): Rather straight, pointed apically; length 622 (536-718) long, 47 (42-52) wide at midlength; costal and veinal setae at midlength shorter than width of wing; 17 (14-17) costal setae; 21 (16-22) anterior fringe cilia, straight; forevein with 4 (4-6) setae in proximal 1/2, 3 (3-4) setae in distal 1/2; hindvein with 8 (6-8) setae; scale with 5 (4-5) marginal setae.

Abdomen: Anterior tergites with reduced median setae, those on posterior tergites longer; sculpture lines on tergites III-VIII extending to D2 setae or slightly mesad, absent medially; submarginal microtrichia on sculpture lines lines and on posterior margin (cf. Fig. 35); median sensilla about 4 times their diameter anterior of posterior margin; posteromarginal comb well developed (cf. Fig. 37), 26 (22-26) microtrichia 17-24 long, close-set; tergite IX (Fig. 42) with 2 pairs of senilla, B1 setae 62-67 (59-69) long, shorter than tergite X, B2 setae 72 (69-82) long; tergite X completely divided by dorsal split, B1 setae 74 (74-82) long. Pleurotergites with microtrichia on sculpture lines and on posterior margin; pleurosternites with teethlike processes. Sternite I with 2 anteromedian setae (cf. Fig. 43); B1 setae on sternite VII anterior of posterior margin.

Male (macropterous). Body length from interantennal process 1.07-1.16 mm., distended. Brown median maculation on abdominal tergites smaller or absent from intermediate and posterior tergites. Otherwise, similar to female in color and most morphological characters, smaller.

Antenna: Total length 206-215; length and width of segment I 17, 24-27; II 30-32, 22-24; III 37, 17; IV 30-32, 15-17; V 30-32, 17; VI 32, 17; VII 10, 12; VIII 8, 7; IX 12-15, 5. Forewing: l5 costal setae, 14-15 fringe cilia; foreveins with 5-6 setae in proximal 1/2, 3 distal setae; hindvein with 5-7 setae; length 503, width at midlength 37.

Abdomen: tergite VIII with well developed, complete posteromarginal comb, microtrichia close set; tergite IX (Fig. 47) with B1-B2 setae stout, on tubercles, B1 setae 12-17 long, 5-6 wide, B2 setae 11-17 long, 3-4 wide, posterior of and farther apart than B1 setae; other setae bristle-like: dorsal setae laterad of B1 setae, 40-50 long; lateral setae 40-51 long; midlateral ventral setae 52-62 long; a sensillum between B1 and dorsal seta. Sternites III-VII each with a C-shaped glandular area, 50-62 wide (Fig. 56).

Material Examined: Holotype female (USNM), 16 female and 3 male paratypes: Gainesville, Florida, grass, 14-VI-54, M.J. Westfall & J.D. Hood (Hood 2261); 1 female paratype, Welaka, Florida, sweeping grass, 9-VIII-54, J. D. Hood (Hood 2333). Paratypes deposited in FSCA, INHS, NHM, SMF, UNAM, USNM.

Distribution: United States (FL).

Hosts: Grass.

Etymology: Specific ephithet is a combination of Latin "uni" and "vittatus". This species has a transverse pale brown band on the forewing.

Comments: The specimens are not adequately cleared and several pertinent setae and sculpturing of the pronotum could not be observed distinctly. Thus the measurements or descriptions for these structures are not given.

From the other pale species with 9-segmented antennae, *A. univittatus* is readily differentiated by the pale brown transverse band between the hindvein and posterior margin of the forewings.

Anaphothrips zizania Hood
(Figs. 12, 22, 23)

Anaphothrips zizania Hood 1938b:360.

Female (macropterous): Body brown; legs yellow with femora and tibiae shaded brown on outer margin; ocellar cresent red; setae on terminal abdominal segments brown; forewings pale brownish yellow; antenna brown, segments III-IV yellowish brown, apex of III darker gray, IV brown, base paler yellowish brown, VI pale at extreme base.

Body length 1.15 (partially distended 1.29) mm long (Hood 1938b: 360). Antenna 241 long, 9-segmented, segment VI completely divided; segment III strongly convex distal of narrow base, about 2.0 times wider than long, IV subrectangular distal of pedicel (Fig. 23). Head slightly prolonged anterior of eyes, wider than long (Fig. 12); occiput reticulated, cheeks rather straight; mouthcone conical, apex pointed, mandible about 124 long. Pronotum slightly longer than head. Abdominal tergites III-VIII

without median sculpturing, submarginal striae with microtrichia; median sensilla 4-5 times their diameter anterior of posterior margin; posteromarginal comb on tergite VIII complete, with about 28 close-set microtrichia, longest about 17 long; tergite IX with B1 setae 82-86 long, slightly longer than tergite X.

Male (brachypterous): Similar to females in color and in most morphological characters, smaller. Antennal segment III subglobular distal of narrow base, IV subglobular distal of pedicel (Fig. 22). Abdominal sternites III-VII each with a large C-shaped glandular area (cf. Fig. 48).

Material Examined: Holotype, allotype, Cheboygan Co., Michigan, hibernating in axils or sheaths of wild rice, 5-X-34, W.C. Frohne (USNM).

Distribution: United States (MI).

Host: *Zizania* sp.

Comments: The shape of antennal segment III and IV, short antenna, completely brown body and C-shaped glandular areas of the males distinquish *A. zizania* from other brown congeners with 9-segmented antennae.

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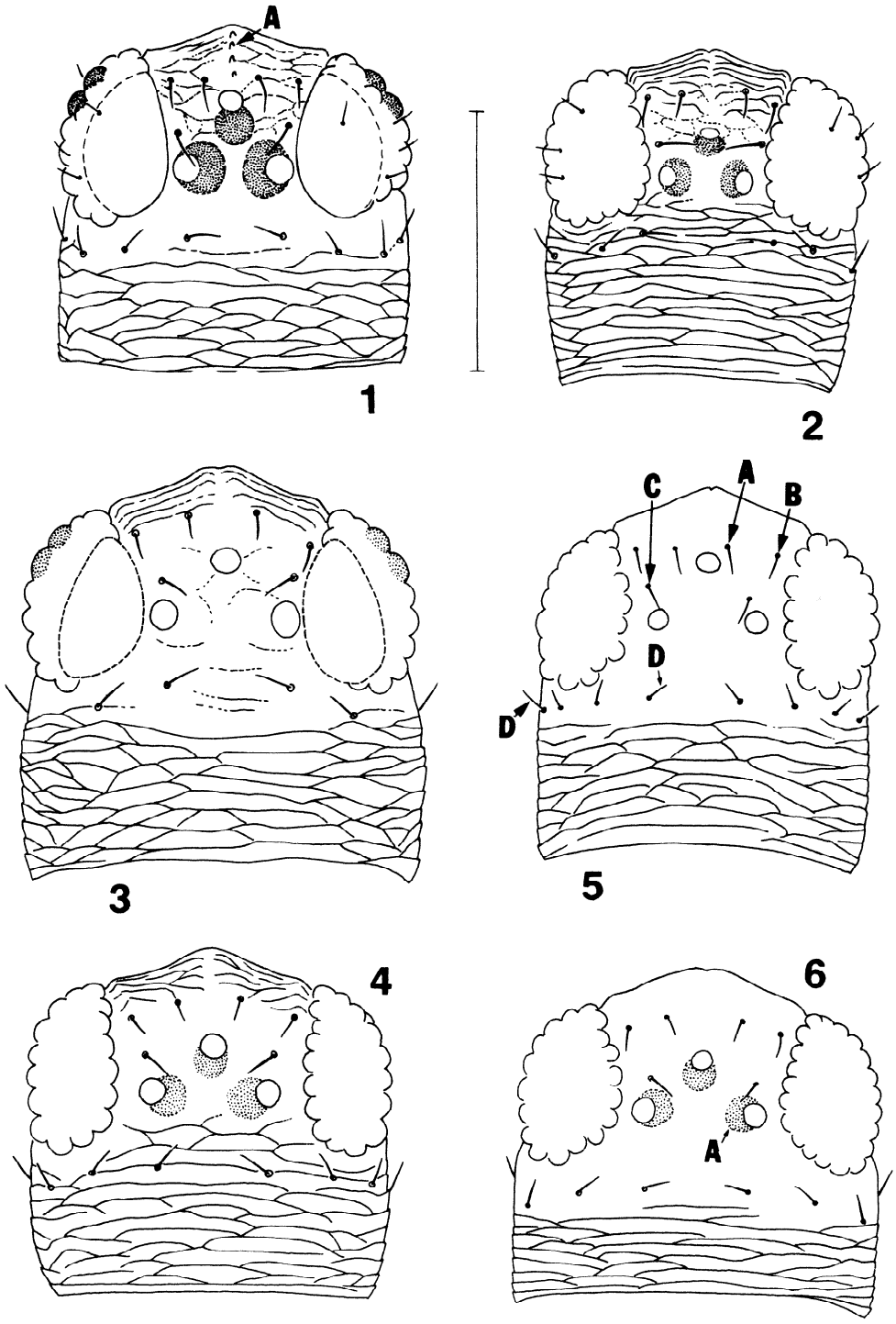
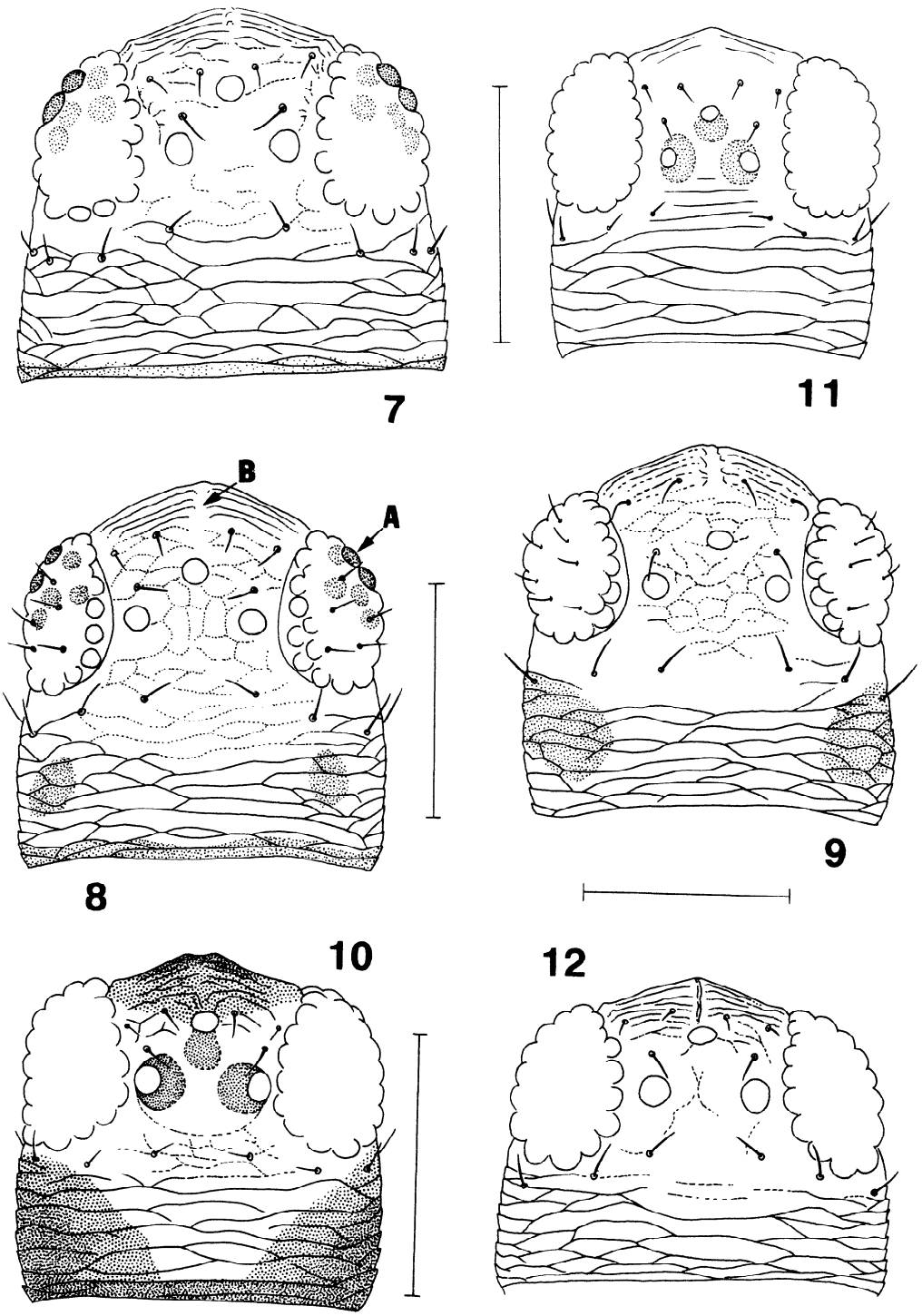
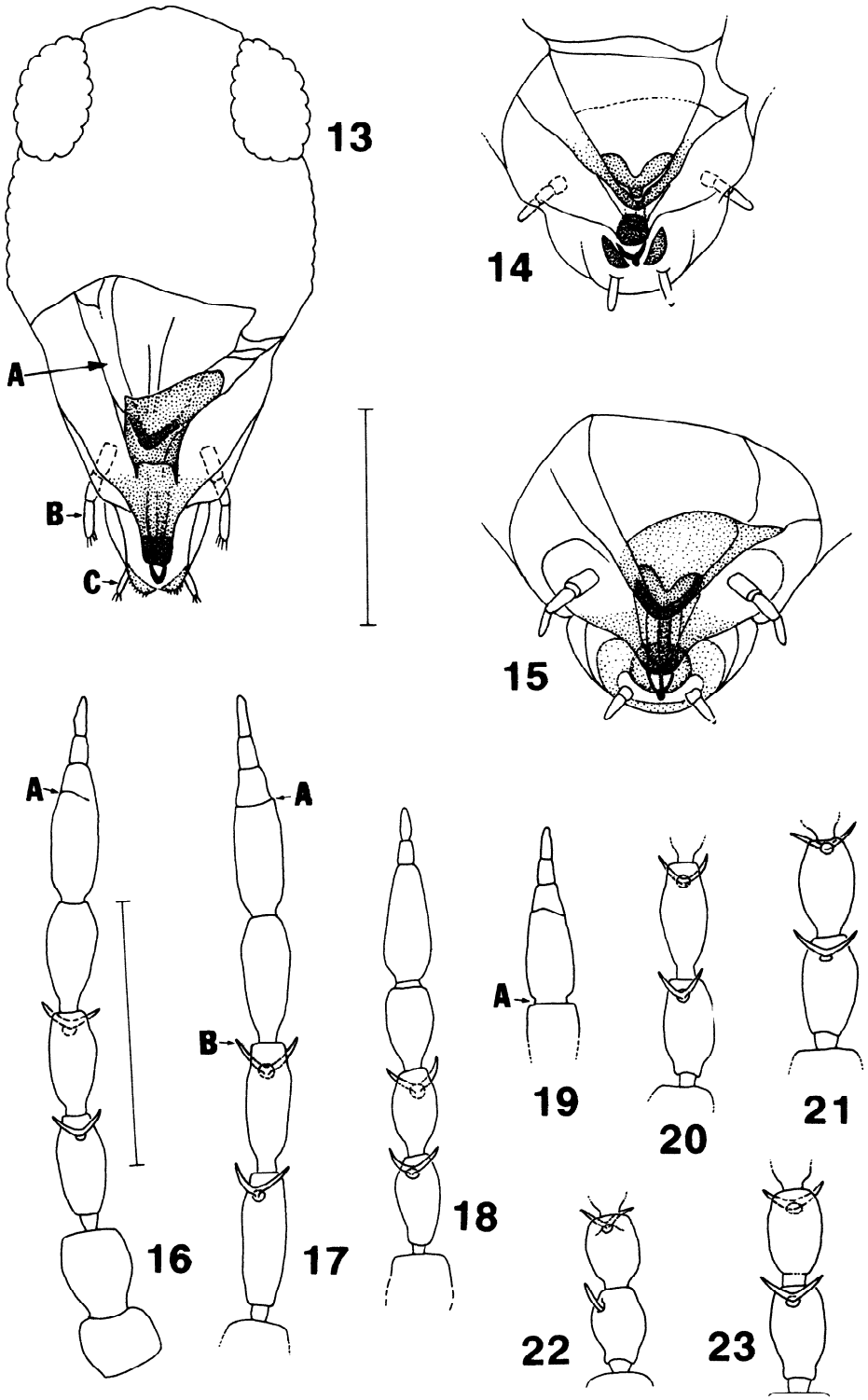


Figs. 1-6. Head: 1. *A. amoenus*; A. anteromedian tubercles. 2. *A. catawba*. 3. *A. decolor*. 4. *A. helvolus*. 5. *A. luteus*, partial sculpturing shown; A. ocellar seta I; B. ocellar seta II; C. ocellar seta III; D. postocular seta (PO). 6. *A. mexicanus*, partial sculpturing shown; A. ocellar crescent. Scale = 0.1 mm.



Figs. 7-12. Head: 7. *A. obscurus*. 8. *A. paludicola*; A. pigmented facets; B. shallow furrow. 9. *A. spartina*. 10. *A. trimaculatus*. 11. *A. univittatus*. 12. *A. zizania*. Scale = 0.1 mm.



Figs. 13-15. Mouthcone: 13. *A. cameroni*; A. mandible; B. maxillary palps; C. labial palps. 14. *A. helvolus*. 15. *A. ripicola*. **Figs. 16-23**. Antenna: 16. *A. amoenus*, segments I-IX; A. partial division of segment VI. 17. *A. ripicola*, segments III-IX; A. complete division of segment VI; B. trichomes. 18. *A. trimaculatus*, segments III-VIII. 19. *A. grandioculus*, segments VI-IX; A. widen pedicel and subtruncate base of segment VI. 20. *A. decolor*, segments III-IV. 21. *A. tenebrosus*, segments III-IV. 22. *A. zizinia*, segments III-IV of male, simple sense cone on III. 23. *A. zizinia*, segments III-IV of female. Scale for figures 13-15 = 0.1mm, for figures 16-23 = 0.2 mm.

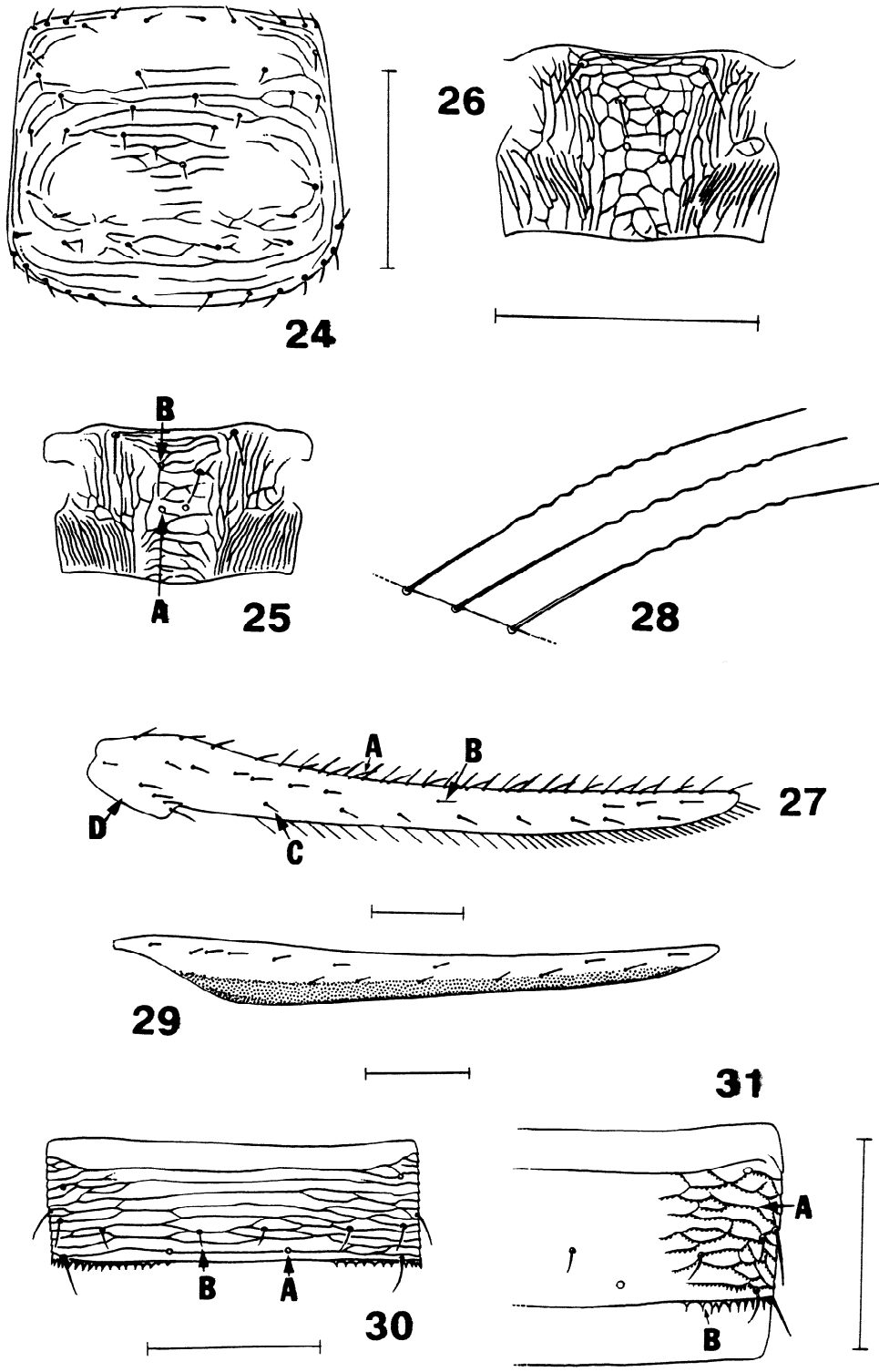
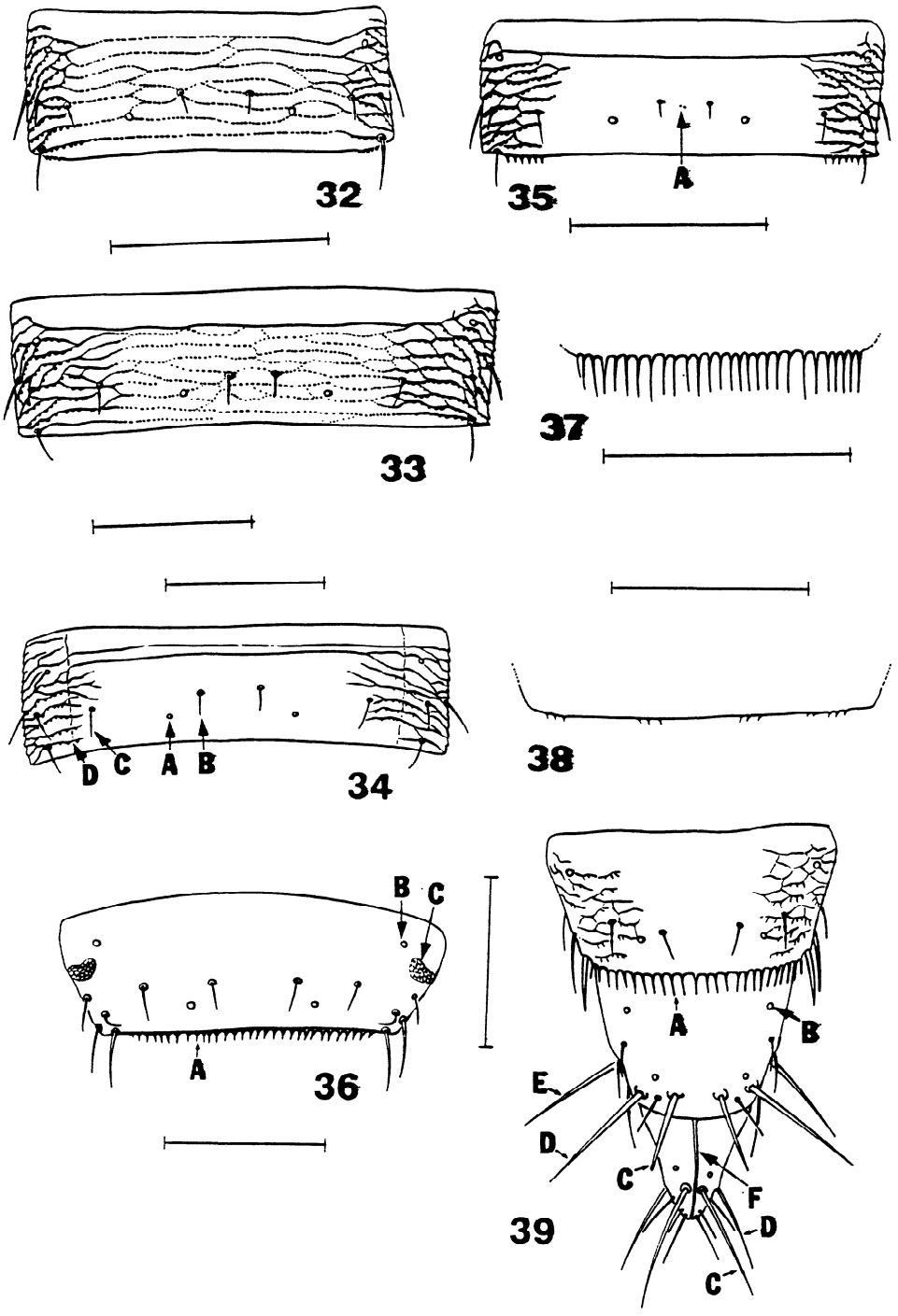
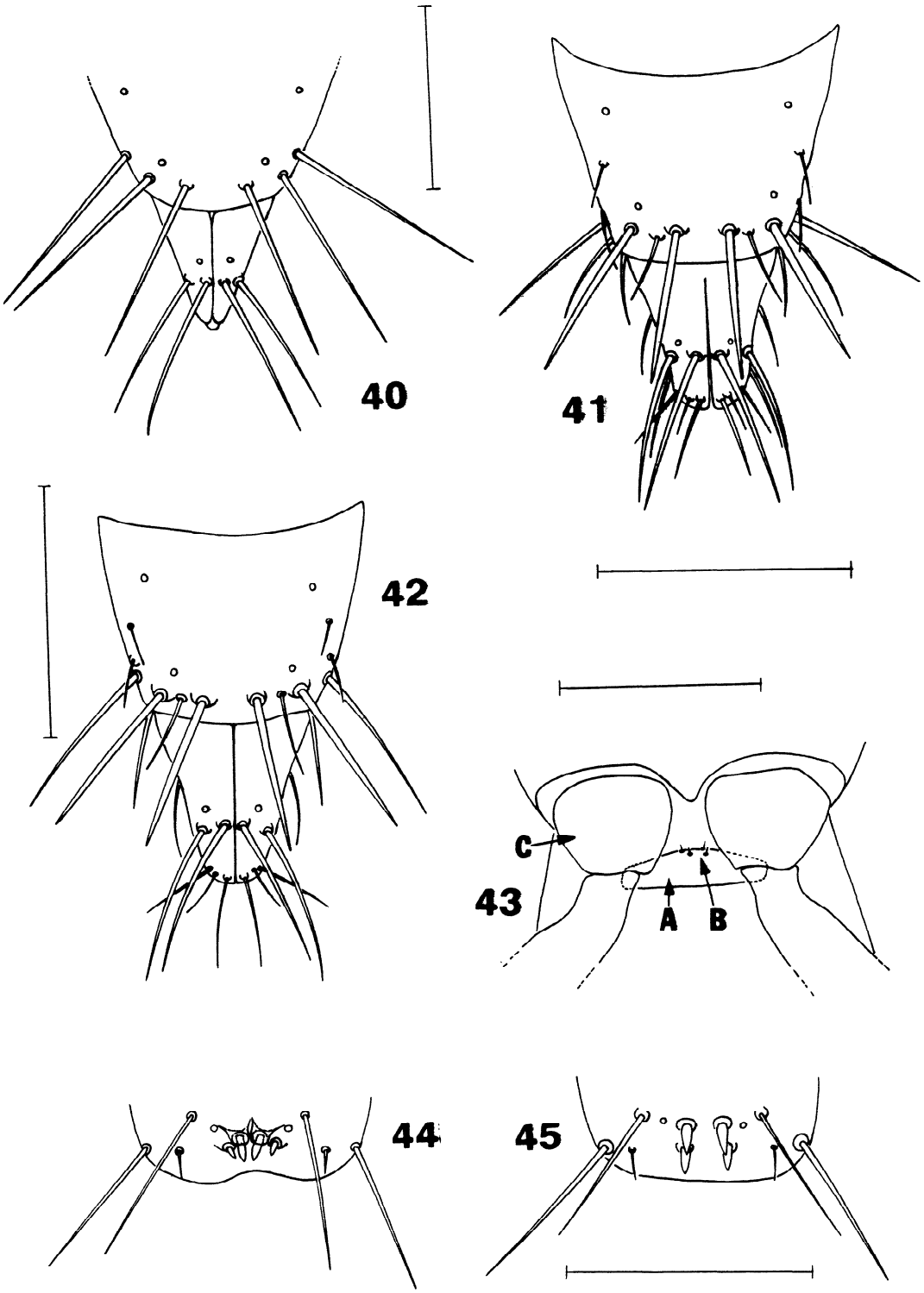


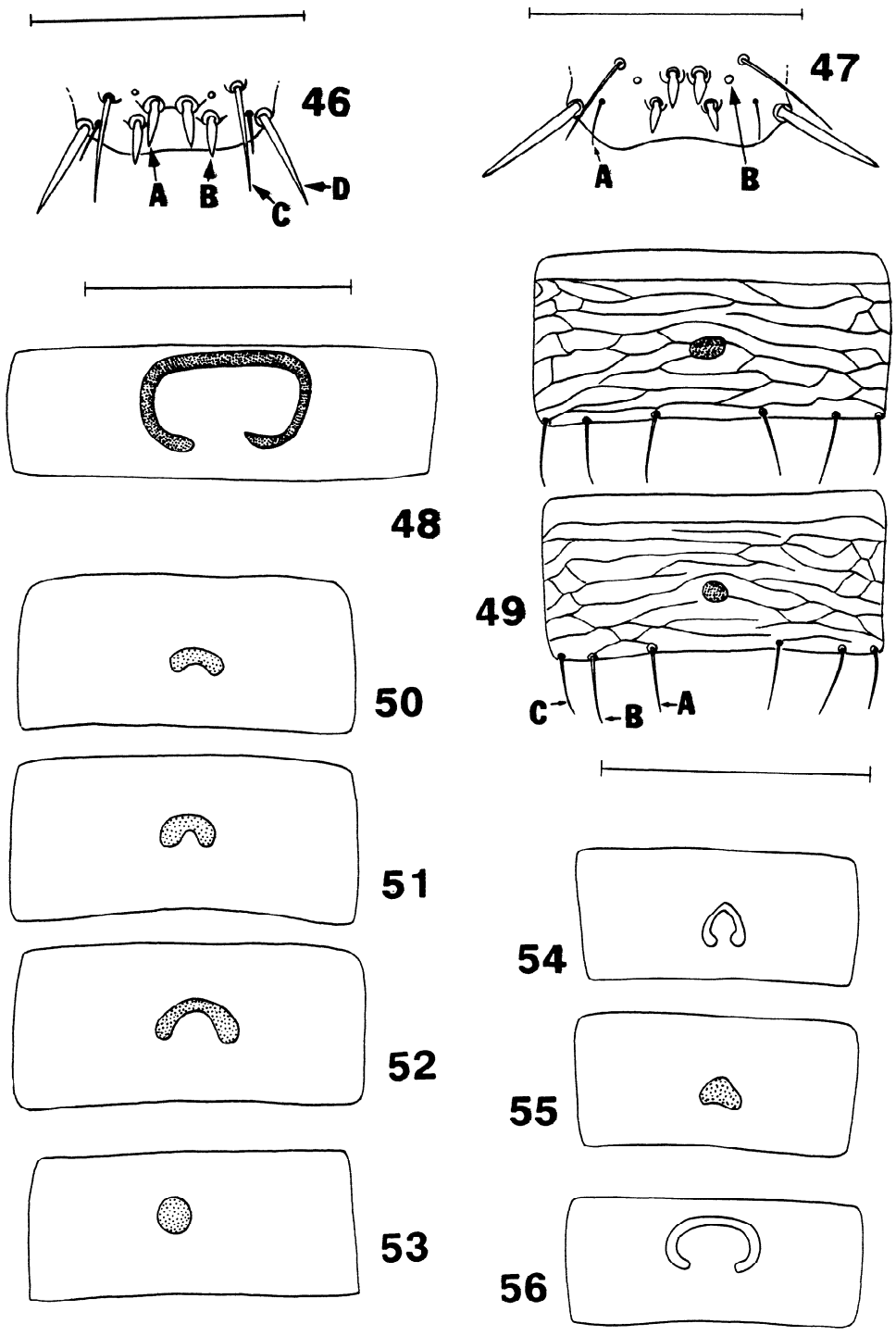
Fig. 24. Pronotum: *A. luteus*.**Figs. 25-26**. Metanotum: 25. *A. catawba*; A. sensilla; B. median setae. 26. *A. paludicola*. **Figs. 27-29**. Forewing: 27. *A. mexicanus*, basal part of fringe cilia shown; A. costal seta; B. seta on forevein; C. seta on hindvein; D. scale. 28. *A. mexicanus*, wavy anterior fringe cilia. 29. *A. univittatus*, fringe cilia and costal setae deleted. **Figs. 30-31**. Abdominal tergite VI. 30. *A. catawba*, completely sculptured; A. median sensilla; B. median seta. 31. *A. helvolus*, sculpture absent medially; A. submarginal sculpture with microtrichia; B. microtrichia or teeth on posterior margin. Scale = 0.1 mm.



Figs. 32-35. Abdominal tergites VI: 32. *A. luteus*, weak median sculpturing. 33. *A. obscurus*, weak median sculpturing. 34. *A. tenebrosus*; A. median sensilla; B. median seta; C. D2 seta; D. submarginal sculpturing and microtrichia. 35. *A. trimaculatus*; A. micropores. **Fig. 36**. Abdominal tergite VIII: *A. obscurus*; A. posteromarginal comb; B. sensillum; C. spiracle. Figs. 37-38. Posteromarginal comb: **37**. *A. trimaculatus*, close-set microtrichia. **38**. *A. spartina*, sparse microtrichia. **Fig. 39**. Abdominal tergites VIII-X: *A. grandioculus*; A. posteromarginal comb; B. sensillum; C. B1 seta; D. B2 seta; E. B3 seta; F. dorsal split. Scale = 0.1mm.



Figs. 40-42. Abdominal tergites IX-X: 40. *A. ripicola*; only B1-B3 setae shown. 41. *A. trimaculatus*. 42. *A. univittatus*. **Fig. 43**. Abdominal sternite I: *A. trimaculatus*; A. sternite I; B. anteromedian setae; C. hind coxa. **Figs. 44-45**. Abdominal tergite IX of male: 44. *A. helvolus*. 45. *A. luteus*. Scale = 0.1 mm.



Figs. 46-47. Abdominal tergite IX of male: 46. *A. trimaculatus*; A. B1 seta; B. B2 seta; C. D1 seta; D. posterolateral seta. 47. *A. univittatus*; A. B3 seta; B. sensillum. **Figs. 48-56**. Glandular areas on abdominal sternites: 48. *A. helvolus*, sternite VII. 49. *A. luteus*, sternites VI-VII; posteromarginal setae, A. B1 seta; B. B2 seta; C. B3 seta. 50-53. *A. ripicola*, variations. 54-55. *A. trimaculatus*, variations. 56. *A. univittatus*, sternite IV. Scale = 0.1 mm.