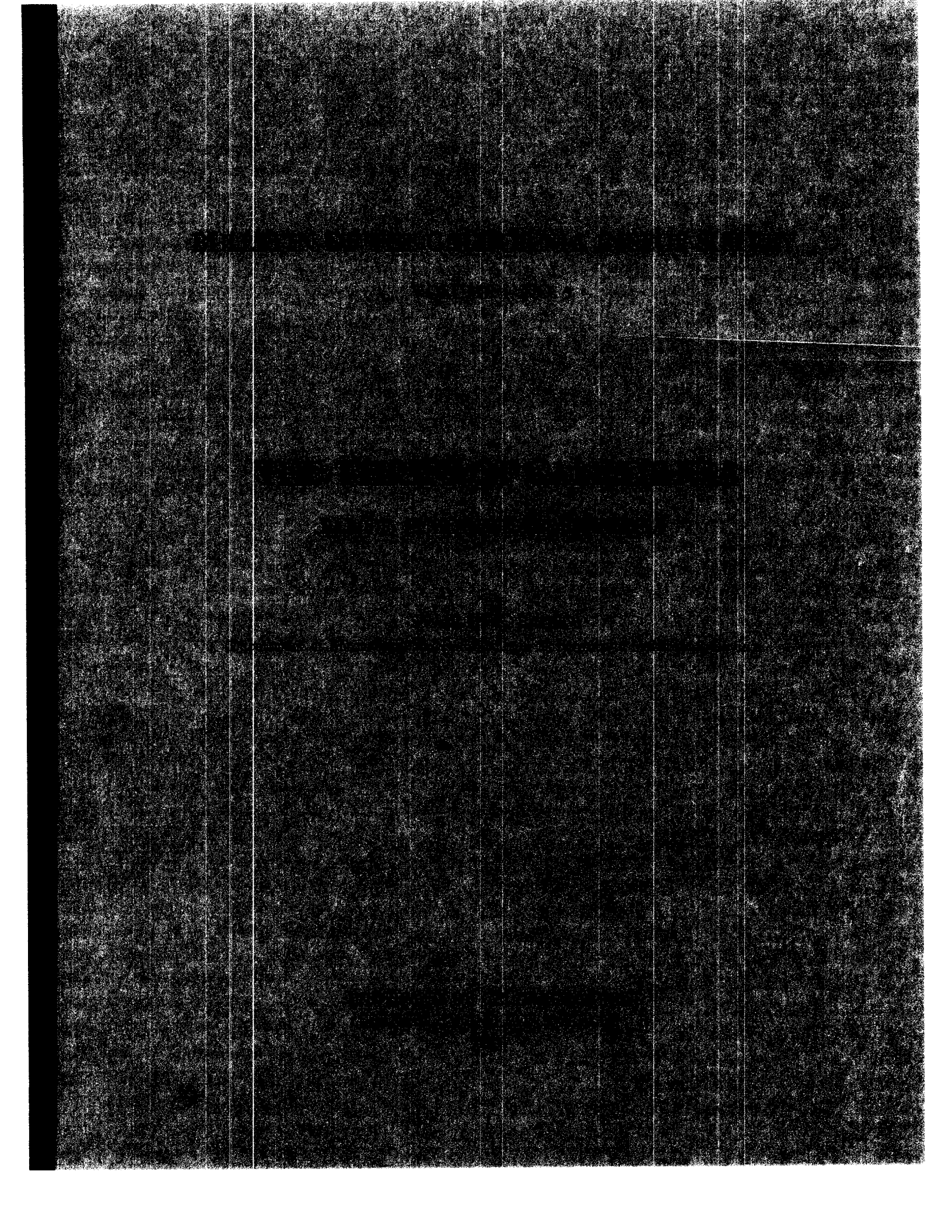

BULLETIN OF THE CALIFORNIA INSECT SURVEY

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THE THRIPS OF CALIFORNIA

PART I: SUBORDER TEREBRANTIA

BY

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THE THRIPS OF CALIFORNIA

Part I: Suborder Terebrantia

By
Stanley F. Bailey

INTRODUCTION

Insects belonging to the order Thysanoptera are generally called thrips. The order is divided into two suborders, the Terebrantia, in which the females have a sawlike ovipositor, and the Tubulifera, those in which the ovipositor is lacking and both sexes have the terminal abdominal segments in the shape of a tube. The first suborder has four families, the Aeolothripidae, Merothripidae, Heterothripidae, and Thripidae, all of which are found in California. The metamorphosis of the group is intermediate between the simple and complete types. The small size of thrips, from 0.5 to 5.0 mm. in length, makes accurate dorsal mounting on slides necessary to see, measure, and illustrate the minute characters used in classification. This report covers the Terebrantia only; an up-to-date review of the Tubulifera of California is being published elsewhere.

The numbers of species of thrips recorded from this state have increased as follows: Hinds (1902), 4; Daniel (1904), 8; Moulton (1907), 25; Moulton (1911), 45; Watson (1923), 54; Bailey (1935), 107. Bailey and Cott (1952) added several more. At this time we record 122 species of Terebrantia alone, 40 of which were described by Moulton. The suborder Tubulifera has about 60 representatives in this state. The increase in numbers is not a true indication of the increase of the fauna or the assiduity of each successive author.

The key to the genera will be useful not only for California but for most of the western area. Keys are available to the specialist for most of the aeolothripid genera and species, as well as for North American *Taeniothrips*, *Chirothrips*, *Limothrips*, and *Frankliniella*. The principal reviews helfpul in determining California thrips are to be found in the references given in the terminal bibliography. No detailed published keys are available for such large genera as *Anaphothrips*, *Scirtothrips*, *Thrips*, and the heliothripid complex in North America.

Unless otherwise noted the collections were made by me. The sex of the specimen has been omitted since this factor is not particularly important in the order from a taxonomic standpoint. In the majority of cases, knowledge of the host plants is not important as is true of aphids. Therefore no host plant index has been compiled. *Taeniothrips xanthius*, *Scirtothrips longipennis*, and *Anaphothrips orchidii* have been collected only in greenhouses in this state. *Bregmatothrips* (*Iridothrips*) *iridis* (Watson) has been taken only in quarantine.

The subgenus *Mycterothrips* is included under *Taeniothrips*, *Microcephalothrips* under *Thrips*, and the various subdivisions of *Anaphothrips* under *Anaphothrips*.

Every working systematist knows that a review, revision, or summation of a group of organisms is never really completed. New specimens and publications continually being received make it necessary periodically to reevaluate and modify concepts and relationships. This is true of this summary of our present knowledge of California thrips. A complete listing of all hosts and distributional records of the more common species would add little, and only selected or "token" records are given. The collections of Moulton, Watson, Steinweden, Andre, Sakimura, P. R. Jones, Hinds, the Canadian National Museum, the U.S. National Museum, and of the California State Department of Agriculture have been studied in part. The verification of many thousands of slides of common species in these collections, however, has not been attempted.

The species of economic importance, their biology and control have been described in detail in other publications by W. E. Ebeling and myself.

METHODS AND MATERIALS FOR THE COLLECTION OF THRIPS

The average entomologist never collects thrips. In general, when he thinks of them, he recalls he has seen them frequenting flowers. Although it is true that flowers provide one readily available source of thrips, the collector will soon find that he is collecting large numbers of a few very

common thrips species over and over again. Therefore, it might be worth while to pass on to collectors my experiences and those of Dr. H. Edwin Cott.

General Suggestions

Thrips should be collected in small vials of ethyl alcohol (grain alcohol) of approximately 70 per cent strength. They should be picked up with a fine camel's hair brush. A thick, bushy brush quickly soaks up the alcohol in the vial and has the further disadvantage of entangling the thrips and damaging them.

Serious collecting requires a sweeping net (a standard insect net with a stiff frame and a closely woven bag) and a beating sheet. The beating sheet is a square of canvas measuring about one yard at the edge and supported by wooden cross bars. Held under a woody plant, it catches thrips and other insects dislodged from the plant by vigorous blows of a stick or club.

One other collecting device of inestimable value is the Berlese funnel, a device useful for collecting small insects from dead leaves, bunch grass, punky wood, and similar situations.

Three collecting maxims which, if observed, will save much needless (and usually fruitless) effort are as follows:

1. Native plants are almost always a richer source of good thrips material than are exotics or introduced ornamentals.

2. Perennials—particularly woody perennials—should be given preference over annuals.

Grasses, of course, constitute one of the exceptions to these rules, but even here a perennial native bunch grass would usually prove better collecting than an introduced annual.

3. Burned-over and recently flooded areas should be avoided. Humus inhabiting species do not quickly become reëstablished after a burn.

Under bark.—Many kinds of thrips are found under bark on dead trees or under bark scales on living trees, such as the sycamore. The bark should not be so old that it is widely separated from the tree trunk. If spiders, ants, or psocid colonies have become established under the bark thrips seldom will be found.

Meadows.—These areas are usually collected with the sweeping net. Late in the season, standing dry grass will be found to support a different fauna than do the succulent grasses and herbs of early spring. In the eastern United States special collecting methods may be applied to turf, which supports a characteristic fauna of its own. Sweeping should be done only when the grass is dry since the thrips are best dislodged under these conditions.

Woody perennials.—Beating is perhaps the most effective sampling method. Dead branches (particularly those still bearing leaves) on a living tree or bush respond well to this method of attack. Dying or diseased plants or those heavily encrusted with scale insects are attractive to the predaceous thrips if not overrun with ants.

Beetle frass.—Certain highly specialized thrips prefer the frass of beetles which may be found in abundance under loose bark on fallen logs. If this material is placed on a white background in the sun and spread thinly, the thrips will reveal their presence by becoming active.

Conifers,—In general, conifers are poor sources of thrips material. A few species appear to be restricted to conifers, but usually one obtains only general feeders that have accidentally landed on the plant.

Fungi.—Many thrips feed on fungus spores, apparently to the exclusion of everything else; a few may actually attack the mycelium itself. Bracket or shelf fungi should always be investigated.

Weeds.—Those of a woody nature are always possible sources of thrips. Dead, hollow weed stems often serve as hiding places for aestivating or hibernating adults.

Plants with closely bunched leaves.—Yuccas or palmettos require special treatment. Some very unusual thrips may be found in the blossoms, and still another group is found only between the succulent bases of the leaves.

Plant galls.—These are important mainly as places of hibernation or aestivation. Old galls may support growths of fungi on the walls which are attractive to thrips. Gall-forming thrips are restricted largely to the tropics.

Humus and leaf mold.—Very rich sources of material responding best to treatment by Berlese funnel are humus and leaf mold. Under no circumstances should the humus be wet or soggy, and it should not be in the final stage of decomposition. Sweeping grass and weeds under oaks and other deciduous trees will sometimes result in the capture of these forms where they have climbed up on the plants.

Cactus.—At least two genera of thrips are restricted to cactus and are best detected by direct inspection of the pads.

Leaves.—The undersides of leaves on broad-leafed native plants, particularly in the angles of the larger veins and among the hairs, offer an opportunity for selective collecting. The leaves should be turned slowly to avoid causing the thrips to jump or fly.

This list by no means exhausts the possible sources of thrips material. It is intended merely as a suggestion of what we believe to be a few of the better collecting possibilities.

BIONOMICS

Thrips, averaging in size from 1-2 mm., are not very impressive in contrast to out better known insects. The great majority of the species are plant feeders. A very few species are predaceous on spider mites, eggs and young of scale insects, and other thrips. Members of the genus *Merothrips* are believed to be fungus feeders as are some species of the suborder Tubulifera.

Most thrips attacking plants have a simple life history that varies but little fundamentally in the different species. The minute, bean-shaped eggs are inserted in the tender plant tissue by a tiny, sawlike ovipositor which is lacking in the Tubulifera. After a few days the delicate, soft-bodied nymphs hatch and immediately begin feeding gregariously. The length of all the stages varies, of course, with the temperature. Under favorable conditions the young attain full growth in 7 to 10 days. When feeding ceases, the nymphs either drop to the ground or rest quietly on the host. Some mature nymphs such as the pear thrips make an earthen cell in the soil, in which they transform. Many aeolothripids form a crude silken "cocoon." During this period the wings and other organs develop, and in 4 to 14 days the adult stage is reached. Reproduction occurs with or without mating; in some species males are unknown.

There are one to many generations of thrips a year, and though less prolific than some insects, each female lays from 25 to as many as 200 eggs, more commonly 40 to 50. During the growing season and the warmer parts of the year the generations more or less overlap. The greatest seasonal abundance depends on the requirements of the particular species; some are most numerous in the spring and others during the warm, dry season. They are readily destroyed by heavy rains and consequently are most numerous in arid and semiarid climates.

Hibernation most commonly occurs in the adult stage. The citrus thrips, however, passes the coldest months in the egg stage. Also, nymphs of the onion thrips and the western flower thrips are active throughout the winter in California. Other thrips hibernate under bark, in curled leaves, on evergreen plants, and in other suitable hiding places.

Migration is not pronounced. If sufficient food is available, the adults move about very little. Many species with well-developed wings use them infrequently and are weak fliers. Local migrations, such as occur in the pear thrips and western flower thrips, are usually occasioned by a shortage of food or by the discovery of a more desirable supply. In such event the migration is only for a few hundred yards, generally in the direction of the prevailing wind.

Thrips are found on the most tender, succulent parts of the host plants—usually in buds, in blossoms, under bracts, in leaf sheaths, or on bulbs. In some cases, however, they feed unprotected on the leaf surface, as, for example, the bean thrips on cotton or the greenhouse thrips on avocados.

Usually the host range of thrips is very wide, though some species, such as the gladiolus thrips, exhibit a narrower choice than others. This cosmopolitan host range and the habit of living somewhat concealed make control difficult and eradication almost impossible. Of the environmental factors affecting thrips populations, heavy rains and cold weather are the most important. Thrips have but few insect enemies.

The species of economic importance have been studied in detail (Bailey, 1938), but the life histories of many of the less common species are not known.

DISTRIBUTION

The numbers and diversity of thrips species vary with the locality and the season. As I pointed out (1940*a*), the largest number of species of thrips are found on the Atlantic and Pacific coasts. The relative paucity of thrips in the Central States seems to be correlated with the extensive grassland area east of the Rocky Mountains, which is less rich in flora than the eastern and far western states. A few species such as the onion thrips and *Limothrips cerealium* Haliday are found throughout the country. Others, with restricted hosts or narrow climatic limitations such as the pear thrips, the citrus thrips, and the noneconomic *Heterothrips vitifloridus* Bailey and Cott obviously have a restricted distribution. Certain groups or whole genera are confined geographically. For example, the genera *Dactuliothrips, Orothrips,* and *Hercothrips* are typical of the arid western area. Within some genera there are distinct geographical limits of certain species. In the large genera *Aeolothrips* and *Frankliniella, Ae. kuwanaii*

Moulton, *Ae. nitidus* Moulton, *Frankliniella occidentalis* (Pergande), and *F. minuta* Moulton are strictly western.

There are certain species that are restricted in their distribution apparently for a different reason—that of a very limited reproductive potential. This characteristic makes them scarce even in the specific localities where they are known to occur. Examples of these rare species are *Toxonothrips gramineae* Moulton and *Psilothrips priesneri* (Moulton).

The introduced species *Drepanothrips reuteri* Uzel, *Taeniothrips simplex* Morison, and *Taeniothrips inconsequens* Uzel are found almost exclusively associated with the crops which they infest.

As we have learned more about the seasonal habits of thrips we have been able to collect in numbers what were formerly considered to be uncommon species such as *Oligothrips orieos* Moulton, *Hercothrips bromi* Moulton, and *Ankothrips notabilis* Bailey. Many species appear on their hosts only for a very limited period and not always throughout the range of that host. Recently discovered species in the state, notably *Isoneurothrips australis* Bagnall and *Rhipidothrips* species, appear to be extending their distribution annually.

A study of the distribution of thrips species in California in relation to life zones has brought out a few generalizations. The number of species found at high elevations is very limited. These species are similar to the European fauna. At lower elevations in the Canadian or coniferous belt we see many similarities with the European thrips but additional and typical western genera, such as *Orothrips* and *Erythrothrips*, also occur. In the so-called Transition, 1,000 to 5,000 feet, both in the coastal range and the Sierra and Cascades, we find the greatest diversity of species. In very dry or very wet years the relative abundance of thrips is considerably reduced. Collecting in the coastal Redwood Transition zone usually yields very few species. The interior Valley Sonoran areas support what is largely a spring population when the annual flowering plants are blooming. The desert areas having highly specialized plants also produce a limited number of characteristic thrips species. It should be mentioned that on the east side of the Cascade and Sierra ranges, species representative of the Great Basin appear, but insufficient collecting has been done in this part of the state to draw any general conclusions. In May the greatest variety of species can be found throughout most of the state, from sea level to about 3,000 feet.

SYSTEMATICS

The systematics of the order Thysanoptera in North America had its beginning with the work of Hinds in 1902 (Bailey, 1939). His work was based largely upon Uzel's monograph of the group which appeared in 1895. Since this time Hood, Moulton, and Watson have contributed the majority of descriptions of North American thrips. Moulton, Jones, Steinweden, and I have specialized on western Thysanoptera. Since World War II, R. L. Post studied the Thysanoptera of Oregon and H. Edwin Cott the Tubulifera of California. In 1947-1949 I compiled an up-to-date annotated list of the North American workers and the known species. At present the principal need is for keys to the North American genera and species. Also, a comprehensive, illustrated treatment by a seasoned worker of the higher categories in the order is needed, even if it is provisional.

The beginner is referred to the principal texts on entomology for the fundamental terminology commonly employed in the systematics, anatomy, and biology of the Thysanoptera. In view of the fact that the metamorphosis is of a transitional type, the immature stages sometimes have been called "larvae" and sometimes "nymphs." Since the "prepupal" and "pupal" stages are mobile and the wings develop externally, the term nymph is perhaps more appropriate although the last two stages are nonfeeding and in some genera spin a loose cocoon.

In describing thrips, specialists in the group have used the ovipositor, antennae, forewings, palpi, and chaetotaxy of the pronotum to establish major categories. There has been some lack of consistency in the use of generic characters. The dependence on color and measurements of antennal segments has frequently been unreliable because of the variable techniques in preparing and mounting specimens. It is very difficult at present to make positive determinations in such genera as *Frankliniella, Taeniothrips, Thrips,* and *Sericothrips.*

Bagnall (1912, 1930, 1931) and Hood (1915) presented outlines of the higher groups as they conceived them at the time. Priesner (1949) in his "Genera Thysanopterorum" has prepared the most comprehensive treatment yet attempted. This authority states—"the further separation of tribes, though it may be indicated, I consider for the moment unadvisable, in order to avoid the shifting to and fro of genera from one tribe to another, which would happen in the present state of uncertainty as to the correct position of many genera. For years to come, our main task must

remain the continuation of the thrips survey of the world, the description of the unknown species found, and the allotment of them to different genera, together with revisions of the genera and species described hitherto, a work that is far from completion."

Thus we are confronted with a dilemma. Shall we call a halt on new descriptions and concentrate on consolidating and evaluating the knowledge to date? If so, the necessary filling in of the gaps in the order will be delayed, and many relationships will remain confused. A compromise is the obvious solution. The burden of the work has fallen on but a few, when compared with other groups of insects which have large numbers of specialists. Therefore, historically speaking, the systematics of the Thysanoptera has not yet reached full maturity.

Priesner's arrangement of the higher groups of the order is as follows:

Terebrantia
- Aeolothripoidea
  - Aeolothripidae
    - Erotidothripinae
    - Melanthripinae
    - Mymarothripinae
    - Aeolothripinae
      - Orothripini
      - Franklinothripini
      - Aeolothripini
- Merothripoidea
  - Merothripidae
- Thripoidea
  - Heterothripidae
    - Heterothripini
    - Hemithripini
    - Opadothripini
    - Fauriellini
  - Thripidae
    - Heliothripinae
    - Thripinae
      - Dendrothripini
      - Sericothripini
      - Anaphothripini
      - Chirothripini
      - Thripini

Tubulifera
- Phlaeothripidae
  - Phlaeothripinae
    - Phlaeothripini
    - Eupathripini
    - Hoplothripini
    - Haplothripini
    - Hystricothripini
    - Plectrothripini

Tubulifera (*continued*)
- Megathripinae
  - Megathripini
  - Compsothripini
- Pygothripinae
- Urothripinae

Key to the Genera of California Thysanoptera: Terebrantia

1. Ovipositor curved upward (fig. 1). Wings almost always broad and rounded at tip (fig. 2). Antennae 9-segmented, with variable types of sensoriae 2
   Ovipositor down curved (fig. 3). Wings smaller, usually pointed and with one or no cross veins 10

2(1). Prothorax with long, prominent bristles at posterior lateral angles (fig. 4). Terminal antennal segments not fused. Maxillary and labial palpi 3- and 2-segmented 3
   Prothorax without long bristles at outer angles; those at anterior angles very small, in *Rhipidothrips* those at posterior placed forward of outer angles. Terminal antennal segments (VI-IX or VIII-IX) reduced or fused (fig. 5) (*Orothrips* excepted). Maxillary palpi 3- to 8-segmented, labial palpi 4-segmented 5

3(2). Second antennal segment produced apically in the form of a tooth. Vertex produced anteriorly (fig. 4) . . . . . *Ankothrips* D. L. Crawford, 1909
   Second antennal segment normal: not produced anteriorly. Vertex not produced 4

4(3). Fore tibiae with strong tooth or spur at tip (fig. 6). Fore tarsi without claws. Sensory areas on antennal segments III and IV in the form of an oblique line or ring near the tip of the segments and partly or entirely encircling them. Annulations on antennal segments absent or very weak . . . . . *Melanthrips* Haliday, 1836
   Fore tibiae without teeth or spurs. Fore tarsi with a well-developed claw (fig. 7). Sensory areas on antennal segments III and IV represented by 2 circular to oval areas on each segment; annulations on segments strongly developed . . . . . *Dactuliothrips* Moulton, 1931

5(2). Maxillary palpi 5- to 8-segmented. Labial palpi 4- to 5-segmented 6
Maxillary palpi 3-segmented. Labial palpi 4-segmented 8

6(5). All antennal segments clearly articulated. Antennal segments III and IV each with 2 similar sensory areas (fig. 8). Forewings slightly broadened toward tip . . . . . *Orothrips* Moulton, 1907
Terminal antennal segments more or less shortened and united. Antennal segments III and IV with a single sensory area on each segment (fig. 9) 7

7(6). Forewings markedly constricted in basal third (fig. 10). Sensory areas on antennal segments III and IV linear, enlarged, or hooked at distal end. Head about as wide as long; eyes little or not at all prolonged ventrally . . . . . *Stomatothrips* Hood, 1912
Forewings not so constricted. Sensory areas on antennal segments III and IV linear but shorter and not hooked at distal end. Head longer than wide and eyes noticeably prolonged ventrally (fig. 11) . . . . . *Erythrothrips* Moulton, 1911

8(5). Antennae very long and threadlike (fig. 12). Segment III at least 10 times as long as broad. Sensory areas on segments III and IV extending nearly the entire length of segment and appearing vermiform, the margins being sinuate . . . . . *Franklinothrips* Back, 1912
Antennae not threadlike and sensory areas not as above described 9

9(8). Sensory areas on segments III and IV at distal end, ventral, lense-shaped and partly encircling segment. Head longer than wide with varying degrees of reticulation on posterior dorsal part, forming a collar; a group of short, stout bristles on cheeks behind eyes (fig. 13) . . . . . *Rhipidothrips* Uzel, 1895
Sensory areas on segments III and IV linear or oval never tending to encircle segments. Head about as long as wide, reticulations, if present, weak and not forming a collar; group of bristles behind eyes lacking . . . . . *Aeolothrips* Haliday, 1836

10(1). Ovipositor atrophied or reduced; tip of abdomen blunt with long setae (fig. 14). Antennae 7- or 8-segmented 11
Ovipositor well developed. (Visible in some *Plesiothrips* although apparently nonfunctional.) Antennae 5- to 9-segmented 12

11(10). Antennae 8-segmented; with transparent, ventral sensory band at tip of segments III and IV (fig. 15). Tip of abdomen of male without armature . . . . . *Merothrips* Hood, 1912
Antennae 7-segmented; with forked trichomes on segments III and IV (fig. 25). Male with heavy spurs on dorsum of abdominal segment IX (fig. 16) . . . . . *Plesiothrips* Hood, 1915

12(10). Antennae 9-segmented. Fore tarsi with hooked claw on second segment (fig. 17) 13
Antennae 5- to 8-segmented (or apparently 9-segmented; refer to *Oxythrips; Anaphothrips*). Fore tarsi without claw on basal part of second segment (2 small teeth present in *Odontothrips*) 14

13(12). Posterior margins of abdominal segments extended to form a row of comblike teeth (fig. 18). No sutures or strong spines on pronotum. Sensoriae on antennal segments III and IV take the form of a ring of minute discs at tip (fig. 19) . . . *Heterothrips* Hood, 1908
Posterior margins of abdominal segments not produced. Irregular, central longitudinal suture on pronotum which also has many long spines. Sensory areas on antennal segments III and IV are represented by one short, broad, bluntly pointed cone at the outer tip of each (fig. 20) . . *Oligothrips* Moulton, 1933

14(12). Head extending in front of eyes (fig. 21). Males usually brachypterous or wingless 15
Head not projected in front of eyes, at most only rounded (fig. 22) 18

15(14). Head much smaller than prothorax (fig. 21). Front legs reduced in size . . . . . *Chirothrips* Haliday, 1836
Head and front legs not reduced (cf. *Merothrips* with differing sensoriae, fig. 15) 16

16(15). Hind angles of pronotum each with 1 long bristle (fig. 23). Sense cones on antennal segments III and IV simple or forked. Hind margins of abdominal

tergites II-VIII without scallops . . . . . *Limothrips* Haliday, 1836

Hind angles of pronotum each with 2 long bristles 17

17(16). Antennae 8-segmented. Sense cones on antennal segments III and IV simple. Hind margins of abdominal tergites II-VIII with well-developed scallops (fig. 24) . . . . . *Bregmatothrips* Hood, 1912

Antennae 7-segmented (fig. 25). Sense cones on segments III and IV forked. Without well-developed scallops, teeth, or setae on hind margins of abdominal tergites . . . . . *Plesiothrips* Hood, 1915

18(14). Body surface with heavy reticulations, usually polygonal (fig. 26) 19

Body surface without heavy reticulations which form irregular polygons 26

19(18). Bristles on longitudinal veins of forewing bluntly pointed and enlarged at tip (fig. 27) . . . . . *Echinothrips* Moulton, 1911

Bristles on forewings, when present, not bluntly pointed 20

20(19). Wingless 21

Wings present 22

21(20). Setae on head and pronotum, broad flattened, and usually notched near tip (fig. 28) . . . . . *Kurtomathrips* Moulton, 1927

Setae normal (fig. 29) . . . . . *Anaphothrips reticulatus* Moulton, 1907

22(20). Antennal segments III and IV without forked sensory trichomes. Costal margin of forewings without fringe of delicate hairs (fig. 30) 23

Antennal segments III and IV with forked sensory trichomes. Costal margin of forewings with usual fringe of delicate hairs 24

23(22). Forewings narrow, basal fourth expanded. Surface of wings not reticulated . . . . . *Heliothrips* Haliday, 1836

Forewings broad, costal margin constricted in distal part of basal third. Surface of wings reticulated (fig. 30) . . . . . *Parthenothrips* Uzel, 1895

24(22). Dorsum of head heavily reticulated only in posterior region which forms a collar-like area which is not emarginate or constricted laterally (fig. 31). Ocelli not situated on a raised part of the vertex . . . . . *Monilothrips* Moulton, 1929

Dorsum of head reticulated throughout. Ocelli situated on raised part of vertex 25

25(24). Posterior, lateral parts of head notched, forming a basal constriction, often giving the appearance of a collar. Pronotum strongly transverse and shorter than head (fig. 26) . . . . . *Hercinothrips* Bagnall, 1932

Posterior, lateral parts of head without notch, collar, or constrictions. Pronotum not as strongly transverse and, about same length as head (fig. 32) . . . . . *Hercothrips* Hood, 1927

26(18). Antennae 6-segmented (fig. 33) 27

Antennae 7- to 8-segmented 28

27(26). Ocelli and wings absent . . . . . *Aptinothrips* Haliday, 1836

Ocelli and wings present . . . . . *Drepanothrips* Uzel, 1895

28(26). Ocelli and wings absent 29

Ocelli and/or wings present (see *Arpediothrips*) 31

29(28). Posterior outer angles of pronotum with 2 long bristles. Antennae 7-segmented . *Toxonothrips* Moulton, 1927 (male only)

Posterior outer angles of pronotum with 1 or no prominent bristles (fig. 34) 30

30(29). Interocular bristles well developed (fig. 29) . . . . . *Anaphothrips* Uzel, 1895

Interocular bristles very weak and minute (fig. 34) . . *Aptinothrips* Haliday, 1836

31(28). Well-developed claw on fore tibia (fig. 35). . . . . *Odontothrips* Amyot and Serville, 1843

Fore tibia without claws 32

32(31). Antennae 7-segmented, style 1-segmented (fig. 36) 33

Antennae 8-segmented or appearing 9-segmented because of partial or entire cleavage of segment VI (fig. 37) . . . 37

33(32). Forewings with 1 longitudinal vein (fig. 38). Small, delicate species. . . . . *Leucothrips* Reuter, 1904

Forewings with 2 longitudinal veins . . 34

34(33). Antennal segment VI large, style reduced (fig. 39) . . . . . *Isoneurothrips* Bagnall, 1915
Antennal segment VI and style normal (fig. 40; cf. male of *Plesiothrips*) 35

35(34). Posterior margins of abdominal tergites I-VIII with teeth (fig. 41) . . . . . *Thrips* (*Microcephalothrips*) Bagnall, 1926
Posterior margins of abdominal segments without teeth, segment VIII often with partial or complete fringe of setae . . 36

36(35). Head oval, rounded in front, without well-developed bristles (fig. 22). Ocelli and wings absent in male . . . . . *Toxonothrips* Moulton, 1927
Head usually wider than long, not projected or rounded in front and with well-developed bristles (fig. 42). Males usually with ocelli and wings . . . . . *Thrips* Linné, 1776

37(32). Antennae appearing 9-segmented (fig. 37) 38
Antennae clearly 8-segmented 39

38(37). Comb present on posterior margin of abdominal tergite VIII; tergites II-VIII each with a pair of moderate to heavy spines in center (fig. 43). Males without armature on dorsum of abdominal segment IX . . . . . *Anaphothrips* Uzel, 1895
Comb absent on abdominal segment VIII; tergites without pairs of bristles in center. Males with spurs on dorsum of abdominal segment IX (fig. 44) . . . . . *Oxythrips* Uzel, 1895

39(27). Mouth cone long and often very large, reaching nearly to or beyond posterior margin or prothorax (fig. 45) 40
Mouth cone normal, not reaching to posterior margin of prothorax 42

40(39). Body flat. Head nearly as wide as pronotum which has 2 bristles at each posterior outer angle (fig. 46) (alate and apterous forms) . . . . . *Arpediothrips* Hood, 1927
Body not flattened. 41

41(40). Head much smaller than pronotum which has 1 bristle at each posterior outer angle (fig. 45). Fore tibia with 2 spurs . . . . . *Chilothrips* Hood, 1916
Head and pronotum normal. Two bristles at each outer posterior angle of pronotum (fig. 47). Fore tibia unarmed . . . *Taeniothrips* (*Mycterothrips* Trybom, 1912)

42(39). Forewings with 1 longitudinal vein extending entire length of wing (fig. 48) . . . . *Sericothrips* Haliday, 1836
Forewings with 2 longitudinal veins . . 43

43(42). Abdomen with fine pubescence or rows of microsetae on lateral surfaces of tergites (fig. 49) 44
Abdomen without pubescence or lateral asperities 45

44(43). Maxillary palpi 2-segmented. Costal margin of forewing without fringe of secondary setae (fig. 50) . . . . . *Psilothrips* Hood, 1927
Maxillary palpi 3-segmented. Costal margin of forewing with usual fringe of setae . . . . *Scirtothrips* Shull, 1909

45(43). Pronotum with very long, conspicuous mid-lateral bristle, equal in length to those at posterior angles (fig. 51) . . . . . *Scolothrips* Hinds, 1902
Pronotum without prominent mid-lateral bristles equal in length to those at posterior angles 46

46(45). Pronotum with 1 long bristle at each outer anterior angle (fig. 52) . . . . . *Frankliniella* Karny, 1910
Pronotum without prominent bristles at outer anterior angles 47

47(46). Pronotum with 1 prominent bristle at each outer posterior angle (fig. 53). Posterior margin of abdominal tergite VIII without fringe of setae . . . . . *Oxythrips* Uzel, 1895
Pronotum with 2 prominent bristles at each outer posterior angle (fig. 54) 48

48(47). All setae on pronotum minute except on posterior margin (fig. 54). Fore vein of forewing clearly joined to costa in 2 or more places (fig. 55). Antennae of male with greatly enlarged segment VI (fig. 56) . . . . . *Rhopalandrothrips* Priesner, 1922
Pronotal setae variable, longest being at posterior outer angles (Fig. 57). Fore vein of forewing nearly always separate from costa. Antenna of male normal . . . *Taeniothrips* Amyot and Serville, 1843

Genus *Aeolothrips* Haliday

Antennae nine-segmented, segments III and IV cylindrical and each with one oval-elongated sensory area. Ocelli present in both sexes. Maxillary palpi three-segmented. Labial palpi four-segmented. Pronotum without large bristles. Legs slender, fore femora somewhat enlarged in both sexes. Second segment of fore tarsi with large, fingerlike hook attached at base and present in both sexes. Wings present or absent. When present in macropterous forms, broad and rounded at tip. Forewing with two longitudinal veins reaching the tip and with cross or longitudinal dark bands, or combinations thereof. Cross veins present. Ovipositor large and upturned. Males smaller than females with antennal segments usually differently proportioned and the sensory areas variable. Dorsum of first abdominal segment divided into thirds by two longitudinal thickenings which form distinct lines. Genitalia with or without claspers and with or without projections on the dorsum of abdominal tergites IV to VI.

The genus was divided into *Coleothrips* and *Aeolothrips* by Haliday in 1836, but only the latter has been used generally by entomologists.

The members of this genus are widely distributed and are considered predaceous on thrips, spider mites, and young scale insects. Both adults and nymphs feed in the same manner as do the majority of Thysanoptera. The nymphs spin a loose cocoon in which the last two of the four stages sometimes called "pupae" are passed. In the western states this group is very well represented.

Key to North American Species of *Aeolothrips*

I. Forewings with 2 dark crossbands 1

II. Forewings with dark, longitudinal band on posterior part 11

III. Forewings with longitudinal band on posterior part and also 1 crossband 19

IV. Forewings with 2 crossbands connected with longitudinal band in posterior half . . . 26

V. Forewings otherwise marked 27

VI. Forewings brachypterous, not fully developed, or absent 28

1(1). Body bicolorous 2
Body (head, thorax, and abdomen) unicolorous 6

2(1). Body golden yellow or light brown with tip of abdomen dark brown. Antennal segment II yellow or light brown. Sensory area on antennal segment IV about one-half length of segment, and curved at tip; that on V small, oval to linear. Male with claspers and sickle bristle (Nevada, Arizona) . . . . . *aureus* Moulton, 1931
Abdominal segments II-III, II-IV, II-V, or II-VI yellow. Remainder of body brown 3

3(2). Abdominal segments II-V or II-VI yellow or light brown. Antennal segment I dark brown, II light brown in distal half. Male with claspers. (Brachypterous forms common. See 28) (W. Canada, Wn., Ore., Calif.) . . . . *auricestus* Treherne, 1919
Abdominal segments II-II or II-IV yellow 4

4(3). Abdominal segments II and III each with 2 distinct brown spots on dorsum. Male unknown (Utah, Calif., Ariz., N. M., Idaho). . . . . *brunneipictus* Bailey, 1951
Abdominal segments II and III clear uniform yellow. 5

5(4). Antennal segments I and II dark brown; segments VIII and IX greatly reduced and closely joined. Wings and antennae long and slender. Tip of abdomen dark brown. Male with claspers, not distinctly bicolorous (Mass. to Fla.; Utah to Texas) . . . . . *bicolor* Hinds, 1902
Antennal segments I-III yellow; segments VI-IX about equal and closely joined. Tip of abdomen yellow or light brown. Wings lacking or seldom completely developed (see 28). Male without claspers (Mass., N. Y., N. J., Ontario, Iowa, Ill.) . . . . . *albicinctus* Haliday, 1836

6(1). Antennal segment VI about twice as long as VII. Wings narrow with a distinct hump in center of fore margin. All legs brown (Widely distributed, Mass. to Calif.) . . . . . *nasturtii* Jones, 1912
Antennal segment VI about the same length as VII; VI-IX reduced and closely joined; *fasciatus* type . . 7

7(6). Forewings with crossbands connected along posterior margin by a dark line (ring vein only). Sensory areas on antennal segments III and IV very small, that on IV not hooked at tip, on V circular. Fore tarsi yellowish brown. Male unknown (Oregon) . . . . . *oregonus* Hood, 1935

Forewings with crossbands distinct (ring vein in *duvali* often pigmented) 8

8(7). Sensory area on antennal segment V oval-elongate; those on III and IV narrow, linear, about half the length of segment, IV usually curved at tip. Segment III brown, lighter in basal half. All legs uniform dark brown (lighter in male). Male with claspers, strong sickle bristle, projections on tergites IV and V variable (Nev., N.M., Wyo., Idaho, Colo., Ark., Okla., Utah, Texas, Ariz., Calif., and Mexico). . . . *duvali* Moulton, 1927

Sensory area on antennal segments V and VI small and circular. Antennal segment III pale grayish yellow, brown at tip 9

9(8). Antennal segment I very short (I, 0.027 mm. long; II, 0.026 mm).. Abdomen short, tergum of IX very short (0.088 mm.). Wings short and broad (5.5 times as long as greatest width). Male unknown (Ore., Calif.) . . . . . *brevicauda* Hood, 1935

Antennae and abdomen not unusually long or short 10

10(9). Antennal segment V about 2.7 times as long as VI (V, 0.052 mm.; VI, 0.019 mm.). Forewings white in basal third. Head about as long as wide. Male with claspers, but without projections on tergites IV-VI (Arizona) . . . . . *wetmorei* Hood, 1927

Antennal segment V 3 to 4 times as long as VI. Forewings white in basal fourth. Head wider than long. Male (of *fasciatus*) with claspers, with projections on tergites IV and V (Widely distributed, Alaska to Mex.) . . . . . *fasciatus* (Linné), 1758 (New Mexico). *vebemens* Hood, 1927

11(II). Very large species; head 0.189 to 0.260 mm. long. Longitudinal band on forewing widened to form an incomplete crossband near center. Antennal segment IV yellow in basal fourth to third (Mexico) . . *major* Bailey, 1951

Longitudinal band on forewing without a crossband. Antennal segment IV entirely brown (Mexico) . . . . . *diabolus* Priesner, 1932

Smaller species 12

12(11). Antennal segments III-IV grayish-white, base of IV with dark ring, V-IX with very light brown shading. Sensory area on segment V linear. Tarsi and tips of tibiae on forelegs, and tarsi of middle legs, light yellowish brown. Head deeply striate. Male unknown (Idaho, Utah, Calif.). . . . . *nitidus* Moulton, 1946

Antennal segment III, and usually basal half of IV, yellowish-brown . . . 13

13(12). Longitudinal band on forewings not extending entire length of wing. 14

Longitudinal band on forewings extending entire length of wing 15

14(13). Longitudinal band on forewings variable in width, often extending to and beyond anterior longitudinal vein in basal part, 35-50 spines on posterior longitudinal vein in dark area of forewing.

Antennal segment III, only, white in female, smoky in male. Antennal segments noticeably spinose. Male with claspers and accessory thorn. Tergites of abdominal segments IV and V with toothlike projections (Pacific slope) . . . . . *kuwanaii* Moulton, 1907

Longitudinal band on forewing narrow, complete but not extending either to base or tip or to anterior longitudinal vein. Bristles on posterior longitudinal vein in dark area fewer in number (15 in paratype) and weaker than in *kuwanaii*. Antennal segment III brown at distal end, shading to yellow at base. Dorsal bristles on antennal segments not prominent. Sensory area on V oval. Male with claspers but without toothlike projections on IV and V (Oklahoma, Nev., Utah, Ariz., Calif.) . . . . . *fuscus* Watson, 1931

15(13). Sensory area on antennal segment V small and circular (or slightly oval) 16

Sensory area on antennal segment V linear 18

16(15). Antennal segment V definitely shorter than IV. Sensory areas on III and IV very short. All tarsi brown in female; front legs pale yellowish brown in male. Male with very small claspers and without tergal projections on IV and V (Texas) . . . . . *hesperus* Bailey, 1951

Antennal segment V (0.090 mm.) about as long as IV (0.084.). Antennal segments V-IX pale grayish brown. All tarsi blackish brown. Forewings 7.6 times as long as greatest width. Male unknown 17

17(16). Scale of forewing brown. Head strongly cross-striate (New York). . . . . *pallidicornis* Hood, 1938

Scale white. Head not deeply striate (Calif.) . . *occidentalis* Bailey, 1951

18(15). All tarsi uniformly brown. Antennal segments V-IX light brown, V yellowish brown in basal part, basal half of IV light yellowish brown, III with brown ring at tip. Band on forewing in some specimens with tendency to form crossband in center (see 21). Head deeply and closely cross-striate. Male without claspers, tergites without projections (D. C., N. J., Fla., Ill., Ariz., Calif., N. M., Tenn., Utah). *vittipennis* Hood,[1] 1912

Basal part of fore and middle tarsi and distal end of fore tibia yellow (Calif., Utah, Ariz.) . . . . . *vittipennis yosemitae* (Moulton), 1929

19(III). Sensory area on antennal segment V linear 20

Sensory area on antennal segment V circular or oval 22

20(19). Longitudinal band on forewing continuing broadly the entire length of wing 21

Longitudinal band in basal or proximal part narrowing to ring vein. Scale dark. "Tarsi pale, fore pair in basal half; tips of fore tibiae lemon yellow" (Hood, 1927). Male unknown (Ariz., Colorado) . . . . . *vittipennis oculatus* (Hood), 1927

21(20). Head deeply and closely cross-striate. Crossband on forewings approximately in center in male (usually absent in female). Male without claspers (see 18) (N. J., Ill., Tenn., Fla., D. C., N. M., Ariz., Utah, Calif.) . . . *vittipennis* Hood, 1912

Head less strongly striated. Crossband on forewings of female in center and complete (see also 11). Tarsi all blackish brown. Male unknown (Mexico) . . . *mexicanus* Priesner, 1924

22(19). Antennal segments III and IV pale yellowish brown 23

Antennal segments III yellowish white, IV dark brown, lighter towards base, pedicel blackish brown 24

23(22). Crossband on forewing throughout its width extending to costal margin. The longitudinal band not reaching tip of wing. Scale of wing dark at base. "Antennal segment V as long as IV or somewhat shorter" (from Priesner's unpublished notes). Male unknown (Ontario, N. Y., N. J., Ill.) . . . . . *vittatus* Haliday, 1936

Crossband not extending to costal margin and not broadly defined. Longitudinal band tapers toward the wing tip and barely reaches it. Scale clear white. "Antennal segment V much shorter than IV" (from Priesner's unpublished notes). Male unknown (Md., Va., Ill.) . . . . . *crassus* Hood, 1912

24(22). Crossband on forewing in distal half (Calif.). . *metacrucifer* Bailey, 1951

Crossband on forewing in basal half 25

25(24). Antennae with long, brown setae, particularly prominent on segments III, IV, and V. Segment IV, 0.107 mm. long. Posterior margin of pronotum with heavy spines. Male with claspers, accessory thorn, and tergal projections (Calif., Ore., Wn., Utah) . . . . . *crucifer* Hood, 1935

Antennae lacking heavy, dark pubescence. Segment IV, 0.075 mm. long. Posterior margin of pronotum without

[1]Synonyms: *floridensis* Watson, 1916, and *yosemitae* Moulton, 1929.

heavy spines. Male with claspers but without tergal projections (Nev., Utah, N. Y., Calif.) . . . . . *hartleyi* Moulton, 1927

26(IV). Head prolonged in front of eyes. Distal part of all tibiae, and all tarsi yellowish white. Antennal segments III and IV white. Male without claspers (D. C., N. J.) . . . . . *versicolor* form *similis* Priesner, 1919

Head not prolonged. Fore tibiae at tip and fore tarsi only, yellowish brown Antennal segment III and basal third or fourth of IV white. Male unknown (Ontario, N. Y., Md., D. C., N. J., Va., Ill., Calif., N. H., Mont., Ore., Wn., B. C., Idaho, Mich., Mo., Colo.) . . . . . *melaleucus* Haliday, 1852

27(V). Longitudinal band interrupted in center by an irregular clear area; without crossbands. Antennal segment III mottled with brown rather than gradually shading from dark to light basally. Male unknown (Utah). . . . . *interruptus* Bailey, 1951

Part of longitudinal band lying in distal half of forewing not connected with crossband which is in second fourth. Antennal segment III clear yellowish white with brown ring at tip. Male unknown (Calif.) . . . . . *montanus* Bailey, 1951

28(VI). Body bicolorous 29

Body unicolorous 30

29(28). Abdominal segment I deeply cross-stritate in female and reticulate at sides in male. Abdominal segments II-III or II-IV yellow, terminal segments yellow in female. Antennal segments I and II yellow, I shaded with brown at base (female with only tip of III brown). Male without claspers. Forewings reduced to minute colorless pads, usually not visible (Mass., N. Y., N. J., Ill., Iowa, Ontario) . . . . . *albicinctus* Haliday, 1836

Abdominal segment I sparsely cross-striate-reticulate in female (very sparse or none in male). Abdominal segments II-IV yellow or lighter brown than remainder, terminal segments dark brown. Antennal segment II yellow, shaded to brown at base, I dark brown. Fore tibiae and tarsi light brownish yellow, particularly in male. Forewings reduced to distinct stubs, in female usually with smoky crossband (B. C., Ore., Wn., Calif.) . . . . . *auricestus* Treherne, 1919

30(28). Antennal segment II yellow, at least in distal half. Body and all legs in female dark brown (fore tibiae sometimes mottled), yellow in male with fore tibia mottled. Wing pads colorless (Calif., Wyo.) . . . . . *auricestus* (unicolorous form)

Antennal segment II brown 31

31(30). Forewing pad with smoky crossband. Male unknown (Calif.) . . . . . *terrestris* Bailey, 1951

Forewing pad minute and colorless. Male with claspers but without tergal projections (Calif.) . . . . . .*clarus* Bailey, 1951

Aeolothrips auricestus Treherne

Aeolothrips auricestus Treherne, 1919. Canad. Ent., 51(8-9): 184-185, pl. XV, figs. 6, 7, pl. XVI, fig. 1.

Aeolothrips auricestus, Bailey, 1949. Canad. Ent., 81(6):153-158; 1951. Hilgardia, 21(2):51. figs. 3, 19, 34, 55.

Location of type: Canadian National Museum, No. 353.

Type locality: Vernon, B.C.

Geographic range: British Columbia, Washington, Oregon, California.

Discussion: This thrips is found chiefly on grasses in and around mountain meadows and appears to be predaceous as are its relatives. The bright yellow and black bicolorous condition makes it easily recognizable when collecting. Mixed populations with the unicolorous form, however, do occur. Brachypterous forms are common.

California records:

Modoc Co.: Alturas, V-24-49; Willow Ranch, V-24-49; Goose Lake, V-24-49.

Siskiyou Co.: Tule Lake, V-10-54, grass (O. G. Bacon).

Aeolothrips brevicauda Hood

Aeolothrips brevicauda Hood, 1935. Trans. Amer. Ent. Soc., 61:105-106, pl. III, fig. 4.

Aeolothrips brevicauda, Bailey, 1951. Hilgardia, 21(2):52-53.

Location of type: Cornell University.
Type locality: Crater Lake National Park, Oregon.
Discussion: This small species appears to be rare.
California records:

Inyo Co.: Big Fine Creek, 8,000', V-19-47, sweeping grass nr. pool (R. M. Bohart).

Mono Co.: Nr. Coleville along Walker River, V-18-47, flowering shrub (R. M. Bohart); Mammoth, VIII-5-36, *Mentha* sp. (R. M. Bohart).

Tehama Co.: Deer Creek, Potato Patch Camp, VI-5-49, sweeping (R. M. Bohart).

Aeolothrips brunneipictus Bailey

Aeolothrips brunneipictus Bailey, 1951. Hilgardia, 21(2):53, pl. 8, fig. 70.
Location of type: University of California, Davis.
Type locality: Green River, Utah.
Geographic range: Utah, New Mexico, Arizona, California.
Discussion: This western species is closely related to *Ae. nasturtii* from which it can be told by the yellow abdominal segments II and III.
California records:

Contra Costa Co.: Antioch, VI-5-39, sweeping grass nr. water.

Fresno Co.: Fresno, VII-5-39, sweeping grass on ditch bank.

Aeolothrips clarus Bailey

Aeolothrips clarus Bailey, 1951. Hilgardia, 21(2): 53-54, pl. 1, fig. 1.
Location of type: University of California, Davis.
Type locality: Mt. St. Helena, California.
Geographic range: California.
Discussion: This brachypterous species is found in small numbers and very locally in association with the plant, *Galium sp.* (bedstraw).
California records:

Contra Costa Co.: Russellman Park, Mt. Diablo, IV-8-36, sweeping grass.

Lake Co.: Upper Lake, Clear Lake, V-14-47, grass on ditch bank.

Madera Co.: Miami Lodge, 3,000', V-27-38, sweeping grass.

Napa Co.: Mt. St. Helena, IV-2-36, sweeping.

Nevada Co.: Grass Valley, IV-27-39, sweeping grass.

Placer Co.: Newcastle, IV-1-47, grass under live oak.

Solano Co.: Fairfield, III-20-36, sweeping grass and IV-7-39, *Galium* sp.; Mix Canyon, IV-11-39, sweeping; Gordon Valley, III-27-36, grass.

Yolo Co.: Rumsey, IV-11-36, sweeping.

Aeolothrips crucifer Hood

Aeolothrips kuwanaii var. *crucifer* Hood, 1935. Trans. Amer. Ent. Soc., 61:104–105, pl. III, fig. 5.
Aeolothrips crucifer, Bailey and Knowlton, 1949. Proc. Ent. Soc. Wash., 51(5):231.
Aeolothrips crucifer, Bailey, 1951. Hilgardia, 21(2):54-55, pl. 3, fig. 13.
Location of type: Cornell University.
Type locality: Korbel, California.
Geographic range: Utah, Washington, Oregon, California.
Discussion: Usually collected in flowers of native shrubs in the spring in company with *Aeolothrips kuwanaii.*
California records:

Contra Costa Co.: Russellman Park, Mt. Diablo, IV-8-36, sweeping; Mt. Diablo, VI-29-51, chamise flrs.

El Dorado Co.: Camino, 3,400', V-12-37, *Ceanothus.*

Humboldt Co.: Korbel, VII-28-27, *Sambucus* flrs. (J. D. Hood, C.U.).

Kern Co.: Greenhorn Mts., IV-22-49, *Prunus* (R. M. Bohart).

Lake Co.: Upper Lake, V-14-47, sweeping grass on ditch bank.

Lassen Co.: Pit River, VI-15-47, *Chrysothamnus* (E. O. Essig).

Mariposa Co.: El Portal, Yosemite Valley, V-18-38, sweeping grass; Indian Flat, V-23-38, sweeping (R. M. Bohart).

Mono Co.: Mammoth, VIII-1936, mint (R. M. Bohart).

Nevada Co.: Grass Valley, IV-26-36, *Ceanothus.*

Placer Co.: Lake Tahoe, VII-5-39, sweeping; Penryn, III-12-35, *Ceanothus;* Emigrant Gap, VI-18-36, *Ceanothus.*

Shasta Co.: Mt. Lassen Natl. Park, VII-3-37 (S. R. Moyer).

San Mateo Co.: Woodside, VI-24-24, toyon berry (D. Moulton).

Solano Co.: Fairfield, IV-16-37, *Prunus;* Mix Canyon, IV-30-39, grass under wild grape; Bates Canyon, V-4-39, *Sambucus* flrs.; Mix Canyon, III-6-36, *Ceanothus;* Fairfield, III-11-36, nectarine.

Tehama Co.: Deer Creek, VI-5-49, sweeping (R. M. Bohart).

Tulare Co.: Camp Nelson, IV-26-51, *Ceanothus.*

Yolo Co.: Davis, V-5-31, *Ceanothus.*

Aeolothrips duvali Moulton

Aeolothrips duvali Moulton, 1927. Bull. Brooklyn. Ent. Soc., 22:186.

Aeolothrips duvali, Bailey, 1951. Hilgardia, 21(2): 55-56, pl. 4, fig. 22, pl. 5, fig. 30, pl. 7, fig. 59.
Location of type: Moulton collection, holotype ♀, No. 746, allotype, No. 746, California Academy of Science.
Type locality: Bastrop, Texas.
Geographic location: Arkansas, Oklahoma, Texas, Colorado, Utah, New Mexico, Nevada, Arizona, California, and Mexico.
Discussion: Widespread in Southwest. Very similar to *Aeolo. fasciatus* but with darker antennae and broader wings.
California records:

Alpine Co.: Winnemucca Lake, VIII-17-49 (R. M. Bohart).

Colusa Co.: Grizzly Springs, Colusa Highway, V-14-46, chamise flrs.

Inyo Co.: Daylight Pass, III-14-47, shaking wild flrs. (A. T. McClay); Westgaard Pass, V-18-47, sweeping (R. M. Bohart); Bishop Creek, 8,400', VIII-2-36, buckwheat (R. M. Bohart).

Kern Co.: Tehachapi Pass, IV-10-36, tarweed (R. M. Bohart); El Paso Mts., IV-19-49, desert flrs.

Los Angeles Co.: Griffith Park, V-14-32, chamise.

Modoc Co.: Chimney Rock (nr. Alturas), V-24-49, *Ceanothus;* Willow Ranch, V-24-49, grass and *Prunus* flrs.

Plumas Co.: Blairsden, VII-15-49, misc. sweeping (R. M. Bohart).

Riverside Co.: Morongo Canyon, IV-13-30, *Rhus* sp. (R. M. Bohart); Palm Springs, III-25-37, Joshua tree flrs. (R. M. Bohart); Palm Canyon, IV-15-38, sweeping (R. M. and G. E. Bohart).

San Diego Co.: Potrero, IV-26-49, sweeping.

San Joaquin Co.: Vernalis, VIII-16-35, rosinweed.

Santa Clara Co.: Alum Rock Pl., San Jose, IV-26-49, sweeping grass; San Jose, VI-6-10, monkey flrs. (P. R. Jones).

Aeolothrips fasciatus Linné
(Pl. 17, fig. 2)

Thrips *fasciatus* Linné, 1761. Fauna Svecica, p. 266; Linné, 1767, Systema Naturae, p. 743.
For reviews of synonymy refer to: Uzel (1895), Hinds (1902), Priesner (1926, 1948), and Bailey (1951).
Location of type: Unknown to me.
Type locality: Probably north-central Europe.
Geographic location: nearly world-wide. Throughout North America, Hudson Bay to Florida and Mexico.
Discussion: One of the most generally known predaceous thrips. It is referred to frequently as the "banded-wing thrips."
California records: The following records are representative only. The species has been found throughout the state.

Colusa Co.: Nr. Grizzly Springs Lake, Colusa Highway, V-14-47, grass; Arbuckle, IV-23-41, chamise flrs.

Contra Costa Co.: Mt. Diablo, IV-8-36, sweeping grass.

Inyo Co.: Bishop Creek, 8,400', VIII-2-36, wild buckwheat (R. M. Bohart).

Kern Co.: Techachapi Pass, IV-10-36 (R. M. Bohart).

Lake Co.: Upper Lake; Clear Lake, V-14-46, grass on ditch bank.

Los Angeles Co.: El Monte, IX-30-31, grass.

Marin Co.: Stinson's Beach, VIII-3-49, grass.

Modoc Co.: Willow Ranch, V-24-49, *Prunus* flrs.

Monterey Co.: Arroyo Seco (near Jamesburg), V-26-50, grass.

Placer Co.: Newcastle, IV-1-47, grass under live oak; Donner Lake, VI-19-36, sage.

Riverside Co.: Idyllwild, IV-7-39, *Ericameria pinifolia* (R. M. Bohart); Palm Springs, III-25-37, joshua (R. M. Bohart); Palm Canyon, IV-15-38, sweeping (R. M. and G. E. Bohart).

San Joaquin Co.: Lodi, IV-4-40, ♀, almond hull on tree.

Santa Clara Co.: Gilroy, VII-14-36, tomato.

Sonoma Co.: Knight's Valley, IV-19-36, sweeping.

Aeolothrips fuscus Watson

Aeolothrips fuscus Watson, 1931. Univ. Okla. Biol. Surv., 3(4): 340–41.
Aeolothrips fuscus, Bailey, 1951. Hilgardia, 21(2): 57, pl. 1, fig. 6, pl. 5, fig. 37, pl. 6, fig. 56.
Location of type: University of Florida.
Type locality: Near Sayre, Beckham County, Oklahoma.
Geographic location: Oklahoma, Utah, Arizona, Nevada, California.
Discussion: Very little is known about this western species.
California records:

Modoc Co.: Canby, VII-19-50, sweeping grass (R. M. Bohart).

Mono Co.: Mammoth, VII-22-26, sage (R. M. Bohart); Rock Creek, VII-20-36, 8,000', sweeping (R. M. Bohart).

San Bernardino Co.: Cajon Pass, IV-20-49, beating sage; Cajon Pass, IV-24-49, *Ceanothus.*

Sierra Co.: Webber Lake, VIII-25-46, sweeping (R. M. Bohart).

Aeolothrips hartleyi Moulton

Aeolothrips hartleyi Moulton, 1927. Bull. Brooklyn Ent. Soc., 22:185–86.

Aeolothrips hartleyi, Bailey, 1951. Hilgardia, 21(2):57–58, pl. 3, fig. 14, pl. 5, fig. 42, pl. 6, fig. 52.

Location of type: Moulton collection. Holotype ♀, No. 856, allotype, No. 860, California Academy of Science.

Type locality: Cranberry Lake, N. Y.

Geographic location: New York, Utah, Nevada, California.

Discussion: The records of this species indicate it is much more widely distributed than formerly realized.

California records:

Inyo Co.: Westgaard Pass, 7,276′, V-18-47, sweeping (R. M. Bohart).

Marin Co.: VIII-19-37, sweeping (F. Andre).

Modoc Co.: Fandango Pass, V-24-49, sweeping.

Mono Co.: Mammoth Lake, VIII-5-36, mint (R. M. Bohart).

Nevada Co.: Deer Creek, Potato Patch Camp, VII-5-49, sweeping (R. M. Bohart).

Placer Co.: Lake Tahoe, 1937, grass (F. Andre).

San Bernardino Co.: Cajon Pass, IV-20-49, manzanita.

Sierra Co.: Webber Lake, VIII-25-46, sweeping (R. M. Bohart).

Aeolothrips kuwanaii Moulton

Aeolothrips kuwanaii Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, pp. 47–48, pl. I, figs. 5–8.

Aeolothrips kuwanaii var. *robustus. Ibid.*, p. 48.

Aeolothrips longiceps. D. L. Crawford, 1909. Pomona Coll. Jour. Ent., 1:101–103, fig. 46, A-G.

Franklinothrips longiceps. Bagnall, 1913. Trans. 2d International. Congr. Ent. (Oxford, 1912), p. 397.

Aeolothrips kuwanaii, Bailey, 1951. Hilgardia, 21(2):59, figs. 4, 45, 58, 64, 71.

Location of type: Moulton collection. Lectotype, ♀, No. 7, allotype, No. 8 (Bailey, 1951), California Academy of Science.

Type locality: Saratoga, California.

Geographic location: British Columbia, Washington, Oregon, Utah, Nevada, Arizona, and California.

Discussion: This is a common species in the far western states in the spring. It is found chiefly in the blossoms of flowering shrubs.

California records: The following are representative:

Colusa Co.: Grizzly Springs Lake, Colusa Highway, V-14-46, chamise flrs.

Contra Costa Co.: Mt. Diablo, IV-8-36, sweeping; Mt. Diablo, IV-12-35, *Ceanothus.*

El Dorado Co.: Camino, V-12-37, *Ceanothus.*

Humboldt Co.: Korbel, VII-28-27, *Sambucus racemosa* flrs. (J. D. Hood, C.U.)

Inyo Co.: Daylight Pass, III-14-47, shaking wild flrs. (A. T. McClay).

Lake Co.: Upper Lake, V-14-47, sweeping grass on ditch bank; Bartlett Springs, VI-10-36, *Ceanothus.*

Los Angeles Co.: Claremont, *Artemesia* (D. L. Crawford); Los Angeles; El Monte, V-25-32, *Sambucus* sp.

Mono Co.: Mammoth, VIII-19-36, mint (R. M. Bohart).

Napa Co.: Mt. St. Helena, IV-2-36, sweeping grass.

Placer Co.: Auburn, IV-27-39, grass sweeping (S. F. Bailey and F. Andre); Emigrant Gap, VI-18-36, *Ceanothus.*

Riverside Co.: Beaumont, V-6-49, beating (R. M. Bohart).

San Bernardino Co.: Cajon Pass, IV-24-49, Ceanothus.

San Diego Co.: Chula Vista, V-7-49, sweeping (R. M. Bohart); Vista, VII-2-35, toyon.

Santa Barbara Co.: Gaviota Pass, IV-24-51, toyon (S. F. Bailey and R. M. Bohart).

Santa Cruz Co.: Hecker Pass, IV-17-36, grass.

Shasta Co.: Lassen Park, VII-3-37, manzanita (S. R. Moyer).

Aeolothrips melaleucus Haliday

Aeolothrips melaleucus Haliday, 1852. Walker, Homop. Ins. Brit. Mus., pp. 1, 117.

Aeolothrips melaluecus, Bailey. 1951. Hilgardia, 21(2):60–61, pl. 4, fig. 27, pl. 5, fig. 35.

Location of type: Unknown to me, probably British Museum.

Type locality: Unknown to me, probably central Europe.

Geographic location: Europe; Canada, northeastern U. S., and Missouri, Michigan, Illinois, Colorado, Montana, Idaho, Washington, Oregon, and California.

Discussion: This species appears much less common in the western states. It is easily mistaken for *fasciatus* when collected.

California record:

Stanislaus Co.: Empire, VI-1-49, peach foliage.

Aeolothrips metacrucifer Bailey

Aeolothrips metacrucifer Bailey. 1951. Hilgardia, 21(2):61, pl. 3, fig. 17.
Location of type: University of California, Davis.
Type locality: Vacaville, California.
Geographic location: California.
Discussion: This thrips appears to have the same habits as *kuwanaii,* but at present has a very restricted distribution.
California records:
Contra Costa Co.: Mt. Diablo, V-29-51, beating; V-22-54, buckeye flrs. (R. M. Bohart).
San Bernardino Co.: Cajon Pass, IV-20-49, *Ceanothus* flrs.
Solano Co.: Vacaville, V-29-49, buckeye flrs. (A. T. McClay); Cordelia, V-28-49, buckeye flrs.

Aeolothrips montanus Bailey

Aeolothrips montanus Bailey, 1951, Hilgardia, 21(2):62, pl. 3, fig. 16, pl. 7, fig. 65.
Location of type: University of California, Davis.
Type locality: Fandango Pass, Modoc County, California.
Geographic location: California.
Discussion: This species is known at present only from two high mountain passes on the eastern border of the state. Its distinct wing pattern makes it easy to recognize.
California records:
Modoc Co.: Fandango Pass, 6,250′, V-24-49, sweeping grass (S. F. Bailey and R. M. Bohart).
Mono Co.: Sonora Pass, 9,000′, VII-19-36, sweeping wild flrs. (R. M. Bohart).

Aeolothrips nasturtii Jones

Aeolothrips nasturtii Jones. 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, pp. 2–3, pl. I, figs. 1-4.
Franklinothrips nasturtii, Bagnall. 1913. Trans. 2d. International Cong. Ent., p. 397.
Aeolothrips tuolumnei Moulton. 1927. Bull. Brooklyn Ent. Soc., 22:187.
Location of type: Cornell University. Mr. Jones told me that many years ago he sent this and other type specimens to Hood who had retained them.
Type locality: San Jose, California.
Geographic location: Widespread in North America.
Discussion: This species is common on grasses during the summer months although not as abundant as *fasciatus.*
California records:
Calaveras Co.: Chili Gulch, VIII-17-49, beating willow.
Contra Costa Co.: Antioch VI-5-39, sweeping watergrass; Mt. Diablo, IV-8-36, grass.
El Dorado Co.: Coloma, VII-18-39, sweeping grass; Kyburz, III-20-39, sweeping grass.
Fresno Co.: Fresno, VII-5-39, sweeping grass on ditch bank; Cherry Gap, 5,900′, VIII-3-50, sweeping.
Kern Co.: Isabella, IV-19-49, sweeping meadow.
Lake Co.: Upper Lake, V-14-47, sweeping grass.
Los Angeles Co.: Griffith Park, V-14-32, chamise.
Marin Co.: Mt. Tamalpais, VII-7-48, *Aralia californica.*
Madera Co.: N. Chowchilla, IX-15-39, sweeping grass.
Mariposa Co.: Yosemite Valley, V-31-38, sweeping grass; Wawona, V-31-36, *Ceanothus.*
Merced Co.: Snelling, VIII-2-50, *Typha* sp., grass, oak.
Modoc Co.: Fandango Pass, 6,250′, V-24-49, sweeping.
Monterey Co.: Arroyo Seco, V-26-50, sweeping.
Nevada Co.: Nevada City, VI-26-49, grass (R. M. Bohart).
Placer Co.: Lincoln, II-21-37, sweeping grass; Donner Lake, VI-19-36, sage.
Plumas Co.: Blairsden, VII-15-49, misc. sweeping (R. M. Bohart).
Sacramento Co.: Galt, VII-6-39, watergrass.
Santa Clara Co.: San Jose, V-23-10, watercress flrs. (P. R. Jones).
San Diego Co.: Jacumba, IV-26-49, sweeping (S. F. Bailey and H. E. Cott).
Tuolumne Co.: Tuolumne Meadows, grass; Strawberry, VIII-24-38, grass.
Yolo Co.: Davis, VIII-18-39, ex. alfalfa; Davis, VI-10-35, sweet corn; Davis, VI-13-36, sweeping lawn.

Aeolothrips nitidus Moulton

Aeolothrips nitidus Moulton. 1946. Pan-Pac. Ent., 22(2):59.
Aeolothrips nitidus, Bailey, 1951. Hilgardia, 21(2): 63, pl. 2, fig. 7, pl. 5, fig. 49.
Location of type: Moulton collection. Holotype ♀, No. 3488, California Academy of Science.
Type locality: Moscow, Idaho.
Geographic location: Idaho, Utah, Oregon, California.
Discussion: This thrips is not at all common. It is easily told by the uniformly pale yellow or white color of antennal segments III-IX.

California record:

Inyo Co.: Bishop, VI-28-49, willow foliage (H. E. Cott).

Aeolothrips occidentalis Bailey

Aeolothrips occidentalis Bailey. 1951. Hilgardia, 21(2):63-64.

Location of type: University of California, Davis.

Type locality: Yosemite Valley, California.

Geographic location: California.

Discussion: This unusual form is a member of the *vittipennis* complex. It is separated from related species by the white scale at base of forewing and the small circular sensory area on antennal segment V.

California record:

Mariposa Co.: Yosemite, V-17 and 31-38, grass.

Aeolothrips terrestris Bailey

Aeolothrips terrestris Bailey. 1951. Hilgardia, 21(2):64-65, pl. 1, fig. 2.

Location of type: University of California, Davis.

Type locality: Placerville, California.

Geographic location: California.

Discussion: This is the third brachypterous species known to us; the others are *auricestus* and *clarus*. This species has a dark band on the forewing stub and the first two antennal segments are dark brown.

California records:

Contra Costa Co.: Russellman Park, Mt. Diablo, IV-8-36, sweeping grass.

El Dorado Co.: Placerville, IV-13-47, live oak leaves among grass.

Lake Co.: Upper Lake, Clear Lake, grass on ditch bank.

Napa Co.: Mt. St. Helena, IV-2-36, sweeping.

Placer Co.: Newcastle, IV-1-47, grass under live oak.

Santa Clara Co.: Alum Rock Park, IV-26-49, sweeping; Palo Alto, IV-27-49, grass.

Solano Co.: Fairfield, IV-23-41, grass under oaks; Fairfield, III-20-36, sweeping grass; Gordon Valley, III-27-36, sweeping grass.

Yolo Co.: Rumsey, IV-11-36, sweeping.

Aeolothrips vittipennis Hood

Aeolothrips vittipennis Hood. 1912. Proc. Ent. Soc. Wash., 14:129-30, pl. IV, figs. 1, 2.

Aeolothrips floridensis Watson. 1916. Ent. News, 27:126-27.

Aeolothrips yosemite Moulton, 1929. Pan-Pac. Ent., 5(3):125-27.

Aeolothrips vittipennis, Bailey. 1951. Hilgardia, 21(2):66, figs. 5, 9, 15, 47, 48, 60.

Location of type: Cornell University.

Type locality: Topeka, Illinois.

Geographic location: The typical species appears to be more commonly found in the eastern states. Our records show collections from widely separated states as follows: Arizona, California, D. C., Florida, Illinois, N. J., N. M., Tenn., and Utah.

Discussion: In the western area this species appears to be variable. Bailey (1951) indicated that *vittipennis* included two varieties, *oculatus* Hood and *yosemitae* Moulton. These forms exhibit variations in coloration and wing patterns.

California records:

Mariposa Co.: Yosemite Valley, V-31-38, sweeping grass; VI-22-27, *Ceanothus integerrimus* (D. Moulton).

Plumas Co.: Blairsden and Quincy, VII-15 and-16-49, sweeping (R. M. Bohart).

Ae. vittipennis yosemitae was taken together with *vittipennis* in Mariposa County as indicated above.

Genus *Anaphothrips* Uzel

Antennae eight-segmented or nine-segmented; a partial or total cleavage of segment VI results in a three-segmented style in some cases. Sensory trichomes simple or forked. Ocelli missing in apterous forms. Maxillary palpi three-segmented. Prothorax and wings usually without strongly developed setae. Legs without spines or claws. Wings macropterous, brachypterous, or absent. Two longitudinal veins on forewings. Ovipositor present. Males smaller than females often with thornlike setae on posterior abdominal segments.

Anaphothrips species are generally grass- and sod-inhabiting thrips. They are not strong fliers. In some seasons, when very abundant, they cause injury to small grains and grasses, especially when the latter are grown for seed. The species are more numerous along the coast than in the interior.

Key to the California Subgenera[2] of *Anaphothrips*

1. Body heavily reticulated . . . . . .
. . . .*Prosopoanaphothrips* Moulton, 1926
Body not heavily reticulated 2

[2]There are revisional manuscripts in press by other authors that will change the status of these categories.

2(1). Abdominal tergites II–VIII with comb, complete on VII and VIII . . . . . *Odontanaphothrips* Moulton, 1926

Abdominal tergites without comb on segments II-VIII, at most with comb or fringe of hairs on VIII 3

3(2). Antennal segment VI without line of fragmentation . . . . . *Chaetanaphothrips* Priesner, 1926

Antennal segment VI with a line of cleavage visible in majority of specimens . . . *Anaphothrips*, s. str., Müller, 1776

Key to California Species of *Anaphothrips*

1. Body heavily reticulated . . . . . *reticulatus* Moulton, 1907

Body not heavily reticulated 2

2(1). Sensory trichomes on antennal segments III and IV forked, very long and slender . . . . . *orchidii* Moulton, 1907

Sensory trichomes on antennal segments III and IV either simple or forked but not long and slender 3

3(2). Body short, broad, wingless species . . 4

Body not short and broad; usually macropterous but having brachypterous and apterous forms 5

4(3). Setae on head and pronotum reduced; those on dorsum of abdominal segment IX very short and thick. No bicolorous forms . . . . . *secticornis* (Trybom), 1896

Setae on head and pronotum all about same length, not reduced; those on tip of abdomen not reduced. Bicolorous forms common . . . *stanfordii* Moulton, 1907

5(3). Antennae 8-segmented . . . . . *minutus* Moulton, 1929

Antennae appearing 9-segmented as a result of cleavage of segment VI . . 6

6(5). Pronotum without conspicuous setae. Sensory trichomes forked on antennal segments III and IV . . . . . *obscurus* (Müller), 1776

Pronotum with prominent setae, 1 at each posterior, outer angle longer than others. Sensory trichome on antennal segment III simple and forked on IV 7

7(6). Comb present and normal only on posterior tergite of abdominal segment VIII. Not bicolorous. Apterous forms common . . . . . *longipennis* D. L. Crawford, 1910

Comb on posterior margins of abdominal tergites VI-VIII developed into large teeth. Bicolorous. Macropterous only . . . . . *tricolor* Moulton, 1911

Anaphothrips longipennis D. L. Crawford
(Pl. 22, fig. 43)

Anaphothrips longipennis D. L. Crawford. 1910. Pomona Coll. Jour. Ent., 2:150–152, fig. 62 A-D.

Anaphothrips zeae Moulton. 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, p. 41, figs. 31–34.

Anaphothrips zeae Jones. 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, p. 15.

Scirtothrips longipennis, Karny. 1912. Zool. Ann., 4:334.

Anaphothrips crawfordi Priesner, 1932. Bull. Soc. Roy. Ent. Egypt., 25 (3):152.

Anaphothrips longipennis, Bailey, 1944. Pan-Pac. Ent., 20(3):86.

Location of type: Canadian National Museum.

Type locality: Claremont, California.

Geographic location: South Dakota, Utah, Idaho, Oregon, Nevada, Arizona, California.

Discussion: This western species is apt to be confused with *obscurus* (Müller) but can be told by the longer interocellar and pronotal setae and the simple sensory trichome on antennal segment III. No truly brachypterous forms are known. Wingless females are common and only macropterous males are known to me.

It should be pointed out that Karny (1912) transferred *A. longipennis* to *Scirtothrips* incorrectly. *S. longipennis* (Bagn.) 1909 was transferred from *Euthrips* to *Scirtothrips* by Hood (1914). Priesner (1932) renamed Crawford's species *crawfordii* in the genus *Scirtothrips* (because of the homonymy) without having seen type material. After this confusing and fruitless journey the species should return to its original status in which the original author correctly placed it.

California records: The following are representative:

Alpine Co.: Carson Pass, VII-1-36, wild flrs.

Amador Co.: Ione, VI-8-39, grass.

El Dorado Co.: Bijou, VIII-23-50, grass; Coloma, VII-18-39, grass.

Fresno Co.: Visalia, V-21-10 (P. R. Jones); Fresno, VII-5-39, grass; nr. Cherry Gap, VIII-3-50, sweeping.

Imperial Co.: Bond's Corner, XII-26-48, mesquite (F. M. Summers).

Kern Co.: Shafter, V-21-41, *Atriplex* (R. E. Suggett).

Lake Co.: Bartlett Springs, VI-10-36, chamise; Upper Lake, V-14-46, grass.

Los Angeles Co.: Claremont, olive foliage infested with black scale (D. L. Crawford).

Madera Co.: Bass Lake, VI-7-35, sweeping grass.

Mariposa Co.: Yosemite Valley, V-24-38, sweeping grass.

Merced Co.: Merced, VII-5-39, bermuda grass and *Echinochloa crusgalli*, sweeping.

Modoc Co.: Hot Creek, VIII-1-36 (R. M. Bohart); Chimney Rock, V-24-49, *Ceanothus*.

Napa Co.: Mt. St. Helena, V-7-36, grass.

Santa Clara Co.: San Jose, V-25-10, locust (P. R. Jones).

Shasta Co.: Manzanita Lake, VII-22-47, grass.

Sonoma Co.: Sebastopol, V-11-35, sweeping (A. T. McClay); Skaggs Is., VII-30-51, oats.

Tehama Co.: Government Flat, VII-19-50, *Ceanothus*.

Tulare Co.: Porterville, I-16-36, lichen on fig tree; Stony Creek, VI-25-48 (A. T. McClay).

Anaphothrips minutus Moulton

Anaphothrips minutus Moulton. 1929. Pan-Pac. Ent., 5(3):127-128.

Location of type: Moulton collection. Holotype ♀, No. 2448, California Academy of Science.

Type locality: Porterville, California.

Geographic location: California.

Discussion: This species is known only from the original collection. It is very close to *arizonensis* Morgan, 1913.

California record:

Tulare Co.: Porterville, X-5-27, *Euphorbia albomarginata* (E. A. McGregor, C.A.S.).

Anaphothrips obscurus (Müller) (Pl. 21, fig. 37)

Thrips obscura O. F. Müller. 1776. Zool. Dan. Prodrom, p. 96.

Anaphothrips obscurus, Priesner. 1919. Sitz. Ak. Wiss. Wien., 128:121. The complete synonymy may be found in Priesner's "Thysanopteren Europas," pp. 183-185.

Location of type: Unknown to me.

Type locality: Unknown to me.

Geographic location: Europe, Australia, and widespread in North America.

Discussion: This turf-inhabiting thrips is not as abundant in the western states as *longipennis*. It may be separated from this related species by the small bristles on the head and pronotum, the dusky forewings, and the forked trichome on the third antennal segment. No males are known.

California records:

Colusa Co.: Grizzly Springs Lake, V-14-46, grass.

Contra Costa Co.: Russellman Park, Mt. Diablo, IV-8-36, grass.

Fresno Co.: Cherry Gap, VIII-3-50, sweeping.

Lake Co.: Clear Lake, V-10-51, sweeping.

Marin Co.: Bolinas, IV-25-47, grass (R. M. Bohart).

Modoc Co.: Alturas (Chimney Rock), V-24-49.

Nevada Co.: Deer Creek, VI-26-49, grass (R. M. Bohart).

Placer Co.: Donner Lake, VI-19-36, sweeping grass; Lake Tahoe, VII-23-38, grass.

Sacramento Co.: Sacramento, IV-27-39, barley (S. F. Bailey and F. Andre).

Shasta Co.: Manzanita Lake, VII-22-47, grass.

Stanislaus Co.: Oakdale, VII-17-51, sweeping.

Tuolumne Co.: Confidence, VII-17-51, sweeping.

Yolo Co.: Davis, VI-8-41, foxtail, VI-10-35, sweet corn, XII-17-35, dandelion, IV-20-48, fescue, and VI-1953, rice (S. T. Miyagawa).

Anaphothrips orchidii (Moulton)

Euthrips orchidii Moulton. 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, pp. 52, 53, pl. II, figs. 15-18.

Physothrips orchidii, Karny. 1912. Zool. Ann., 4:339.

Anaphothrips orchidii Priesner. 1926. Thys. Eur., pp. 204-206.

Chaetanaphothrips orchidii, Hood. 1954. Proc. Biol. Soc. Wash., 67:216-217.

Chaetanaphothrips orchidii, Sakimura. 1955. Proc. Hawaii. Ent. Soc., 15(3):597-598.

Location of type: Moulton collection. Lectotype ♀, designated by Hood, 1954, without number, California Academy of Science.

Type locality: Fruitvale, California.

Geographic location: Europe, Puerto Rico, Honolulu, Formosa, Japan, Dutch Guiana, Honduras, New York, District of Columbia, Kentucky, Florida, California.

Discussion: This thrips appears to be principally a greenhouse species. The very long slender forked sensory trichomes on antennal segments III and IV, and the small dark-colored wings readily characterize it.

California record:

Alameda Co.: Friutvale, greenhouse orchids (O. E. Bremner).

Anaphothrips reticulatus (Moulton)
(Pl. 20, fig. 29)

Sericothrips reticulatus Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, pp. 50-51, pl. I, figs. 9-10.

Anaphothrips reticulatus, Moulton. 1926. Pan-Pac. Ent., 3(1):22-23.

Location of type: Moulton collection. Holotype ♀, no number, allotype, No. 569, California Academy of Science.

Type locality: Stanford University, Palo Alto, California.

Geographic range: California.

Discussion: This heavily reticulated thrips is wingless, without ocelli, and is an inhabitant of sod. In the spring it is found on grass blades and seed heads but later retires to the crowns, stools, and roots.

California records:

Alameda Co.: Niles Canyon, IV-26-49, beating oak.

Contra Costa Co.: Mt. Diablo, IV-8-36, sweeping; Antioch, II-4-47, sweeping (R. M. Bohart).

Santa Clara Co.: San Jose, III-2-10, grass (P. R. Jones); Stanford University, IV-27-49, grass; Alum Rock Park, IV-26-49, grass.

San Luis Obispo Co.: Atascadero Cr., IV-23-51, sweeping (R. M. Bohart); San Luis Obispo, IV-24-51, wild oats.

Solanco Co.: Vacaville, III-2-48, grass under oak; Fairfield, IV-7-39, grass; Fairfield, IV-4-47, grass under live oak.

Yolo Co.: Rumsey, IV-11-36, sweeping grass.

Anaphothrips secticornis (Trybom)

Thrips secticornis Trybom, 1896. Öfvers K-Vetensk. Akad. Förh., No. 8, p. 620.

Sericothrips apteris Daniel, 1904. Ent. News, 15:295. The detailed synonymy is given by Hood, 1927, and Priesner, 1926.

Location of type: Unknown to me.

Type locality: Collection data on holotype (if designated) unknown to me.

Geographic range: Europe, South America, British Columbia, Washington, Oregon, California.

Discussion: This common European species appears at present to be limited in its North American distribution to the Pacific Coast. Like the preceding form it is a grass inhabitant and wingless. Color variants are common in this country whereas the only European specimens we have seen are uniformly dark brown.

California records:

Alameda Co.: Niles Canyon, IV-26-49, beating oak; Berkeley, XII-6-30, weeds; Berkeley, V-9-36, grass (A. T. McClay).

Contra Costa Co.: Antioch, II-4-47, sweeping (R. M. Bohart).

Kern Co.: Shafter, V-21-41, *Atriplex* (R. E. Suggett).

Lake Co.: Upper Lake, V-14-46, grass.

Marin Co.: Mt. Tamalpais, VII-7-48, grass, under oak; Stinson Beach, VIII-3-49, dead grass; Bolinas, IV-25-47, grass (R. M. Bohart).

Mendocino Co.: Philo, VII-19-49, grass; Fort Bragg, VII-19-49, sweeping.

Monterey Co.: Big Sur, III-20-40, grass (R. L. Usinger; Carmel Valley, V-26-50, dead *Baccharus;* Castroville, V-25-49 (W. H. Lange).

Napa Co.: Calistoga, III-23-39, grass.

Sacramento Co.: Galt, III-8-36, grass.

San Luis Obispo Co.: Oceano, IV-24-51, sweeping; Edna, IV-24-51, wild oats (R. M. Bohart).

San Mateo Co.: San Mateo, IX-16-53, oak leaf mold (E. M. Evans).

Santa Clara Co.: San Jose, 1904, grass (S. M. Daniel); Palo Alto, III-21-49, grass (W. W. Middlekauff); Stanford University, IV-27-49, grass; San Jose, V-1-39, prickly lettuce (L. M. Smith); San Jose, III-24-10, weeds (P. R. Jones, C.A.S.).

Sonoma Co.: McDonald Creek, III-10-36, sweeping grass.

Anaphothrips stanfordii (Moulton)

Sericothrips stanfordii Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, p. 52, pl. II, fig. 11.

Anaphothrips stanfordii, Moulton, 1926. Pan-Pac. Ent., 3(1):23.

Location of type: Moulton collection. Holotype ♂, No. 539, "type" ♀, no number, California Academy of Science.

Type locality: Stanford University, Palo Alto, California.

Geographic range: British Columbia, Washington, Oregon, Wyoming, California.

Discussion; Like its relatives this wingless thrips is found on grasses and in sod in uncultivated areas. Hood (1927) did not mention this species when synonymizing *S. apteris* with *A. secticornis,* but Moulton (1926) pointed out its close relationship with *secticornis.* This form appears more variable than typical *secticornis,* the setae on the head, pronotum, and tip of abdomen are larger, and some collections are strikingly bicolorous.

California records:

Alameda Co.: Berkeley, XII-6-30, weeds (S. F. Bailey and J. B. Steinweden).

Kern Co.: Shafter, V-21-41, *Atriplex* (R. E. Suggett).

Marin Co.: Muir Woods, IV-19-36, sweeping grass; Stinson Beach, VIII-3-49, grass; Bolinas, IV-25-47, grass (R. M. Bohart).

Monterey Co.: Castroville, V-25-49, sweeping (W. H. Lange).

Napa Co.: Calistoga, III-23-39, grass under maple; Napa, V-4-48, grass.

Sacramento Co.: Galt, III-8-36, sweeping grass.

San Diego Co.: Chula Vista, V-7-48, sweeping (R. M. Bohart).

San Francisco Co.: San Francisco, V-16-34, pansy (J. B. Steinweden); San Francisco, VI-22 29, *Erigeron glauca* (H. H. Keifer).

San Luis Obispo Co.: Pismo Beach, IV-24-51, sweeping; San Luis Obispo, IV-24-51, wild oats.

San Mateo Co.: Pedro Val., VI-11-36, artichokes (W. H. Lange).

Santa Clara Co.: Stanford University, VI-27-39, grass; San Jose, II-26-10, grass (P. R. Jones); Alum Rock Park, IV-26-49, grass; Palo Alto (U.C.D. and C.A.S.).

Santa Cruz Co.: Hecker Pass, IV-17-36, grass.

Sonoma Co.: Healdsburg, III-10-36, sweeping grass; Vineburg, III-10-36, grass.

Anaphothrips tricolor Moulton

Anaphothrips tricolor Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser. No. 21, pp. 41-42, pl. V, figs. 35-38.

Scirtothrips tricolor, Karny. 1912. Zool. Ann., 4:334.

Anaphothrips enceliae Moulton. 1926. Pan-Pac. Ent., 3(1):24-25.

Anaphothrips bicolor Moulton, 1926 (nec Morgan, 1925*a* = *flavicinctus* Karny, 1913), *lapsus calami enceliae*. Pan-Pac. Ent., 3(1):24-25.

Anaphothrips tricolor, Hood. 1935. Jour. N.Y. Ent. Soc., 43(2):157.

Location of type: Moulton collection. Holotype ♀, No. 222a, C.A.S.

Type locality: Lindsay, Tulare County, California.

Geographic location: California.

Discussion: This insect is found in the desert areas in large numbers on *Atriplex* in the late summer and fall. Both sexes are macropterous only. The abdominal tergites have a well-developed posterior comb. The orange, white, and dark brown variable coloration gave it the specific name.

California records:

Fresno Co.: Fresno, IX-16-38, *Atriplex bracteosa;* Firebaugh, VIII-2-50, *Atriplex;* Tranquility, VII-1-37, cotton (R. Upholt).

Imperial Co.: Coachella Valley, *Enceliae eriocephala*, collector and data unknown.

Kern Co.: Arvin VIII-18-36, *Atriplex* (G. L. Smith).

Stanislaus Co.: Modesto, IX-16-38, *Atriplex bracteosa*, and VIII-15-39, sweeping weeds.

Tulare Co.: Visalia, goldenrod and orange foliage (P. R. Jones, C.A.S.).

Genus *Ankothrips* D. L. Crawford

Ovipositor upturned. Wings broad and rounded at tip with two longitudinal veins in forewing and cross veins. Antennae nine-segmented, terminal segments not fused, second segment produced apically in the form of a tooth. Sensory areas on segments III and IV in the form of a transverse, narrow band partly encircling segments at tip. Vertex of head produced anteriorly. Dorsum of head and pronotum with prominent bristles. Ocelli present. Maxillary palpi three-segmented and labial palpi two-segmented. Abdomen broadly joined to thorax. Tarsal claws and tibial spurs lacking. Males smaller than females, sometimes with heavy spines on the dorsum of terminal abdominal segments.

Ankothrips species are abundant in the early spring in the flowers of native shrubs. There is only one generation a year. The nymphs spin cocoons in the top soil beneath the host plants.

Key to the World Species of *Ankothrips*

1(10). Mouth cone very long and pointed, extending considerably beyond posterior margin of pronotum. Ovipositor very long . Subgenus *Prionothrips* Priesner . . 10

Mouth cone short and blunt, not extending beyond posterior margin of prothorax . . . . . Subgenus *Ankothrips* s. str. . . 2

2(1). Projection on vertex over hanging base of antennae wider at base than at tip . . 3

Projection of vertex overhanging base of antennae with sides parallel 6

3(2). Sensory areas on antennal segments III and IV very broad, about one-fifth the length of the segment and extending almost entirely around the segment. Projection on antennal segment II

toothed or serrate on outer margin only (W. No. Amer.) . . . . . *yuccae* Moulton, 1926

Sensory areas on antennal segments III and IV narrow and extending little more than halfway around segment at tip 4

4(3). Median postocular bristles very short (0.016 mm.) and with microsetae between inner margin of eye and anterior ocellus strongly developed (W. No. Amer.) . . . . . *gracilis* Moulton, 1926

Three postocular bristles well developed 5

5(4). Posterior-angular bristles (pa) on pronotum 0.075 mm. long; sp bristles 0.052 mm.: with 3 strong lateral bristles on pronotum (W. No. Amer.) . . . . . *vandykei* Moulton, 1928

Pa bristles 0.052 mm.; sp bristles absent; lateral bristles on pronotum weak or absent (W. No. Amer.) . . . . . *diffractus* Hood, 1924

6(2). Projection of vertex with a deep U-shaped notch at tip. Median postocular bristles longer (0.072 mm.) than the inner or outer ones. Mid-lateral bristle (ml) very long (0.089 mm.) (So. Africa) . . . . . *fissidens* (Trybom), 1910

Projection of vertex with shallow V-shaped notch 7

7(6). Projection on second antennal segment simple—without notches or serrations on margin 8

Projection on second antennal segment notched on 1 or both sides near tip 9

8(7). All bristles on head and pronotum strongly developed; interocular bristles 0.069 pa bristles very long (0.115 mm.). Pronotum and parts of head, legs, and thorax golden-yellow (W. No. Amer.) . . . . . *notabilis* Bailey, 1940

Bristles on head and pronotum moderately well developed; interocular bristles 0.049 mm.; pa bristles 0.085 mm. Body uniform dark brown (W. No. Amer.) . . . . . *robustus* D. L. Crawford, 1909

9(7). Projection on vertex slightly wider at base than at tip. Pronotal bristles iam 0.023 mm. Interocellar bristles 0.046 mm. Color yellow to orange-brown . . . . . *vandykei* Moulton

Projection on vertex more slender with sides straight. Pronotal bristles iam 0.029 mm. Interocellar bristles 0.039 mm. Color yellow to orange-yellow with bristles dark brown; abdominal segments 2-7 each with dark brown transverse line on anterior margin of sternum (W. No. Amer.) . . . . . *aequalis* Moulton, 1926

10(1). Ovipositor 0.637 mm. long. Head produced in front of eyes and projection with sides nearly parallel. Antennal segments I and II light brown, remainder dark-brown (Cyprus) . . . . . *mavromoustakisi* Pr., 1939

Ovipositor 0.455 mm. long. Head scarcely produced in front of eyes and projection with base much wider than tip. Antennal segment I light brown, remainder dark brown (Central Europe) . . . . . *niezabitowskii* (Shille), 1910

Ankothrips aequalis Moulton

Ankothrips aequalis Moulton. 1926. Pan-Pac. Ent., 3(1):20-21.

Ankothrips aequalis, Bailey. 1940*b*. Pan-Pac. Ent., 16(3):97-106.

Location of type: Moulton collection. Holotype ♀, No. 605 allotype, No. 605, California Academy of Science.

Type locality: Redwood City, California.

Geographic range: California, Washington.

Discussion: This rare species appears to be represented only by seven specimens.

California record:

San Mateo Co.: Redwood City, IV-18-26, *Prunus demissa* (Dudley Moulton, C.A.S.).

Ankothrips gracilis Moulton

Ankothrips gracilis Moulton, 1926. Pan-Pac. Ent., 3(1):19-20.

Ankothrips gracilis, Bailey, 1940*b*. Pan-Pac. Ent., 16(3):97-106.

Location of type: Moulton collection. Holotype ♀, No. 713, allotype, No. 713, California Academy of Science.

Type locality: No collection data on type slides. The original description states the type material was taken "near Riverside and Mayfield, Calif."

Geographic range: California.

Discussion: Widespread in chamise flowers and particularly abundant along the coastal mountains. There is one generation a year.
California records:
Colusa Co.: Arbuckle, V-7-40, chamise.
Contra Costa Co.: Mt. Diablo.
Lake Co.: Bear Creek, VII-5-35, chamise flowers (J. J. duBois); Bartlett Springs, VI-10-36, chamise.
Los Angeles Co.: Tujunga, VI-16-32, chamise.
Mariposa Co.: Briceburg, VI-3-38, chamise flowers; Indian Flat, VI-3-38, chamise.
Monterey Co.: Near Jamesburg, V-26-50, chamise flrs.
Riverside Co.: Riverside, *Adenostoma fasciculatum;* Idyllwild, V-2-39, 5,000' (M. A. Embury).
Solano Co.: Mix Canyon, V-27-37, chamise.
San Mateo Co.: Mayfield, VI-5-27, *Adenostoma fasciculatum* (D. Moulton, C.A.S.).

Ankothrips notabilis Bailey

Ankothrips notabilis Bailey, 1940*b*. Pan-Pac. Ent., 16(3):102-103, pl. I. fig. 6, pl. III, fig. 5.
Location of type: University of California, Davis.
Type locality: Mix Canyon, Solano County, California
Geographic Range: California.
Discussion: This distinctly colored species is found principally in the flowers of California laurel in the spring along the banks of streams. There is only one brood a year.
California records:
Colusa Co.: Wilbur Springs, I-29-35, manzanita.
Los Angeles Co.: San Gabriel Canyon, III-19-39, flrs. of woody plants (A. W. Brereton).
San Bernardino Co.: Cajon Pass, IV-12-36, *Ceanothus* (R. M. Bohart).
San Diego Co.: Ramona, III-1953 (H. H. Keifer).
Santa Barbara CO.: Arroyo Seco, II-28-32, *Ceanothus.*
Sonoma Co.: near Kellogg's, III-1939, laurel flowers.
Solano Co.: Mix Canyon, II-1940, laurel flrs.; Mix Canyon, II-29-36, manzanita and plum blossoms; Gates Canyon, II-15-48, sweeping grass (A. T. McClay).

Ankothrips robustus D. L. Crawford
(Pl. 17, fig. 4)

Ankothrips robustus D. L. Crawford. 1909. Pomona Coll. Jour. Ent., 1(4):100-101, fig. 45, A-I.
Ankothrips robustus, Bailey. 1940*b*. Pan-Pac. Ent., 16(3):97-106.
Location of type: Canadian National Museum.
Type locality: Claremont, California.
Geographic range: Oregon, California.
Discussion: This *Ankothrips,* the type of the genus, is the most common and widely distributed representative of this western genus. It is found in the spring in flowers of native trees and shrubs.
California records:
Colusa Co.: III-6-35, manzanita.
El Dorado Co.: Placerville, *Prunus;* Camino, V-14-37, *Ceanothus.*
Lake Co.: Kelseyville, IV-24-35, *Ceanothus.*
Los Angeles Co.: Claremont, Calif. laurel (D. L. Crawford, C.N.M.).
Marin Co.: Mt. Tamalpais, IV-17-35, *Ceanothus.*
San Bernardino Co.: Cajon Pass, IV-12-36, *Ceanothus* (R. M. Bohart).
Santa Barbara Co.: Arroyo Seco, *Arctostaphylos stanfordiana.*
Santa Clara Co.: Los Gatos, *Ceanothus* (Dudley Moulton).
Santa Cruz Co.: Mt. Madrone, IV-22-37, *Ceanothus* (A. T. McClay).
Solano Co.: Mix Canyon, III-16-36, *Ceanothus;* Mix Canyon, II-29-36, plum.

Ankothrips yuccae Moulton

Ankothrips yuccae Moulton, 1926. Trans Amer. Ent. Soc., 52(2):119-121, pl. V, figs. 1-3.
Ankothrips yuccae, Bailey. 1940*b*. Pan-Pac. Ent., 16(3):97-106.
Location of type: Moulton collection. Holotype ♀, No. 491, allotype, No. 491, California Academy of Science.
Type locality: Fallbrook, Riverside County, California.
Geographic range: California.
Discussion: As indicated by its specific name, *yuccae* is found at present only in the flowers of *Yucca whipplei* in southern California in the spring. The nymph spins a cocoon in which to pupate.
California records:
Kern Co.: Kern Canyon, V-19-37, *Yucca whipplei* flrs.
Los Angeles Co.: Flintridge, VI-3-35, *Yucca whipplei.*
Riverside Co.: Fallbrook, IV-8-34, *Yucca whipplei* flrs. (A. Andre, C.A.S.); Fallbrook, VIII-4-25, yucca flrs. (E. O. Essig, C.A.S.).
San Diego Co.: Pine Grove District, V-1-38, *Yucca whipplei* flrs. (H. H. Keifer).
Ventura Co.: Fillmore, V-22-37, *Yucca whipplei* (B. E. White).

Genus *Aptinothrips* Haliday

Antennae six- or eight-segmented. Ocelli and wings absent. Legs very short. Head small, longer than broad. All setae small and sparse. Maxillary palpi three-segmented. Ovipositor downcurved. Male smaller than female with two short heavy spines on the dorsum of the ninth abdominal segment.

In North America this genus is found on grasses and in sod. In the spring and early summer adults and nymphs are found in the open on grass blades. I have not seen any male specimens.

Aptinothrips rufus (Gmelin)
(Pl. 21, figs. 33, 34)

Thrips rufa Gmelin, 1788. Caroli a Linné Syst. Nat., p. 2224.

Aptinothrips rufa, Haliday. 1836. Ent. Mag., 3:445. The synonymy has been given in detail by Preisner (1926).

Location of type: Unknown to me.

Type locality: Northern Europe.

Geographic location: Europe, India, South America, Massachusetts to Oregon.

Discussion: This wingless, sod-inhabiting insect is found most commonly in temperate areas. Sharga and other European workers have studied this and other grass-inhabiting species in detail. I have discussed the economic aspects elsewhere.

California records:

Alameda Co.: Berkeley, VII-1914, dog fennel (E. R. de Ong); Berkeley, V-1936, sweeping grass (A. T. McClay).

El Dorado Co.; Coloma, VII-18-39, sweeping grass; Meyers, VIII-26-50, grass.

Fresno Co.: Kings River Canyon, VIII-3-50, sweeping grass.

Lake Co.: Upper Lake, V-14-47, sweeping grass.

Mariposa Co.: Yosemite Valley, V-22-38, sweeping grass.

Marin Co.: Bolinas, IV-25-47, sweeping grass in salt marsh (R. M. Bohart).

Napa Co.: Mt. St. Helena, IV-2-36, sweeping.

Placer Co.: Roseville, V-3-39, sweeping grass.

Sacramento Co.: Sacramento, IV-27-39, sweeping barley (Bailey and Andre).

San Luis Obispo Co.: Atascadero Creek, IV-23-51, beating.

Santa Clara Co.: San Jose, III-2-10 (P. R. Jones).

Shasta Co.: Redding, V-23-49, sweeping grass.

Solano Co.: Fairfield, IV-4-47, grass under live oak; Gordon Valley, IV-1-36, grass.

Sonoma Co.: Skaggs Island, IV-12-51, oats.

Stanislaus Co.: Oakdale, VIII-2-50, sweeping grass.

Tulare Co.: Visalia, V-I-10, weeds (P. R. Jones).

Tuolumne Co.: Hardin Flat, VI-9-38, grass.

Yolo Co.: Davis, XII-17-35, dandelion; Rumsey, IV-2-36, grass.

Aptinothrips rufus stylifera Trybom

Aptinothrips stylifera Trybom, 1894. Ent. Tidskr., 15:41.

Aptinothrips rufus f. stylifera, Priesner. 1922. Konowia, 1:77.

Location of type: Hartwig (1952), reviewing Trybom's types, did not include this genus. Because the type material was in alcohol, it is very possible that no type specimen exists today. Trybom's collection is in the Naturhistoriska Museum, Göteborg, Sweden. Speyer (1935) has reviewed the genus in detail.

Type locality: Probably northern Europe.

Geographic location: Europe, Massachusetts, New York, Wyoming, Utah, Nevada, California.

Discussion: This variety or form has a two-segmented terminal style on the antenna. The typical species has antennae that are six-segmented only, instead of eight.

California records:

El Dorado Co.: Bijou, VIII-23-50, sweeping grass.

Fresno Co.: Cherry Gap, VIII-3-50, sweeping.

Shasta Co.: Manzanita Lake, VII-22-47; Redding, V-23-49, sweeping grass.

Tulare Co.: Visalia, V-1-10, weeds (P. R. Jones).

Genus *Arpediothrips* Hood

Hood described the genus as follows: "Body much flattened, glabrous. Head large and very broad, longer than and very nearly equal in width to prothorax. Antennae eight-segmented; trichomes on segments 3 and 4 forked. Mouth cone long, nearly attaining posterior margin of prosternum, moderately stout; maxillary palpi three-segmented. Pronotum, with two pairs of bristles at posterior angles, the outer pair minute and somewhat shorter than a pair at the anterior angles. Wings (when present) with two longitudinal veins which are sparsely but regularly setose throughout their length. Abdominal bristles short and slender."

All stages of *Arpediothrips* are found between leaves of *Yucca* in the western deserts. They feed on the soft tissue at the base of the leaves.

Arpediothrips mojave Hood
(Pl. 22, fig. 46)

Arpediothrips mojave Hood, 1927. Proc. Biol. Soc. Wash., 40:197–198.
Location of type: Cornell University.
Type locality: Mojave Desert, California.
Geographic range: Arizona, California.
Discussion: This thrips appears restricted to the leaf bases of *Yucca brevifolia* in desert regions. It is the type of the genus.
California records:

Kern Co.: Tehachapi, X-8-38, Joshua tree (H. H. Kiefer).

Los Angeles Co.: Littlerock, VIII-14-37, *Yucca brevifolia* (J. D. Hood).

San Bernardino Co.: Needles, VIII-6-36 (F. Andre).

Genus *Bregmatothrips* Hood

Head large, produced and overhanging base of antennae. Eyes swollen. Antennae eight-segmented with trichomes simple. Maxillary palpi three-segmented. Mouth cone short. Ocelli present in macropterous forms. Prothorax elongated. Pronotum with two long bristles at each outer posterior angle. Legs unarmed. Wings, when present, with two longitudinal veins. Abdomen with scallops or comb plates, similar to *Heterothrips*, on the posterior margin of tergites II-VIII. Ovipositor downturned. Males usually brachypterous and without thorns or chitinous projections on terminal body segments.

Key to the North American Species of *Bregmatothrips*

1. Fore vein of forewing with bristles along its entire length. Eyes strongly protruding and head projecting noticeably beyond eyes . . . . *iridis*[3] Watson, 1924
   Fore vein of forewing with 2 distal bristles and 4-5 in basal group 2
2. Postoculars short. Antennal segment VI with slight constriction at base; III-V yellow . . . . . *gracilis* Hood and Williams, 1915
   Postoculars long. Antennal segment VI without constriction at base; III-V shaded with brown . . . . . *venustus* Hood, 1912

[3]Priesner, 1940, Philippine Jour. Sc., 71:403, established the genus *Iridothrips* for this species on the basis of the long bristle near the outer anterior angles of the pronotum. A similar situation occurs in *Taeniothrips orionis*, *T. vulgatissimus*, *Thrips impar* Hood and others which have a long bristle similarly placed. To date subgenera have not been established for these species.

Bregmatothrips venustus Hood
(Pl. 20, fig. 24)

Bregmatothrips venustus Hood, 1912. Proc. Biol. Soc. Wash., 25:66–67, pl. IV, left, fig. 2, *a, b.*
Location of type: Cornell University.
Type locality: Brownsville, Texas.
Geographic location: Hawaii, Cuba, Illinois, Tennessee, Texas, Wyoming, Arizona, California, and Mexico.
Discussion: Bermuda grass is the first place to look for this thrips. The males are brachypterous and bicolorous. In undisturbed mats of this grass it breeds in large numbers, resulting in a silvering of the blades.
California records:

El Dorado Co.: Coloma, VII-18-39, sweeping grass.

Fresno Co.: Fresno, IX-16-38, *Atriplex bracteosa.*

Imperial Co.: Bond's Corner, XII-24-48, bermuda grass (F. M. Summers).

Kern Co.: Shafter, VI-16-42, onion flrs., grass, and cotton.

Merced Co.: Merced, VII-5-39, sweeping bermuda grass.

Monterey Co.: Big Sur, VIII-31-46, coffee fern (W. H. Lange).

Orange Co.: Yorba Linda, VII-1936, bermuda grass.

Stanislaus Co.: Oakdale, VII-2-50, sweeping grass.

Yolo Co.: Davis, XI-2-37, bermuda grass (S. R. Moyer), VII-24-39, bermuda grass, VI-4-41, bermuda grass.

Genus *Chilothrips* Hood

Antennae eight-segmented, segments III and IV with forked sensory trichomes. Head broad, vertex somewhat pointed anterior to forward ocellus. Pronotum very long, sides parallel; one prominent bristle only near each posterior outer angle. Mouth cone unusually large and extending considerable distance onto mesosternum. Maxillary palpi three-segmented. Forewings with two longitudinal veins. All tibiae with two small spurs at distal end. Abdominal segment VIII without a comb. Ovipositor downcurved. General appearance is that of *Oxythrips* and *Anaphothrips.*

Chilothrips pini Hood
(Pl. 22, fig. 45)

Chilothrips pini Hood, 1916. Proc. Biol. Soc. Wash., 29:119–121.
Location of type: Cornell University.
Type locality: Bladensburg, Maryland.
Geographic location: Maryland, New York, Virginia, Minnesota, California.
Discussion: Together with several *Oxythrips* species, this single member of *Chilothrips* appears to prefer conifers. The very large mouth cone and pronotum make it easy to recognize. It is known only from two collections in California. Only females have been taken.
California record:
Fresno Co.: Huntington lake, VI-26-48, wild currant (A. T. McClay).
Sierra Co.: VI-21-32, dwarf *ceanothus* (A. C. Browne, C.A.S.).

Genus *Chirothrips* Haliday

Head small and projected forward beyond the eyes. Eyes small and somewhat flattened. Antennae eight-segmented, sometimes with basal segments swollen or asymmetrically projected. Sensory trichomes forked or simple. Maxillary palpi three-segmented. Fore legs reduced, unarmed. Prothorax wedge-shaped. Forewings long and narrow with two longitudinal veins. Ovipositor downcurved. Males smaller than females and with ocelli and wings absent. Posterior margins of abdominal segments of males with variable comb. Abdomen bluntly pointed and without thorns or chitinous projections.

Key to the California Species of *Chirothrips*

Females

1. First antennal segment greatly enlarged . 2
First antennal segment normal or only slightly swollen 3

2(1). Posterior angles of pronotum each with 1 bristle (pa) longer than others. Reticulations on mesonotum in the form of longitudinal rows of scallops . . . . . *spiniceps* Hood, 1915
Posterior angles of pronotum each with 2 long pa bristles of about equal length. Reticulations on mesonotum variable . . . *mexicanus* D. L. Crawford, 1909

3(1). Second antennal segment greatly enlarged outwardly and distally. 4
Second antennal segment normal or gradually enlarged symmetrically toward the tip 5

4(3). Tip of projection of antennal segment II with a very small terminal seta. . . . . *manicatus* (Haliday), 1836
Tip of projection of antennal segment II with a subterminal seta . . . . . *aculeatus* Bagnall, 1927

5(3). Sensory trichome on antennal segment IV forked . . . . . *secalis* Moulton, 1935
Sensory trichome on antennal segment IV simple . . . . . *falsus* Priesner, 1925

Males

1. First antennal segment greatly enlarged 2
First antennal segment normal or only slightly swollen 3

2(1). Posterior angles of pronotum each with 1 bristle (pa) longer than others . . . . . spiniceps Hood
Posterior angles of pronotum with 2 long pa bristles . *mexicanus* D. L. Crawford

3(1). Reticulations on anterior half of pronotum represented by smooth, nearly continuous lines arranged in a semicircle 4
Reticulations on anterior half of pronotum arranged in a series of slightly curved broken lines more widely spaced, sometimes forming polygons 5

4(3). Posterior margin of abdominal sternites with prominent comb. Antennal segments III-V not swollen. . . . *secalis* Moulton
Posterior lateral margins of abdominal sternites with indistinct, scattered comb teeth bluntly rounded. Intermediate antennal segments swollen. . . . . *aculeatus* Bagnall

5(3). Comb teeth indistinct and sparse on abdominal tergites . . . . *manicatus* Haliday
Comb teeth distinct (fused at base) and usually a complete row on abdominal tergites II-VIII. . . . . *falsus* Priesner

Chirothrips aculeatus Bagnall

Chirothrips aculeatus Bagnall, 1927. Ann. Mag. Nat. Hist., Ser. 9, 19:567.
Chirothrips similis Priesner, 1926 (nec *similis* Bagnall, in part). Thys. Eur., pp. 142, 708.
Chirothrips aculeatus, Hood. 1938, Ent. Mon. Mag., 74:164.

Chirothrips aculeatus, Andre, 1939. Proc. Ent. Soc. Wash., 41(6):196–197.

Location of type: British Museum.

Type locality: Unknown to me.

The male was described by Andre from Davis and Gilroy, California.

Geographic location: Europe, Washington, Oregon, California.

Discussion: This *Chirothrips,* together with other grass- and grain-infesting species sometimes becomes injurious in the early summer.

California records:

Alameda Co.: Berkeley, VII-10-35, rhododendron.

Alpine Co.: Markleeville, VII-12-48, lupine (R. M. Bohart).

Calaveras Co.: Calaveras Big Trees, VI-8-39, *Ceanothus*; Avery, VI-8-39, grass.

Colusa Co.: Grizzly Springs Lake, V-14-46, grass.

Contra Costa Co.: Antioch, VI-5-39, sweeping grass.

El Dorado Co.: Kyburz, III-20-39, sweeping grass; Coloma, VII-18-39, sweeping grass.

Fresno Co.: Cherry Gap, VIII-3-35, sweeping.

Lake Co.: Upper Lake, V-14-47, sweeping grass.

Madera Co.: Bass Lake, VI-7-38, marsh grass; Chowchilla, II-9-34, grass.

Marin Co.: Bolinas, I-26-51, bush lupine; Stinson's Beach, VII-3-49, grass.

Mendocino Co.: Philo, VII-19-49, grass.

Mariposa Co.: Yosemite, VI-7-38, grass.

Merced Co.: Snelling, VIII-2-50, sweeping.

Modoc Co.: Willow Ranch, V-24-49, sweeping grass; Alturas, V-24-49, willow.

Monterey Co.: Rocky Creek, VIII-29-50, sweeping (R. M. Bohart).

Napa Co.: St. Helena, VI-9-36, sweeping grass.

Nevada Co.: Nevada City, VI-26-49, grass and holly (R. M. Bohart).

Orange Co.: Tustin, VI-18-47, grass.

Placer Co.: Auburn, IV-27-39, grass sweeping (Andre and Bailey); Lincoln, XI-21-37, grass; Lake Tahoe, VII-23-48, sweeping grass; Applegate, VI-14-39, grass and lupine.

Sacramento Co.: Sacramento, IV-27-39, sweeping barley (Bailey and Andre).

San Francisco Co.: San Francisco.

Santa Barbara Co.: Arroyo Seco, V-26-49, sweeping.

Santa Clara Co.: Gilroy, VII-14-36, tomato; Palo Alto, VI-27-39, sweeping grass, and VII-4-27, Salix (J. D. Hood).

Shasta Co.: Redding, III-23-48.

Solano Co.: Vacaville, VI-2-39, *Sambucus* and oak; Fairfield, VI-15-36, grass.

Sonoma Co.: Sonoma, IV-17-46, grass under oak, Vineburg, III-10-36, grass.

Stanislaus Co.: Oakdale, VIII-2-50, grass.

Yolo Co.: Davis, VI-6-41, barley, IV-20-48, *Fescue,* IV-27-38.

Yuba Co.: Marysville, VI-4-31, pears (J. B. Steinweden); Smartville, IV-26-36, grass.

Chirothrips falsus Priesner

Chirothrips falsus Priesner, 1925. Zool Jahrb., Abt. System., 50:312–313.

Chirothrips simplex Hood, 1927*b*. Jour. N.Y. Ent. Soc., 35:128. Andre, 1939 Proc. Ent. Soc. Wash., 41(6):195–196. Hood, 1939. Rev. de Ent., 10(2): 463.

Location of type: Priesner collection, Cairo, Egypt.

Type locality: Tlalpam, Chapingo, Mexico.

Geographic location: Europe, Canada, Illinois, North Dakota, South Dakota, Iowa, Colorado, Texas, New Mexico, Arizona, California, Mexico.

Discussion: The California records are new and indicate a widespread distribution in the state on grasses.

California records:

Butte Co.: Bear Creek, VII-26-47, sweeping (R. M. Bohart).

Contra Costa Co.: Mount Diablo, sweeping.

El Dorado Co.: Bijou, VII-23-50, grass.

Imperial Co.: Bond's Corner, XII-26-48, bermuda grass (F. M. Summers).

Chirothrips manicatus Haliday
(Pl. 19, fig. 21)

Thrips (*Chirothrips*) *manicata* Haliday, 1836. Ent. Mag., 3:444.

Chirothrips manicata, Amyot et Serville. 1843. Ins. Hemip., p. 642.

Chirothrips manicatus, Hinds. 1902. Proc. U.S. Nat. Mus., 26(1310):134–136. The synonymy is given in detail by Priesner (1926), pp. 138–139.

Location of type: Unknown to me, probably British Museum, if specifically designated by author.

Type locality: Great Britain.

Geographic location: Europe, South America, Hawaii, North America; widespread from Massachusetts to Florida, California to British Columbia.

Discussion: Though having a wide range, this species does not appear to have the propensity for injuring grains as does *C. aculeatus.*

California records:

Calaveras Co.: Avery, VI-8-39, sweeping.

El Dorado Co.: Kyburz, III-20-39, grass.

Modoc Co.: Alturas, V-24-49, *Ceanothus*.
Monterey Co.: Rocky Creek, VIII-29-50, sweeping (R. M. Bohart).
Nevada Co.: Nevada City, VII-26-50, broom.
Shasta Co.: Burney, V-23-49, meadow.
Solano Co.: Fairfield, V-27-37, oak galls.

Chirothrips mexicanus D. L. Crawford

Chirothrips mexicana D. L. Crawford, 1909. Pomona Coll. Jour. Ent., 1(4):114–115.
Chirothrips mexicanus, Hood, 1939. Rev. de Ent., 10(2):464–465. Bailey, 1944. Pan-Pac. Ent., 20 (3):82.
Location of type: Cornell University.
Type locality: Guadalajara, Mexico.
Geographic location: Philippine Islands, Hawaii, South America, West Indies, Mexico, Florida, Illinois, Arizona, California.
Discussion: The collection records would indicate that C. *mexicanus* is common but it is much less frequently found than the foregoing species.
California records:
Amador Co.: Ione, VI-8-39, grass.
Fresno Co.: Fresno, VII-5-34, grass.
Imperial Co.: Bond's Corner, XII-26-48, bermuda grass (F. M. Summers).
Kern Co.: Shafter, VI-16-42, onion flrs., grass, and cotton.
Madera Co.: Chowchilla, VIII-15-39, *Echinochloa* grass (Andre).
Merced Co.: Merced, VII-5-39, sweepings bermuda grass.
Modoc Co.: Willow Ranch, V-25-49, grass.
Orange Co.: Anaheim, VI-20-41, bermuda grass.
Tulare Co.: Pixley, IV-21-49, sweeping grass.
Yolo Co.: Davis, VI-13-41, *Artiplex* sp.

Chirothrips secalis Moulton

Chirothrips secalis Moulton, 1935. Pan-Pac. Ent., 11(4):173–74.
Location of type: Unknown to me.
Type locality: Willow Ranch, Modoc County, California.
Geographic location: California, Wyoming.
Discussion: At present this species appears limited to grass in wet meadows at high elevations.
California records:
Madera Co.: Bass Lake, VI-7-38, grass.
Modoc Co.: Willow Ranch, VII-9-29, rye grass (G. R. Struble, original description); Willow Ranch, V-24-49, grass (R. M. Bohart).
Tuolumne Co.: Sonora Pass, VIII-28-48, grass.

Chirothrips spiniceps Hood

Chirothrips spiniceps Hood, 1915. Insec. Inscit. menst., 3(1-4):12-15.
Chirothrips sacchari Moulton, 1936. Proc. Hawaii. Ent. Soc., 9(2):181.
Chirothrips spiniceps, Andre, 1939. Proc. Ent. Soc. Wash., 41(6):198. Hood, 1939. Rev. de Ent., 10(2):464.
Location of type: Cornell University.
Type locality: Arizona ("Region of Glendale and Phoenix").
Geographic location: Hawaii, Atlantic Coast of North America, Massachusetts to Florida, and westward to California.
Discussion: This thrips also becomes very abundant locally on grasses (and sugar cane). Like many *Chirothrips* in the arid southwest, it hibernates under the bark of trees and in Spanish moss.
California records:
Los Angeles Co.: Glendale (H. H. Keifer).
Madera Co.: Chowchilla, VIII-15-39, grass.

Genus *Dactuliothrips* Moulton

Antennae nine-segmented, segments without projections and terminal segments not fused. Sensory areas on segments III and IV represented by two circular to oval areas on each segment, annulations strongly developed. Head and pronotum with prominent bristles. Vertex of head not produced. Maxillary palpi three-segmented. Labial palpi two-segmented. Fore tarsi with well-developed claws. Fore tibiae without teeth or spurs. Wings broad and rounded at tip. Ovipositor curved upward. Male smaller than female. Tip of abdomen bluntly rounded and without claspers or thornlike projections.

This genus is presently found only in the western area.

Key to the Species of *Dactuliothrips*

1(4). Spurs on inner margin of fore femora absent or weak; when present, 1 to 4 in number, usually 1 or 2. Spines on body prominent but slender.

2(3). Fore tibiae with 2 stout distal spurs; fore femora without spurs. Claw on fore tarsus with strong basal tooth. Antennae uniformly dark brown . . . . . *D. diversus* Bailey, 1939

3(2). Fore tibiae without distal spurs; fore femora with 1 to 4 (usually 1 or 2) weak spurs on inner margin. Claw on fore tarsus simple or with a very weak tooth near base. Third and basal three-fourths of antennal segment IV yellow, remainder brown . . . . . *D. xerophilus* Bailey, 1937

4(1). Spurs on inner margin of fore femora strongly developed, 2 to 9 in number. Spines on body dense and strongly developed.

5(6). Claw on fore tarsus simple and knobbed. Fore femora with 4 to 9 spurs on inner margin. Antennae uniformly blackish brown . . . . *D. bobarti* Bailey, 1937

6(5). Claw on fore tarsus with small tooth below tip. Fore femora with 2 to 5 spurs on inner margin. Antennae dark brown with third segment yellow . . . . . *D. spinosus* Moulton, 1931

Dactuliothrips bobarti Bailey

Dactuliothrips bobarti Bailey, 1937*c*. Pan-Pac. Ent., 13(3):122-123.

Location of type: University of California, Davis.

Type locality: Tehachapi Pass, California.

Geographical location: California.

Discussion: This member of the desert-inhabiting genus is found abundantly in the flowers of Joshua trees in the early spring. The uniformly black antennae and heavily spined pronotum distinguish this species.

California records:

Kern Co.: Tehachapi Pass, IV-10-36, *Ceanothus* and a legume (R. M. Bohart); Frazier Park, V-2-52, oak flrs.

Los Angeles Co.: Valyermo, IV-12-36, *Ceanothus* (R. M. Bohart); near Lancaster, IV-19-49, *Ceanothus*.

Riverside Co.: Palm Springs, III-25-37, Joshua tree flrs., and a legume (R. M. Bohart).

Dactuliothrips diversus Bailey

Dactuliothrips diversus Bailey, 1939. Pan-Pac. Ent., 15(4):170-172.

Location of type: University of California, Davis.

Type locality: Hinkley, California.

Geographic location: California.

Discussion: This species is set apart from the other three representatives by the lack of femoral spurs and the large tibials.

California records:

Los Angeles Co.: Lancaster, IV-13-38, *Oenothera* and *Coreopsis* (A. Downes).

San Bernardino Co.: Hinkley, *Oenothera dentata parishii*, IV-15-38 (B. E. White).

Dactuliothrips spinosus Moulton (Pl. 17, fig. 7)

Dactuliothrips spinosus Moulton, 1931. Pan-Pac. Ent., 7(4):173-174.

Location of type: Moulton collection. Holotype ♀, No. 3832, allotype, No. 3832, California Academy of Science.

Type locality: Willow Ranch, Goose Lake, Modoc County, California.

Geographic location: Utah, Oregon, California.

Discussion: This species is the type of the genus and appears to be the most widespread. Recent collections (Bailey and Knowlton, 1939) have shown that this thrips extends eastward to the Rocky Mts.

California records:

Kern Co.: Frazier Park, V-2-52, oak flrs.; Johannesburg, VI-1-52, sweeping; Kern River Canyon, IV-19-49, *Ceanothus*.

Los Angeles Co.: Near Lancaster, IV-19-49, *Ceanothus*.

Modoc Co.: Willow Ranch, V-19-29, on *Prunus demissa* (G. R. Struble C.A.S.).

San Bernardino Co.: Cajon Pass, IV-12-36, *Ceanothus* (R. M. Bohart).

San Luis Obispo Co.: West of McKittrick, V-2-52, sweeping wild flowers.

Dactuliothrips xerophilus Bailey

Dactuliothrips xerophilus Bailey, 1937*c*. Pan-Pac. Ent., 13(3):123-126.

Location of type: University of California, Davis.

Type locality: Mojave, California.

Geographic location: California.

Discussion: This species appears to be restricted to the southeastern part of the state.

California records:

Kern Co.: Mojave, III-23-37, Joshua tree flowers (R. M. Bohart).

Los Angeles Co.: Littlerock, III-23-37, Joshua tree flrs.; near Lancaster, IV-19-49, *Ceanothus*.

Riverside Co.: Idyllwild, IV-4-39, *Ericameria pinifolia* (R. M. Bohart).

San Bernardino Co.: Victorville, IV-13-37, Joshua tree flrs. (A. E. Michelbacher).

Genus *Drepanothrips* Uzel

Antennae six-segmented and without a style; sensory trichomes forked on segments III and IV. Head and pronotum and wings similar to *Scirtothrips*. Microsetae present on lateral margins of abdominal segments as in *Sericothrips*. Two longitudinal veins present on forewing but indistinct. Maxillary palpi three-segmented. Abdominal tergite VIII with comb. Legs unarmed. Ovipositor downturned. Male smaller than female and with a pair of long sickle-shaped bristles extending beyond tip of abdomen.

Drepanothrips reuteri Uzel

Drepanothrips reuteri Uzel, 1895. Monogr. Ord. Thys. Königgrätz, pp. 213-214; Priesner, H., 1926. Thys. Eur., pp. 170-173.

Drepanothrips reuteri, Bailey, 1942. Jour. Econ. Ent., 35(3):382-386.

Location of type: Unknown to me.

Type locality: Czechoslovakia.

Geographic location: Europe, North America (California only).

Discussion: The vine thrips is one of two injurious Thysanoptera found in vineyards. It attacks both fruit and leaves but the damage fluctuates considerably from year to year. It was apparently introduced from Europe where it is found on various deciduous native trees as well as vines. The biology is somewhat different in this state because of the long growing season and mild winter.

California records:

El Dorado Co.: Riverton, X-20-50, leaf mold.

Fresno Co.: Sanger, VII-14-37, grape.

Kern Co.: Delano, VIII-19-37 (G. A. Osner).

Napa Co.: Spring Mt., VIII-8-46, grape (N. W. Frazier); Cloverdale, IX-1940, grape; St. Helena, IX-19-40, grape.

Sacramento Co.: Florin, IV-2-26, grape (T. D. Urbahns).

Santa Clara Co.: Los Gatos, VIII-5-40, grape (Leslie M. Smith).

Solano Co.: Green Valley, VIII-7-40, grape (N. W. Frazier).

Tulare Co.: Dinuba, VII-17-36, grape (A. D. Rizzi).

Yolo Co.: Davis, IX-23-35, grape.

Genus *Echinothrips* Moulton

Antennae eight-segmented, segment VI long and slender. Sensory trichomes simple and slender. Dorsum of head and thorax reticulated, the network of lines forming polygons. Two long bristles along each outer posterior margin of pronotum. Maxillary palpi appear to be only two-segmented. Forewings with only one longitudinal vein that extends entire length of wing. The complete row of bristles on this vein are blunt at tip as are those along costal margin. Legs unarmed. Ovipositor downcurved. One pair of bristles in center of dorsum of each of abdominal segments I-VIII. Segment VIII with comb. The male has a large number of small, oval, scattered sensory areas on sternites of abdominal segments II-VIII.

Echinothrips americanus Morgan
(Pl. 20. fig. 27)

Echinothrips americanus Morgan, 1913. Proc. U.S. Nat. Mus., 46(2008):14-16.

Location of type: United States National Museum, Cat. No. 15,726.

Type locality: Quincy, Florida.

Geographic location: Florida, South Carolina, Tennessee, District of Columbia, Maryland, Missouri, and California.

Discussion: Moulton's collection of 1 specimen in 1909 from California is very unusual. In the many years of intensive collecting in this state no additional representatives of this genus have been taken, to my knowledge. The above mentioned record was first published by Bailey and Cott (1952).

California record:

Shasta Co.: Olinda, III-30-09, *Prunus* (D. Moulton, C.A.S.).

Genus *Erythrothrips* Moulton

Head usually wider than long, cheeks arched. Ocelli present. Compound eyes rounded dorsally and produced backward ventrally. Antennae nine-segmented with the last two segments closely joined. One linear sensory area on each of segments, III and IV. Maxillary segments variable, from five to nine, geniculate. Labial palpi four-segmented. Prothorax small, but little shorter than head and with all bristles small. Fore tarsi with fingerlike hook. Wings broad and rounded. Ovipositor upturned. Terminal abdominal segments of female long and pointed. Male much smaller than female, abdomen slender and with long, slender bristles only.

Key to the World Species of *Erythrothrips*

1(2). Forewings uniformly dark blackish brown 2
Forewings with posterior half with blackish brown longitudinal band 3

2(1). Third antennal segment black (So. Amer.) . . . . . *stygicus* Hood, 1938
Third antennal segment golden-yellow (So. Amer.) . . . *nigripennis* Hood, 1937

3(1). Forewings with dark band along distal two-thirds of posterior margin only (scale black)(W. No. Amer.) . . . . . *keeni* Moulton, 1929
Forewings with dark band extending the entire length of posterior margin . . . 4

4(3). Segment III of antenna light yellow. . . 5
Segment III of antenna bicolorous, yellow at base and shading to dark brown in outer part 6

5(4). All tibiae and tarsi lemon-yellow in color (India) . . . . . *asiaticus* A. and M., 1930-1931
All tibiae and tarsi dark brown (W. No. Amer.) . . . . *durango* Watson, 1923

6(4). Segment III of antenna very long (200μ). Distal three-fifths of segment II yellow (So. Amer.) . . *costalis* Hood, 1937
Segment III of antenna much shorter. Segment II uniformly dark brown 7

7(6). Sensory area on antennal segment III very short (about 16μ) and often oval (W. No. Amer.) . . . . . *fasciculatus* Moulton, 1929
Sensory area on antennal segment III extending at least one-third the length of segment, narrow and often curved . . 8

8(7). Head longer than wide. Sensory area on antennal segment III about 60μ. Maxillary palpi 8-segmented (W. No. Amer.) . . . . . *arizonae* Moulton, 1911
Head about as long as wide. Sensory area on antennal segment III about 33μ (W. No. Amer.) . . *bishoppi* Moulton, 1929

Erythrothrips arizonae Moulton
(Pl. 17, fig. 1; pl. 18, figs 9, 11)

Erythrothrips arizonae Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, pt. III, pp. 21, 34-36.

Erythrothrips arizonae, Bailey, 1947*a*. Pan-Pac. Ent., 23(3):103-109.

Location of type: Moulton collection. Holotype ♀, No. 200, California Academy of Science.

Type locality: Phoenix, Arizona.

Geographic location: Arizona, Nevada, California.

Discussion: This *Erythrothrips* species is the type of the genus. It is farily common but not collected as frequently as its relative *fasciculatus*. It is collected only in the spring and is not restricted to any particular host plant.

California records:

Alpine Co.: Markleeville, *Mentzelia laevicaulis;* Ebbets Pass, VII-31-26, (C.A.S.).

Butte Co.: Oroville, orange and olive blossoms, *Rhamnus purshiana* (B. B. Whitney).

Inyo Co.: Panamint Mts., Mt. Spring, IV-4-39, beating willow (R. M. Bohart); Furnace Creek, IV-4-39, creosote bush (B. E. White); Mazorka Cyn., 7,000′, VI-1937, *Stanleya* sp. (C. Beutler).

Kern Co.: Tehachapi Pass, IV-10-36, legume (R. M. Bohart); Onyx, IV-13-38, Joshua tree flrs. (B. E. White).

Riverside Co.: Banning, *Artemisia californica;* Palm Canyon, IV-15-38, cat's claw (R. M. Bohart).

San Diego Co.: Willows, *Rhamnus purshiana.*

Santa Clara Co.: Mayfield, *Adenostoma fasciculatum.*

Erythrothrips fasciculatus Moulton

Erythrothrips fasciculatus Moulton, 1929. Bull. Brooklyn Ent. Soc., 24(4):224-225.

Erythrothrips fasciculatus, Bailey, 1947*a*. Pan-Pac. Ent., 23(3):103-109.

Location of type: Moulton collection. Holotype ♀, No. 2782, allotype, No. 2784, California Academy of Science.

Type locality: Santa Barbara, California.

Geographic location: California.

Discussion: This thrips is found abundantly in the flowers of *Adenostoma fasciculatum* in the spring. It has one generation a year, and the nymphs spin cocoons. It is separated from *arizonae* by the short antennae and very small sensory areas on segments III and IV.

California records:

Colusa Co.: Arbuckle, V-7-40, chamise.

Contra Costa Co.: Mt. Diablo, V-29-36, chamise.

Lake Co.: Bartlett Springs, VI-10-36, chamise; Bear Creek, VII-5-35, chamise (J. J. duBois).

Mariposa Co.: Briceburg, VI-3-38, chamise; Indian Flat, VI-3-38, chamise.

Santa Barbara Co.: Santa Barbara, V-15-28, yellow clover (D. Moulton, C.A.S.).

Solano Co.: Mix Canyon, V-1938, California sage.

Erythrothrips keeni Moulton

Erythrothrips keeni Moulton, 1929. Bull. Brooklyn Ent. Soc., 24(4):226-227.

Erythrothrips keeni, Bailey. 1947*a*. Pan-Pac. Ent., 23(3):103-109.

Location of type: Moulton collection. Holotype ♀, No. 2515, allotype, No. 2515, California Academy of Science.

Type locality: Bly, Oregon.

Geographic location: Colorado, Utah, Idaho, Oregon, Nevada, California.

Discussion: The large size and bright iridescence of this thrips makes it "spectacular" to the general collector. It is one of the largest thrips in the state and has the widest distribution of any of the genus in North America. It is common in flowers of *Chrysothamnus* in arid western mountainous regions.

California records:

Alpine Co.: Markleeville and Ebetts Pass, VII-31-26 (D. Moulton), *Mentzelia laevicaulis* and white yarrow (C.A.S.).

Inyo Co.: Bishop Creek, VIII-2-36, *Erigonum* (R. M. Bohart).

Mono Co.: Convict Lake, VIII-6-37, "yellow flowered shrub" (R. M. Bohart).

Placer Co.: Lake Tahoe, VII-27-48, *Chrysothamnus nauseosus*.

San Diego Co.: Escondido, V-7-49, *Mimulus* sp. (R. M. Bohart).

Sierra Co.: Webber Lake, VIII-25-46, sweeping (R. M. Bohart).

Tuolumne Co.: Sonora Pass, VII-19-36, sweeping wild flowers (R. M. Bohart).

Genus *Frankliniella* Karny

Antennae eight-segmented, segments III and IV with forked trichomes; two terminal segments reduced to form a style. Head usually slightly wider than long. Ocelli and interocellar bristles present. Ocelli sometimes absent in seldom-encountered brachypterous forms. Maxillary palpi three-segmented. Prothorax wider than long with prominent bristles on both anterior and posterior outer angles. Legs unarmed. Forewings with two longitudinal veins extending full length of wing and which are beset with bristles throughout their length. Abdominal segment VIII with or without a comb. Male smaller than female. Terminal segments without thornlike bristles. Sternites III-VII sometimes with oval or dumbbell-shaped sensory areas.

The genus *Frankliniella* is one of the most difficult in the entire order Thysanoptera. There have been nearly one hundred and fifty species described or transferred in and out of the genus. Many species are so poorly described and so much dependence has been placed on color (in a group where color is very variable) that much confusion obtains. Watson (1923) and Morgan (1925*b*) prepared keys to the American species. Hood (1925) established "groups" within the genus. Moulton (1948) made an attempt to bring together all the papers on the group and devise a key to the species. It is a very useful reference but leaves many problems unanswered.

The genus in the broadest sense included several "groups" and "series," all of which do not occur in California. Bryan and Smith (1956) have studied carefully the California species, examined many types and given considerable new synonymy. We are listing below only those species from the state which they consider valid.

Key to the California Species of *Frankliniella*

1(2). Interocellar bristles very small, .016 mm. Forewings uniformly smoky brown . . . . . *minuta* Moulton, 1907

Interocellar bristles longer, .040-.070 mm. Forewings nearly colorless to light yellowish brown 2

2(1). Comb on posterior margin of abdominal segment VIII absent 3

Comb on posterior margin of abdominal segment VIII present although sometimes weak in center 4

3(2). Head with a square appearance, somewhat projected in front. Cheeks straight and parallel. Body uniformly brown, forewings nearly colorless. Outer posterior bristles on pronotum .076 mm. long . . . . . *tenuicornis* (Uzel), 1895

Head wider than long, cheeks slightly swollen. Body, legs, and wings light yellow. Outer posterior bristles on pronotum .05 mm. long . . . . . *insignis* Moulton, 1935

4(2). Bristles on veins of forewing: 17 on fore vein, 13 on hind vein . . . . . *conspicua* Moulton, 1935

Bristles on veins of forewing: 22-27 on fore vein and 17-20 on hind vein . . . 5

5(4). Outer posterior bristle on pronotum .096 mm. Antennal segment III, .070 mm. . . . . *yuccae* Moulton, 1935

Outer posterior bristle on pronotum .076 mm. Antennal segment III, .057 mm. . . . . *occidentalis* (Pergande), 1895

Frankliniella conspicua Moulton

Frankliniella conspicua Moulton, 1935. Pan-Pac. Ent., 11(4):173.

Location of type: Moulton collection. Holotype ♀, No. 2816, California Academy of Science.

Type locality: Lakeport, California.

Geographic location: California.

Discussion: The holotype is the only specimen known to me.

California record:

Lake Co.: Lakeport, V-27-28, *Orthocarpus lacerus* (H. Parker, C.A.S.).

Frankliniella insignis Moulton

Frankliniella insignis Moulton, 1935. Pan-Pac. Ent., 11(4):170.

Location of type: Moulton collection. Holotype ♀, No. 3481, California Academy of Science.

Type locality: Yuma, Arizona.

Geographic location: California, Arizona, Texas, and Mexico.

Discussion: This thrips is known from the original collection and interceptions in plant quarantine on flowers at Brownsville, Texas.

California record:

"Southern California," V-10-29, citrus foliage (R. S. Woglum, C.A.S.). The type specimen was actually taken on the Arizona side of the Colorado River at Yuma.

Frankliniella minuta Moulton

Euthrips minuta Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12 pt. III, pp. 56-57.

Euthrips minutus var. *setosus* D. L. Crawford, 1909. Pomona Coll. Jour. Ent., 1(4):105.

Frankliniella minuta, Karny, 1912. Zool. Ann 4:335. Hood, 1914, Proc. Ent., Soc. Wash., 16:38. Moulton, 1948, Rev. de Ent., 19(1-2):93. Priesner, 1935, Deuts. Ent. Zeitschr., 1:16.

Location of type: Moulton collection. Holotype ♀, no number, California Academy of Science.

Type locality: Berkeley, California.

Geographic location: Hawaii, Central America, Wyoming, Montana, Utah, Oregon, Nevada, Arizona, California.

Discussion: This small, dark *Frankliniella* is widely distributed in the western states. It might be expected that such a well-adapted species will extend its range and at times become abundant. The adults are often found hibernating under bark.

California records: The following are representative:

Alameda Co.: Berkeley, grass (D. Moulton, C.A.S.).

Inyo Co.: Westgaard Pass, V-18-47, sweeping (R. M. Bohart).

Kern Co.: Shafter, X-13-35, rubber tree (G. L. Smith).

Lake Co.: Lakeport, V-27-28, *Orthocarpus lacerus* (H. Parker); Upper Lake, V-14-47, grass.

Los Angeles Co.: Malibu Beach, IV-13-36, sweeping (R. M. Bohart).

Madera Co.: Bass Lake, VI-6-38, Plantain (R. M. Bohart and S. F. Bailey).

Mendocino Co.: Willits, VII-24-52 (W. C. Bentnick).

Modoc Co.: Willow Ranch, V-24-49, grass.

Monterey Co.: Salinas, VIII-2-42, guayle (W. H. Lange).

Orange Co.: Newport Beach, III-1-32, composite.

Placer Co.: Roseville, V-3-39, monkey flrs.

Riverside Co.: Palm Canyon, IV-15-38, sweeping R. M. Bohart).

Sacramento Co.: Sacramento, X-22-34, zinnia.

San Diego Co.: Encinitas, VII-2-35, *Chaenoctis glabriuscula;* Jacumba, IV-26-50, ex grass.

San Joaquin Co.: Stockton, III-5-26, plum (Paul Lewis).

Santa Clara Co.: Saratoga, VII-27-35, grass.

Solano Co.: Vacaville, III-2-34, plum (C. H. Wren).

Stanislaus Co.: El Solyo, II-26-30, wild mustard.

Sutter Co.: Meridian, IX-30-38, green grass.

Tulare Co.: Sequoia Park, VI-23-35, lupine; Porterville, I-16-36, lichen on fig tree (E. W. Baker).

Tuolumne Co.: Sonora Pass, VIII-28-48, grass.

Yolo Co.: Davis, VI-20-35, toyon flrs.; Davis, I-6-37, under bark of grapevines; Davis, I-21-35, under bark of apple.

Yuba Co.: Arboga, IV-14-34, walnut catkins (H. H. Keifer).

Frankliniella occidentalis (Perg.)
(Pl. 23, fig. 52)

Euthrips occidentalis Pergande. 1895. U.S.D.A., Div. Ent. "Insect Life," 7(5):392.

Euthrips tritici californicus Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, p. 28.

Frankliniella occidentalis (Pergande), Karny, 1912. Zool. Ann., 4:335.

Frankliniella tritici Moultoni, Hood. 1914. Proc. Ent. Soc. Wash., 16:38.

Frankliniella californica Moulton, 1948. Rev. de Ent., 19(1-2):98.

Frankliniella occidentalis (Pergande), Bryan and

Smith, 1956. Univ. Calif. Publ. Entom., 10:359-410.

Location of type: United States National Museum, Cat. No. 953.

Type locality: Los Angeles, California.

Geographic range: Western United States, western Canada, and northern Mexico.

Discussion: This species is the most widespread of all the thrips of the area. Its importance as an economic species is well known. Peaches, plums, nectarines, cotton, grapes, nursery stock, cut flowers, and seeds are the major crops suffering injury. Its biology and control have been discussed by various writers.

California records: The following are representative collections only since the species is found in every county and on innumerable host plants:

Alameda Co.: Berkeley, VII-1914, dog fennel ("E.R.D."); Castro Valley, X-9-33 (D. Moulton).

Alpine Co.: Markleeville, VII-31-26, sage.

Fresno Co.: Fresno, XI-14-29, inside figs (H. N. Hansen); Auberry, V-31-36, milkweed.

Glenn Co.: Orland, IV-8-36, orange.

Humboldt Co.: Richardson Grove, VIII-8-36, sweeping wild flrs.

Inyo Co.: Mt. Whitney, VI-20-37, lupine (G. L. Smith).

Imperial Co.: Calipatria, IV-25-39, grape flrs. (M. B. Dickson).

Kern Co.: Shafter, X-3-35, sunflower (G. L. Smith); Shafter, VIII-20-35, cotton.

Los Angeles Co.: V-8-26, avocado (H. M. Armitage); Avalon, Catalina Island, VII-11-46, *Brugmonsus arbrea* (N. Krauss); Griffith Park, VIII-27-35 (A. Mallis).

Marin Co.: Mt. Tamalpias, IV-17-35, manzanita flrs.

Mariposa Co.: Yosemite Valley, VI-24-27, *Ceanothus cordulatus* (D. Moulton); Indian Flat, V-23-38, lupine.

Mendocino Co.: Willits, VII-4-52 (W. C. Bentnick).

Modoc Co.: Cedarville, V-23-49, grass.

Monterey Co.: Salinas, VII-15-43, beans (W. H. Lange); Salinas, X-13-33, lettuce (D. Moulton).

Nevada Co.: Grass Valley, VI-16-35, wild snapdragon (J. J. duBois).

Orange Co.: Laguna Beach, VI-30-35, *Heracleum.*

Placer Co.: Lake Tahoe, VII-22-48, lupine.

Riverside Co.: Hemet, I-1934, citrus (H. J. Quayle); Palm Canyon, IV-15-38, sweeping (R. M. and G. E. Bohart).

San Diego Co.: San Diego, V-13-26, marigold (D. Moulton).

San Luis Obispo Co.: Edna, IV-24-51, mustard flrs.

Santa Clara Co.: Alum Rock, II-8-11, *Vinca major* (M. W. Davidson); San Jose, VII-6-10, holly (P. R. Jones).

Solano Co.: Green Valley, III-26-34, cherry (C. H. Wren).

Sonoma Co.: Geyserville, I-29-35, laurel flrs., Vineburg, III-10-36, sweeping grass.

Sutter Co.: Meridian, VII-7-36, *Sambucus.*

Trinity Co.: Douglas City, X-22-38, wild buckwheat (A. T. McClay).

Ventura Co.: Camarillo, VIII-1-35, beans (W. W. Mackie).

Yolo Co.: Davis, X-14-36, English walnut.

Frankliniella tenuicornis (Uzel)

Physopus tenuicornis Uzel, 1895. Monogr. Ord. Thys., p. 99.

Frankliniella tenuicornis, Karny, 1912. Zool. Ann., 4:334, 336.

Priesner has given a long list of references to this species in Thys. Eur., 1926, pp. 247-251.

Location of type: Unknown to me.

Type locality: Unknown to me.

Geographic location: Europe, Asia, New Jersey, Georgia, Texas, Iowa, Oregon, Washington, California.

Discussion: This *Frankliniella* appears to be one of the less injurious species, even though it has a wide range and is found on many hosts. Perhaps its reproductive powers in North America are less well developed. To date it is rare in California.

California records:

Fresno Co.: Minkler, VIII-3-50, *Typha.*

Merced Co.: Snelling, VIII-2-50, *Typha,* grass, oak.

Frankliniella yuccae Moulton

Frankliniella yuccae Moulton, 1935. Pan-Pac. Ent., 11(4):171-172.

Location of type: Moulton collection. Holotype ♀, No. 701, California Academy of Science.

Type locality: Willows, San Diego County, California.

Geographic location: California.

Discussion: We have collected large numbers of *Frankliniella* from yucca blossoms many times but never have taken this Moulton species.

California record:

San Diego Co.: Willows (U.S. Highway 80) V-15-26, yucca flowers (D. Moulton, C.A.S.).

Genus *Franklinothrips* Back

Head broad, bluntly rounded and somewhat retracted into prothorax. Eyes not protruding. Posterior ocelli large. Maxillary palpi three-segmented. Labial palpi appearing three-segmented but with minute basal fourth. Antennae nine-segmented, segments III and IV very long and slender, terminal segment small. Sensory areas on segments III and IV linear, variable, with vermiform margins. Prothorax wider than long and sharply tapered from forward margin to rear; bristles reduced. Wings broadly rounded at tip but constricted in second fourth. Longitudinal veins distinct but cross veins weak. Legs slender and unarmed. Ovipositor upturned. Abdomen with basal segments narrow resulting in an antlike appearance. Male much smaller than female, abdomen not constricted. Terminal segments without thornlike bristles or claspers. Sensory areas on antennal segments III and IV covering a large part of the segments.

Franklinothrips vespiformis D. L. Crawford (Pl. 18, fig. 12)

Aeolothrips vespiformis D. L. Crawford, 1909, Pomona Coll. Jour. Ent., 1(4):109-110.

Franklinothrips vespiformis, Back, 1912. Ent. News, 23(2):74-77. Stannard, 1952. Jour. Wash. Acad. Sci., 42(1):16.

Location of type: Canadian National Museum, Ottawa.

Type locality: Managua, Nicaragua.

Geographic location: South and Central America, West Indies, Florida, Texas, Arizona, California.

Discussion: This exotic, predaceous thrips is easily recognized by its narrow "waist," threadlike antennae, and retracted head. It is the type of the genus. Pupation takes place within a cocoon. Stannard (1952) has reviewed the group in detail.

California records:

Imperial Co.: X-9-26, citrus (E. A. McGregor, C.A.S.); Meloland, VI-24-41, grape, H. Jacob; Calexico, H. J. Quayle.

Los Angeles Co.: Westwood, VIII-16-38, feeding on greenhouse thrips (R. M. Bohart). (See also Ebeling, 1950.)

Genus *Heliothrips* Haliday

Body flattened and heavily reticulated. Head wider than long and bluntly pointed forward of anterior ocellus. Cheeks rough. Antennae eight-segmented, terminal segment long and needlelike. Sensory trichomes on antennal segments III and IV simple. Maxillary palpi two-segmented. Pronotum without long bristles. Forewings narrow and straplike, broadly expanded in basal fourth, without sculpture and without fringe of delicate setae on costa. Ovipositor downcurved. Male known from one specimen (J. C. Crawford, 1940. Proc. Ent. Soc. Wash., 42(4):90-91).

Heliothrips haemorrhoidalis (Bouché)

Thrips haemorrhoidalis Bouché, 1833. Nat. Schädl. Garten-Ins., p. 206.

Heliothrips adonidum Haliday, 1836. Ent. Mag., 3:443.

Heliothrips haemorrhoidalis, Burmeister, 1836. Handb. d. Entom., 2:412.

Heliothrips haemorrhoidalis, Priesner, 1926. Thys. Eur., pp. 126-130.

Location of type: Unknown to me.

Type locality: Unknown to me.

Geographic location: In greenhouses in Europe and the United States and out-of-doors in many tropical and semitropical parts of the world such as India, West Indies, South and Central America, Hawaii, Guam, Australia, China, Japan, Ceylon, and Palestine. In the United States specifically it is known from California, Florida, District of Columbia, and Georgia out-of-doors, and in greenhouses in the states of Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Washington, and West Virginia.

Discussion: The greenhouse thrips is one of the more well-known and easily identified members of the order. It is injurious on many greenhouse plants and ornamentals and attacks citrus, avocados, and other tropical fruits grown commercially. The biology and control have been studied and reported in detail by many workers, among the more recent of whom is Ebeling (1950, pages 640-650). It is found in practically all southern California citrus-growing districts.

California records: The following are representative and exhibit the wide range of hosts and localities out-of-doors in this state.

Alameda Co.: Berkeley, II-27-06, *Laurustinus* (D. Moulton, C.A.S.).

Los Angeles Co.: Whittier, VI-17-08, wild flrs. (D. Moulton, C.A.S.).

Mendocino Co.: Anchor Bay, VII-20-49, *Rhododendron.*

Monterey Co.: Big Sur, VIII-14-47, *Woodwardia* fern (B. S. Schneider).

Santa Barbara Co.: Santa Barbara, X-13-30, persimmon (E. O. Essig); IV-16-27, avocado (Hodgkins); IV-11-11, citrus (E. O. Essig, C.A.S.).

Santa Clara Co.: San Jose, III-12-04, azalea in hothouse (D. Moulton, C.A.A.).

San Diego Co.: San Diego, XII-15-09 (G. Compere, C.A.S.).

San Francisco Co.: San Francisco, IV-22-26, *Illicium anisatum* (E. Walther, C.A.S.); V-18-10, rubber plant (D. Moulton, C.A.S.).

San Mateo Co.: Redwood City, XII-1-27, *Laurustinus*, E. L. Smith, C.A.S.).

Sonoma Co.: Santa Rosa, X-18-38, *Viburnum.*

Yolo Co.: Davis, VII-7-38, lime in greenhouse; VIII-5-41, *Pyracantha* and *Hypericum.*

Genus *Hercinothrips* Bagnall

Head broader than long, dorsum heavily reticulated. Posterior lateral parts notched or constricted to form a collar. Ocelli placed on raised part of vertex. Antennae eight-segmented, two terminal segments forming a slender, sharply pointed style. Sensory cones forked. Maxillary palpi two-segmented. Pronotum strongly transverse and shorter than head. Forewings with two longitudinal veins uniformly beset with heavy bristles. Tarsi without claws. Ovipositor downturned. Male smaller than female and with spurlike, heavy bristles on tergites of terminal abdominal segments.

Hercinothrips femoralis (O. M. Reuter)
(Pl. 20, fig. 26)

Heliothrips femoralis O. M. Reuter, 1891. Medd. Soc. Fauna Fl. fenn., 17:166.

Heliothrips cestri Pergande, 1895, U.S.D.A., "Insect Life," 7(5):390.

Heliothrips femoralis O. M. Reuter, 1899. Acta. Soc. Fauna Fl. fenn., 17:39.

Heliothrips femoralis, Hinds. 1902. U.S. Nat. Mus., 26:(1310):172-173.

Hercinothrips femoralis, Bagnall. 1932. Ann. Mag. Nat. Hist., Ser. 10, 10(59):506.

Location of type: Museum of Helsinki, Finland.

Type locality: Helsinki, Finland.

Geographic location: Europe, E. Africa, Hawaii, Puerto Rico, North America (widespread in the United States and Canada in greenhouses).

Discussion: Formerly known as the sugarbeet thrips, it is now called the banded greenhouse thrips. It is of minor importance in comparison with the greenhouse thrips.

California records:

Alameda Co.: Berkeley, X-14-31, privet.

Glenn Co.: Hamilton City, 1907, sugar beet (E. S. G. Titus).

Riverside Co.: Riverside, VI-1936, sugar beets in greenhouse (H. E. Wallace).

Santa Clara Co.: San Jose, IV-10-31, cactus (L. M. Smith).

Yolo Co.: Davis, VII-22-37, sugar beets in greenhouse.

Genus *Hercothrips* Hood

Head broader than long, vertex raised between eyes; ocelli on convex part. Cheeks without indentations or collarlike constriction. Head, pronotum, and lateral part of abdomen heavily reticulated. Antennae eight-segmented, segment VI smaller than V; segments VI-VIII closely joined, terminal segment long and slender. Sensory trichomes on segments III and IV forked. Maxillary palpi two-segmented. Prothorax very broad. Forewings with two longitudinal veins which are usually united, with ambient vein giving a very heavy appearance to margins. Costal fringe present. Hind coxae large and separated by only about one-fifth of their width. Tarsi unarmed. Ovipositor downcurved. Male smaller than female and with thornlike bristles on dorsum of terminal abdominal segments.

Hercothrips bromi (Moulton)

Heliothrips bromi Moulton, 1927. Pan-Pac. Ent., 4(1):31-32.

Hercothrips bromi, Bailey, 1935. Pan-Pac. Ent., 11(4):164.

Location of type: Moulton collection. Holotype ♀, No. 968, allotype, No. 968, California Academy of Science.

Type locality: Big Tree Camp, Mariposa County, California.

Geographic location: California.

Discussion: Brome grass seems to be nearly always associated with this thrips. It is most commonly collected in the late summer on the banks of streams or at the margins of wooded areas in hot, dry locations. The adults jump very quickly. In the field it is very difficult to distinguish this species from *H. fasciatus.* Hood's description of the genus (1927*c*) was

apparently in press at the time Moulton's description (1927) appeared and so *bromi* was not included. It is not a crop pest as is its relative, the bean thrips.

California records:

Calaveras Co.: Arnold, VIII-17-49, grass.

El Dorado Co.: Coloma, VII-18-39, sweeping grass.

Fresno Co.: Fresno, VII-5-39, grass.

Madera Co.: Chowchilla, IX-15-39, brome grass.

Mariposa Co.: Big Tree Camp, VIII-1-26, *Bromus carinatus* (D. Moulton, C.A.S.).

Merced Co.: Merced, VII-5-39, bermuda grass.

Monterey Co.: Jamesburg, V-26-50, dry grass.

Napa Co.: Mt. St. Helena, IX-8-48, *Bromus rigidus.*

Santa Clara Co.: Alum Rock Park, IV-26-49, sweeping dead grass.

Stanislaus Co.: Empire, IV-13-49, grass.

Hercothrips fasciatus (Pergande)
(Pl. 21, fig. 32)

Heliothrips fasciate Pergande, 1895. U.S.D.A., "Insect Life," 2:391.

Heliothrips fasciatus, Hinds. 1902. Proc. U.S. Nat. Mus., 26(1310):82, 174–175.

Caliothrips woodworthi Daniel, 1904. Ent. News, 15:293-297.

Hercothrips fasciatus, Hood. 1927*c*. Psyche, 34:233-242.

Location of type: United States National Museum.

Type locality: Marysville, California.

Geographic location: Western United States and Mexico, Wyoming, Utah, Oregon, Nevada, Arizona, California, Hawaii. There are other records in the literature, but we have not seen the specimens to verify them. This well-known crop pest, the bean thrips, has been studied in detail (Bailey, 1937).

California records: At present it is known to me from all counties except Mono, Alpine, Sierra, Trinity, Plumas, Lassen, Modoc, and Del Norte. The following are representative:

Fresno Co.: Fresno, XI-14-29, figs (H. N. Hansen).

Humboldt Co.: Richardson Grove, VIII-8-36, *Disporum hookeri.*

Imperial Co.: Calipatria, IV-25-39, grape (M. B. Dickson).

Inyo Co.: Big Pine Creek, V-18-47, sweeping (R. M. Bohart).

Kern Co.: Shafter, VIII-1936, cotton (G. L. Smith).

Mariposa Co.: Yosemite Valley, VI-5-38, grass.

Merced Co.: Merced, VII-5-39, bermuda grass and *Echinochloa crusgalli.*

Santa Clara Co.: Gilroy, VII-14-36, tomato.

Yolo Co.: Davis, IX-4-35, *Lactuca scariola.*

Yuba Co.: Marysville, IX-3-38, sow thistle.

Hercothrips marginipennis (Hood)

Heliothrips marginipennis Hood, 1912. Proc. Ent. Soc. Wash., 14:136-137.

Hercothrips marginipennis, Hood, 1927*c*. Psyche, 34(6):233.

Heliothrips bishoppi Moultion, 1929. Bull Brooklyn Ent. Soc., 24:229-230.

Hercothrips marginipennis, Hood. 1940. Jour. Ent. Soc. So. Afr., 3:37.

Location of type: Cornell University.

Type locality: Monterey, Mexico.

Geographic range: Mexico, Texas, California

Discussion: This thrips appears to be an inhabitant of the southwestern area. Little is known of its hosts and life cycle.

California record:

Riverside Co.: Indio, 1946, corn, *Quercus,* grasses (H. M. Armitage, Bur. Ent., State of Calif., Sacramento).

Hercothrips phaseoli (Hood)

Heliothrips phaseoli Hood, 1912. Psyche, 19(4): 113.

Heliothrips gossypii Moulton, 1927. Pan-Pac. Ent., 4(1):32-34.

Hercothrips phaseoli, Hood. 1927*c*. Psyche, 34(6):233.

Hercothrips phaseoli Hood, 1940. Jour. Ent. So. Afr., 3:37.

Location of type: Cornell University.

Type locality: Brownsville, Texas.

Geographic range: Mexico, Texas, Arizona, California.

Discussion: In the original description it was pointed out the insect has injurious potentialities. It has been since collected so rarely that little new information is available on this thrips. Nymphs of what might well be this species have been received from Bard (North Yuma Valley), California, damaging cantaloupe in 1951.

California record:

Imperial Co.: Calexico, IX-1926, citrus (E. A. McGregor, C.A.S.).

Genus *Heterothrips* Hood

Antennae nine-segmented; segments III and IV barrel-shaped or vasiform with a circumpolar band

of sensoria arranged in single or multiple rows, basal portion of third with constrictions. All segments free except in sugbenus *Protemnothrips* Hood, in which the three terminal segments are fused. Head usually wider than long. Ocelli present. Maxillary palpi three-segmented. Labial palpi two-segmented. Legs slender, fore femora somewhat enlarged in both sexes, second segment of fore tarsi in both sexes with a fingerlike hook at base. Forewings slender and pointed, the two longitudinal veins beset with short, stout bristles. Posterior margin of abdominal segments fringed with small setae variously arranged, the bases of some groups fused into plates. The sides of the abdominal segments are reticulated along which markings are usually arranged rows of microtrichia as in *Sericothrips*. Ovipositor curved downward. Male smaller than female with abdominal fringe of setae weaker. Sternites of abdominal segments II, III, or IV to VIII usually with a clear oval area on each, centrally and anteriorly located. Some species with a pair of heavily chitinized fingerlike projections on dorsum of segment IX; others with neither projections or oval areas.

Key to the North American Species of *Heterothrips*

1. Comb fringe of setae on posterior lateral margins of abdominal terga simple and not fused into plates at base. . . . . (Group I) 2
   Comb or fringe of setae on posterior lateral margins of abdominal terga fused into plates at base. . . (Group II). . . . 7

2(1). Pronotum finely cross-striate 3
   Pronotum reticulate, often faintly so, lines tending to form polygons 4

3(2). Middle and hind tibiae pale yellow at both ends. Antennal segment III 0.072 mm. long; V grayish yellow . . . . . *analis* Hood, 1915
   Middle and hind tibiae yellowish brown at distal ends only. Antennal segment III 0.054–0.061 mm. long; V brown. . . . . *vitis* Hood, 1916 (*tiliae* Watson, 1920)

4(2). Sensoria on tip of antennal segment III (and sometimes IV) reduced to a narrow single row on dorsum . . . . . *cuernavacae* Watson, 1939
   Sensoria on antennal segments III and IV arranged in 2 or more rows. 5

5(4). Sensoria arranged in more than 2 rows. . . . . *watsoni* Bailey and Cott, 1955
   Sensoria arranged in 2 rows 6

6(5). Antennal segments III and IV yellow usually with orange pigment in distal part. Middle and hind tibiae yellow at both ends . . *auranticornis* Watson, 1922
   Antennal segments III and IV light brown, III yellow in basal two-thirds. Legs brown. . . . . *gillettei* Moulton, 1929

7(1). Pronotum cross-striate with lines not closely parallel 8
   Pronotum smooth, or reticulated to varying degrees, frequently forming polygons . 10

8(7). Terminal comb setae on abdominal plates 2 or 3 times longer than base. One row or circle of sensory areas at tip of antennal segments III and IV. . . . . *vernus* Hood, 1939
   Terminal comb setae on abdominal plates shorter than base. Two irregular rows or circles of sensory areas, at least ventrally, at tip of antennal segments III and IV 9

9(8). Antennal segment III white to yellow; 0.076–0.087 mm. in length. Sides of comb plates overlapping and appearing to be fused. Male glandular areas small (0.025–0.028 mm. wide on segment VIII) . . . *prosopidis* J. C. Crawford, 1943
   Antennal segment III with basal two-thirds yellow, remainder dark gray-brown; 0.071 mm. in length. Male glandular areas large (0.060 mm. wide on segment VIII). . . . . *lasquerellae* Hood, 1939

10(7). Comb plates extending across entire posterior margins of terga of abdominal segments II-IV . . . . *limbatus* Hood, 1925
   Comb plates only on posterior lateral margins of abdominal segments I-VI. . 11

11(10). Base of comb plates completely fused. Antennal segment III 0.090 mm. long. Glandular area on sternite of abdominal segment VIII of male wide, 0.065 mm. in width . . . . . *decacornis* D. L. Crawford, 1909
   Base of comb plates partly fused, overlapping, or distinct. Antennal segment III shorter than 0.090 mm. Glandular areas on sternite VIII of male absent or smaller 12

12(11). Terminal abdominal segment (X) long and pointed, 0.1–0.11 mm. in length . . 13

Terminal abdominal segment not long and pointed 14

13(12). Pronotum and abdominal sternites heavily setose. Abdominal sternites with posterior fringe of setae at lateral margins only . . . . . *mexicanus* Watson, 1924

Pronotum and abdominal sternites not heavily setose. Abdominal sternites II–VI with complete fringe of setae on posterior margins . . *pectinifer* Hood, 1915

14(12). Antennal segments III and IV strongly vasiform with a broad band of sensoria arranged in a complete double row . . . . . *arisaemae* Hood, 1908

Antennal segments III and IV not vasiform and with band of sensoria narrow and sometimes reduced to a single row . . 15

15(14). Terminal fringe of setae on comb plates on posterior lateral margin of abdominal tergite VI longer than length of base . 16

Terminal fringe of setae on comb plates on posterior lateral margin of abdominal tergite VI shorter than length of base . 18

16(15). Basal plates on posterior margins of abdominal tergites weakly formed, short and broad . . . . . *quercicola* J. C. Crawford, 1942

Basal plates on posterior margins of abdominal tergites distinct, nearly as long as terminal fringe 17

17(16). Setae and microtrichia at lateral margins of abdominal segments sparse. Antennal segment IV bicolorous . . . . . *lyoniae* Hood, 1916

Setae and microtrichia at lateral margins of abdominal segments closely spaced. Antennal segment IV brown . . . . . *azaleae* Hood, 1916

18(15). Lateral parts of abdominal tergites heavily pubescent, the lines from which the microtrichia arise closely spaced. . . . . *vitifloridus* Bailey and Cott, 1955

Lateral parts of abdominal tergites sparsely pubescent and reticulations with or without irregularly spaced microtrichia 19

19(18). Microtrichia on lateral margins of abdominal tergites absent. Antennal segment III 0.077 mm. long. . . . . *xolismae* Hood, 1936

Microtrichia present on lateral margins of abdominal tergites. Antennal segment III 0.954–0.057 mm. long. 20

20(19). Comb plates strongly tapered. Central patch of tergal setae on abdominal segments II-V well developed with the bases frequently fused into weak comb plates on V (and usually on VI) . . . . . *salicis* Shull, 1909

Comb plates slightly tapered, as broad or broader than long on V. Central patch of tergal setae on II–V very weak, sparse and bases not fused . . . . . *aesculi* Watson, 1915

Heterothrips pectinifer Hood

Heterothrips pectinifer Hood, 1915. Insec. Inscit. menst., 3(1–4):5–7.

Heterothrips pectinifer, Bailey and Cott, 1954. Ann. Ent. Soc. Amer., 47(4):616, 626–628.

Location of type: Cornell University.

Type locality: Tempe, Arizona.

Geographic location: Texas, Utah, Arizona, California.

Discussion: Of the North American representatives of this genus, *pectinifer* is one of the most commonly collected in the southwestern arid areas. The principal host is desert malva. There is one generation a year and feeding and reproduction appear to take place only in the flowers.

California records:

Inyo Co.: Mazurka Canyon, VI-20-37, mallow (C. Beutler).

Kern Co.: Boron, IV-27-50, *Malva* flrs.; Johannesburg, VI-1-52, *Malva* flrs.

Riverside Co.: Aguanga, IV-27-50, apricot mallow; Idyllwild, VI-6-52, *Sphaeralcea* sp. (P. W. Smith); Palm Springs, IV-15-39, ex yucca (R. M. Bohart).

San Diego Co.: Julian, IV-23-50, orange mallow (W. J. Wall).

Heterothrips prosopidis J. C. Crawford

Heterothrips prosopidis J. C. Crawford, 1943. Proc. Ent. Soc. Wash., 45(4):93–94.

Heterothrips prosopidis, Bailey and Cott, 1954. Ann. Ent. Soc. Amer., 47(4):616, 628–630.

Location of type: United States National Museum, Cat. No. 56496.

Type locality: Brownsville, Texas.

Geographic location: Texas, Arizona, California.

Discussion: This species has the same general distribution and habits as *pectinifer* except that it is found in the flowers of mesquite. It can be separated from this other species by the short terminal abdominal segment and the overlapping

and apparent lateral fusion of the bases of the comb plates.

California records:

Kern Co.: Randsburg, VI-1-52, mesquite flrs.

San Diego Co.: Bonsall, V-7-49, host unknown (R. M. Bohart).

Heterothrips salicis Shull
(Pl. 19, figs. 18, 19)

Heterothrips salicis Shull, 1908. Ent. News, 20(5): 220–221.

Heterothrips salicis, Bailey and Cott, 1954. Ann. Ent. Soc. Amer., 47(4):617, 630–631.

Location of type: United States National Museum, Cat. No. 12635.

Type locality: Huron County, Michigan.

Geographic location: Michigan, Illinois, California.

Discussion: Like many *Heterothrips*, this species is restricted in its host range; it is known only from willow catkins.

California records:

Alpine Co.: Markleeville, VI-13-50, willow (R. M. Bohart).

Modoc Co.: Chimney Rock, V-24-49, willow.

Heterothrips vitifloridus Bailey and Cott

Heterothrips vitifloridus Bailey and Cott, 1954. Ann. Ent. Soc. Amer., 47(4):631–632.

Location of type: University of California, Davis.

Type locality: Winters, California.

Geographic location: California.

Discussion: This species appears to be the western counterpart of *vitis*, which is principally eastern. A study of the *Heterothrips* found on various species of Northern American grape undoubtedly will extend the knowledge of this group of insects.

California records:

Colusa Co.: Nr. Grizzly Springs Lake, V-14-47, wild grape flrs.

Mariposa Co.: Indian Flat, VI-3-38, wild grape flrs.

Placer Co.: Penryn, V-19-39, wild grape flrs.

Shasta Co.: Ingot, V-23-49, grape flrs.

Solano Co.: Nr. Winters, IV-30-39, wild grape flrs.; Mix Canyon, IV-30-39, wild grape flrs.

Genus *Isoneurothrips* Bagnall

Antennae seven-segmented, segment VI large, VII reduced. Sensory trichomes on III and IV forked. Head wider than long, cheeks slightly rounded. Ocelli present. Prothorax wider than long; two well-developed bristles at each outer, posterior angle and with reduced bristles at the anterior angles, as in *Thrips*. Maxillary palpi three-segmented. Tarsi unarmed. Forewings large, pointed, regularly beset on the two longitudinal veins with strong bristles. Abdomen normal; ovipositor downcurved. Male smaller than female; antennal segment VII greatly reduced and with variable sensory areas on abdominal sternites.

Isoneurothrips australis Bagnall
(Pl. 21, fig. 39)

Isoneurothrips australis Bagnall, 1915. Ann. Mag. Nat. Hist., Ser. 8, 15:592–593.

Isoneurothrips australis, Morison, 1930. Bull. Ent. Res., 21(1):13–14.

Location of type: British Museum.

Type locality: Mundaring Weir, Darling Range, Perth, W. Australia.

Geographic location: Australia, Japan, Cyprus, Palestine, Egypt, South Africa, Brazil, North America.

Discussion: In recent years this newly introduced thrips has been rapidly extending its range. According to Steele (1935) its biology appears similar to *Frankliniella occidentalis*, but as yet this Australian species has not become a pest in California.

California records:

Contra Costa Co.: Mt. Diablo, 1951, native shrubs.

Orange Co.: Orange, 1949 (H. H. Keifer); Stanton, III-26-53, blackberry (A.F.H.).

San Bernardino Co.: Cucamonga, orange, III-8-46 (R. C. Dickson).

San Diego Co.: Pine Valley, IV-26-50, *Adenostoma sparsifolium*.

Santa Clara Co.: Palo Alto, Stanford Univ., III-14-47, galls (J. W. Tilden, C.A.S.).

Genus *Kurtomathrips* Moulton

Antennae eight-segmented; segment II large and globular, III small and with distinct pedicel. Sensory trichomes simple, that on segment III small and difficult to discern. Style two-segmented. Vertex of head roughened, with an irregular V-shaped groove on vertex. Ocelli wanting. Mouth cone long. Maxillary palpi three-segmented. Prothorax about twice as wide at posterior as at anterior margin. Surface with irregular ridges. One bristle at each outer posterior angle longer than others. Bristles on pronotum and head thickened,

curved, and usually serrate at tip. Wings absent. Legs short, roughened, and unarmed. Bristles on dorsum of abdominal segments I-VIII broad and curved. Posterior margins of pro- and meta-nota and abdominal tergites I-VIII with a continuous row of coarse, bluntly rounded comb teeth. Ovipositor downturned. Male similar to female but much smaller and without thornlike bristles or claspers on terminal abdominal segments.

Kurtomathrips morrilli Moulton
(Pl. 20, fig. 28)

Kurtomathrips morrilli Moulton, 1927. Bull. Brooklyn Ent. Soc., 22:187–188.

Location of type: Moulton collection. Holotype ♀, No. 896, California Academy of Science.

Type locality: Gila Bend, Arizona.

Geographic location: Arizona, Nevada, California.

Discussion: The genus is monotypic. The first record of the insect was that of severe injury to cotton. This is hard to understand since it is a wingless sluggish thrips, and cotton fields in the West are intensively irrigated and cultivated. The second report, in 1939, of the species was from California, where it was damaging chrysanthemum. The conditions causing the increase of *morrilli* to injurious proportions are unknown.

California records:

Kings Co.: Hanford, IX-30-39, chrysanthemum (H. H. Keifer).

Monterey Co.: Herky Creek, VI-10-40, *Wyethia ovata* (E. G. Linsley).

Genus *Leucothrips* Reuter

Antennae seven-segmented, style one-segmented. Sensory trichomes on segments III and IV simple. Head wider than long and somewhat indented beyond the eyes. Ocelli present. Maxillary palpi two-segmented. Pronotum with a row of well-developed bristles along posterior margin; those on anterior margin reduced. Forewings with one longitudinal vein. Abdominal segments II-VIII with a pair of closely placed bristles in the center of each tergite. Segment VIII with a comb. Tarsi unarmed. Male smaller than female and without thornlike bristles or claspers on terminal segments.

Key to the Known Species of *Leucothrips*

1. Antennae 8-segmented (Brazil) . . . . . *pictus* Hood, 1952
   Antennae 7-segmented. 2

2(1). Crimson spot in front of head between antennae (So. America) . . . . . *theobromae* Pr., 1923
   Head not so colored 3

3(2). Wings (fore pair) dusky brown (Europe) . . . . . *nigripennis* Reuter, 1904
   Wings pale 4

4(3). Sensory trichomes on antennal segments III and IV forked (Guadeloupe, Fr. W. Indies) . . . . . *furcatus* Hood, 1931
   Sensory trichomes simple (U.S.) . . . . . .*piercei* (Morgan), 1913

Leucothrips furcatus Hood

Leucothrips furcatus Hood, 1931. Bull. Brooklyn Ent. Soc., 26:153.

Location of type: Cornell University.

Type locality: Guadeloupe, French West Indies.

Geographic location: West Indies, California.

Discussion: We are assigning to this species eight specimens collected on willow leaves at Davis, California. All stages were found on the host in August. We have not seen any of the Hood specimens.

California record:

Yolo Co.: Davis, III-20-38, willow. (First record in United States.)

Leucothrips piercei (Morgan)
(Pl. 21, fig. 38)

Microthrips piercei Morgan, 1913. Proc. U.S. Nat. Mus., 46 (2008) :19–21.

Leucothrips piercei, Hood. 1931. Pan-Pac. Ent., 7(4):170.

Location of type: United States National Museum, Cat. No. 15728.

Type locality: Dallas, Texas.

Geographic location: South America, Hawaii, Mexico, New York, Virginia, Maryland, Tennessee, Texas, California.

Discussion: This thrips is not commonly collected and little is known about it. Small colonies occur on various host plants such as cotton, eggplant, linden, mustard, and so forth, which indicates a broad host range.

California records:

Imperial Co.: El Centro, VIII-1942.

Kern Co.: Shafter, XII-12-35, mustard (G. L. Smith). Arvin, XI-5-47, cotton (G. L. Smith).

Yolo Co.: Davis, XI-2-38, willow.

Genus *Limothrips* Haliday

Antennae eight-segmented, style two-segmented. Sensory trichomes simple or forked. Head about as wide as long, extending forward in front of eyes. Ocelli present in female. Maxillary palpi two-segmented. Mouth II cone rounded, reaching to center of prothorax. Prothorax wider than long; with one long bristle at each outer posterior angle of pronotum. All other bristles on head and pronotum reduced. Forewings long and pointed, broadest in basal fourth. Two longitudinal veins present. Abdominal segment VIII without comb, dorsum of terminal segment with a pair of very heavy, short bristles. Male smaller than female, without ocelli and wings, with antennal segments reduced. Terminal abdominal segments with fingerlike, short chitinous processes on the dorsum of segment IX.

Key to the North American Species of *Limothrips*.

1. Antennal segments without lateral projections; segments III and IV with simple sense cones. . *cerealium* Haliday, 1836
   Antennal segments with lateral projections; sense cone on segment III variable . . 2

2(1). Third antennal segment prolonged laterally; sense cone simple . . . . . *denticornis* Haliday, 1836
   Second antennal segment extended laterally. Sense cone on segment III forked . . . . . *angulicornis* Jablonowski, 1894

Limothrips angulicornis Jablonowki

Limothrips angulicornis Jablonowski, 1894. Term. Fuzetek., 17:45.

Limothrips setariae Jones, 1912. U.S.D.A., Bur. Ent., Tech Ser., No. 23, p. 8.

Limothrips angulicornis, Herrick, 1924. Ann. Ent. Soc. Amer., 17(2):231–232.

Limothrips angulicornis, Priesner, 1926. Thys. Eur., p. 145.

Location of type: Museum of Budapest, Hungary.

Type locality: Probably Central Europe.

Geographic location: Europe, Mediterranean area, Australia, North America.

Discussion: In California this species does not occur in large numbers like *cerealium* and therefore is not a pest of grain. However, its life cycle is similar, and it aestivates in the hot weather under bark and in dry grass and in buildings.

California records: The following are representative:

Amador Co.: Ione, VI-8-39, meadow grasses.

Contra Costa Co.: Brentwood, III-16-36, fiddleneck (A. T. McClay).

Fresno Co.: Fresno, VII-5-39, watergrass.

Kern Co.: Shafter, V-21-41, *Atriplex* (R. E. Suggett).

Lake Co.: Upper Lake, V-14-47, sweeping grass.

Los Angeles Co.: Pasadena, V-29-38, *mullein* (H. L. Marsh).

Merced Co.: Merced, VII-5-39, bermuda grass.

San Luis Obispo Co.: Pismo Beach, IV-24-51, sweeping beach shrubs.

Santa Clara Co.: San Jose, II-19-36, under sycamore bark.

Siskiyou Co.: Gazelle, VI-22-48, marsh grasses.

Solano Co.: Fairfield, XI-8-39, beating live oak.

Sonoma Co.: Petaluma, VI-10-51, grass (E. I. Schlinger); Skaggs Island, VII-30-51, oats.

Stanislaus Co.: El Solyo, X-22-31, under grape bark (J. F. Lamiman).

Yolo Co.: Davis, VI-7-35, wild oats, VI-27-31, wild lettuce, barley.

Limothrips cerealium Haliday
(Pl. 20, fig. 23)

Limothrips cerealium Haliday, 1836. Ent. Mag., 3:444–445.

Limothrips avenae Hinds, 1902. Proc. U.S. Nat. Mus., 26(1310):139–141.

Limothrips cerealium, Priesner, 1926. Thys. Eur., pp. 150–154.

Location of type: Unknown to me.

Type locality: Probably northern Europe.

Geographic range: Europe, Africa, Australia, Hawaii, India. In North America we know of current records from California, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, and Virginia.

Discussion: In 1948 I reviewed the status of this and other grain- and grass-infesting species. The common name officially adopted for this thrips is the grain thrips. In the Middle West and in Europe great swarms of adults occur at grain harvest. It is frequently referred to as "black fly," "oat-bug," etc. Certain years, when weather conditions are favorable for its increase, this thrips causes injury to small grains. I first found it in California in 1932, although it undoubtedly had been here for some time. It reaches a seasonal peak of abundance in June and early July and then aestivates.

California records: The following are representative:

Contra Costa Co.: Antioch, VIII-20-49, lupine.

Fresno Co.: Fresno, III-16-49, weeds (Leslie M. Smith).

Los Angeles Co.: Pasadena, V-29-38, mullein (H. L. Marsh). W. Los Angeles, IV-14-40, stems (C. Everhaus). Alhambra, VI-6-32, in residence. Arroyo Seco, V-29-38 (H. L. Marsh).

Marin Co.: Mt. Tamalpais, VII-7-48.

Monterey Co.: Arroyo Seco, V-26-49, sweepings.

Napa Co.: Napa, V-4-48, grass. Mt. St. Helena, IV-30-49, grass and oak.

Orange Co.: Tustin, VI-18-47, orange.

Riverside Co.: Temecula, IV-25-50, red shanks. Aguanga, IV-25-50, *Prunus*.

San Diego Co.: Jacumba, IV-26-49, sweeping; Chula Vista, V-7-49, sweeping (R. M. Bohart).

Santa Clara Co.: Stanford University, IV-27-49, grass.

Solano Co.: Mix Canyon, VI-6-50, perennial lupine; Green Valley, IV-26-47, sweeping (R. M. Bohart).

Sonoma Co.: Skaggs Island, V-4-51, oats; Knights Valley, III-10-36, grass.

Stanislaus Co.: Oakdale, VIII-2-50, grass.

Yolo Co.: Davis, III-26-47, grass (A. T. McClay).

Genus *Melanthrips* Haliday

Antennae nine-segmented, the terminal segments not closely joined. Segments III and IV with linear sensory areas partly encircling segments at tip usually at angle. Head generally wider than long. Ocelli present. Maxillary palpi three-segmented. Labial palpi two-segmented. Pronotum wider than long; with well-developed bristles along posterior margin. Fore tibiae armed with spurs. Fore tarsi without claws. Forewings broad and rounded with two longitudinal veins and distinct cross veins. Ovipositor upturned. Male smaller than female and with first abdominal segment elongated; without thornlike bristles or claspers.

Melanthrips digitus Bailey
(Pl. 17, fig. 6)

Melanthrips digitus Bailèy, 1954*a*. Proc. Ent. Soc. Wash., 56(2):79-80.

Location of type: University of California, Davis.

Type locality: Pine Valley, San Diego County, California.

Geographic location: California.

Discussion: The recent finding of the European genus *Melanthrips* in North America well established on a native shrub indicates that there is much yet to learn about thrips. It has a life cycle similar to the related aeolothripids occurring in the spring on flowering shrubs.

California records:

Riverside Co.: Idyllwild, Mt. San. Jacinto, IV-7-39, *Ericameria pinifolia* (R. M. Bohart); Aguanga, IV-25-50, *Prunus* (H. E. Cott and S. F. Bailey).

San Diego Co.: Pine Valley, IV-26-50, *Adenostoma sparsifolium*; Warner Springs, V-25-51, beating.

Genus *Merothrips* Hood

Antennae eight-segmented, segments somewhat moniliform; terminal segments not fused. Narrow sensory areas, one to a segment, partly encircle the tip of segments III and IV. Segments III-IX pedicillate. Head small. Eyes reduced and ocelli wanting in apterous form. A long slender bristle is situated between base of antennae and eye. Maxillary palpi three-segmented. Prothorax broader than long with one long, slender bristle at each posterior outer angle. Forewings, when present, slender and sharply pointed, two longitudinal veins regularly beset with small bristles, fringe very long. Legs short and thickened, fore and hind femora swollen. Abdomen bluntly pointed at tip with greatly reduced ovipositor and long slender bristles. Male smaller than female with large spur at tip of fore tibiae (greatly reduced in female) and without chitinous projections on apical segments.

Merothrips morgani Hood
(Pl. 18, fig. 14; pl. 19, fig. 15)

Merothrips morgani Hood, 1912. Proc. Ent. Soc. Wash., 14:132-134.

Location of type: Cornell University.

Type locality: Homer, Illinois.

Geographic location: New York, New Jersey, Maryland, District of Columbia, Florida, Kentucky, Illinois, Iowa, California.

Discussion: Members of this unique group of thrips are rare, difficult to collect, and little is known of their biology. Almost always they are found in association with dead trees, bark, and beetle burrows.

California records:

Napa Co.: Mt. St. Helena, XII-21-48 in beetle burrow in dead willow (H. E. Cott, Cott Collection).

Riverside Co.: Indio, X-10-38, date palm (H. H. Keifer).

Solano Co.: Green Valley, VII-23-50 dead willow (H. E. Cott, Cott collection)

Genus *Monilothrips* Moulton

Antennae eight-segmented, style two-segmented, segment VI small and segments III and IV vasiform similar to the heliothripids. Sensory trichomes on segments III and IV forked and very long. Head wider than long with a collarlike band of reticulation near posterior margin. Postocular bristles well developed. Ocelli present. Maxillary palpi three-segmented. Prothorax wider than long and without polygonal reticulations; all four angles with long bristles. Legs unarmed. Forewings very long and pointed; two longitudinal veins near margins and evenly beset with bristles. Abdomen with reticulation on segments II-VIII; terminal segment split above. Ovipositor downturned. Male unknown.

Monilothrips kempi Moulton
(Pl. 21, fig. 31)

Monilothrips kempi Moulton, 1929. Rec. Ind. Mus., 31(2):94-95.

Location of type: Indian Museum, Calcutta.

Type locality: Sureil, Nangphu, Darjiling District., East Himalayas, India.

Geographic location: India, North America.

Discussion: This rare thrips has been previously known only from India. In collections it can be easily confused with the bean thrips, *Hercothrips fasciatus* (Perg.). Its finding in North America, a most unusual distribution, was first reported by Bailey and Cott (1952).

California records:

Monterey Co.: Big Sur, VIII-31-46 and IX-12-54, coffee fern (W. H. Lange).

Genus *Odontothrips* Amyot and Serville

Antennae eight-segmented, style two-segmented. Segments III and IV with forked sensory trichomes, VI with a lanceolate clear, sensory area on the inner face extending from the tip downward about half the length of the segment. From this area arises a blade-shaped, narrow sensory structure sharply pointed at distal end. Head wider than long. Interocellar bristle long, postoculars short. Cheeks slightly roughened and curved. Maxillary palpi three-segmented. Mouth cone long but not reaching posterior margin of prosternum. Prothorax much larger than head and broader than long. Two long bristles at each outer posterior angle and one at anterior angles as in *Frankliniella*. Fore tibiae with heavy curved claw on lower, inner distal end. Fore tarsi with one or two small reduced spurs on inner face and at distal end of segment II. Wings broad and pointed with two longitudinal veins. Abdominal segment VIII with weak, incomplete comb. Ovipositor downcurved. Male smaller than female, abdominal segment IX with one pair of small, reduced thornlike spines. Claspers and sensory areas on sternites wanting.

Odontothrips loti (Haliday)
(Pl. 21, fig. 35)

Thrips loti Haliday. Walker, 1852. Homop. Ins. Brit. Mus., p. 1108.

Euthrips ulicis californicus Moulton, 1907, U.S.D.A., Bur. Ent., Tech. Ser., No. 12, III, pp. 55-56.

Odontothrips loti, Williams, 1916. Entomologist, p. 277.

The detailed European synonymy has been given by Priesner (1926, pp. 224-230), Hood (1914), and Moulton (1929).

Location of type: Unknown to me.

Type locality: Probably Central Europe.

Geographic location: Europe, North America; Virginia, Colorado, Utah, Oregon, Washington, California.

Discussion: This large, *Taeniothrips*-like species is common in lupine flowers in the spring. Fortunately it has never adapted to cultivated crops. It is readily identified by the claw at the tip of the fore tibia.

California records:

Inyo Co.: Mt. Whitney, VI-20-37, lupine (G. L. Smith); Bishop Creek, VIII-2-36, lupine (R. M. Bohart).

Mariposa Co.: Yosemite Valley, V-19-38, lupine.

Napa Co.: Monticello, III-31-31, wild vetch (L. M. Smith and S. F. Bailey); Mt. St. Helena, IV-10-35, lupine.

Placer Co.: Applegate, III-15-36, lupine.

Santa Clara Co.: Los Gatos, IV-9-10 (P. R. Jones).

Solano Co.: Mix Canyon, III-6-36, wild flowers (R. M. Bohart), Hardin Flat, VI-9-38, lupine.

Yolo Co.: Davis, V-15-36, grass.

Genus *Oligothrips* Moulton

Antennae nine-segmented, terminal joints not fused. Segments III and IV each with one oval sensory area at tip on outer surface from which arises a spearhead-shaped cone. Head slightly wider than long, widest at posterior margin; bristles long. Maxillary palpi three-segmented. Labial palpi two-segmented. Ocelli present. Eyes not prolonged ventrally. Prothorax about twice as

wide as long. Posterior margin of pronotum with row of bristles and with the appearance of *Melanthrips*. Fore tarsi with curved claw. Forewings long, bluntly pointed, and with two longitudinal veins. Abdominal segment VIII without comb, tip sharply pointed; ovipositor downcurved. Male smaller than female with fore femora noticeably swollen and long, narrow sensory areas on abdominal sternites III-VIII.

Oligothrips oreios Moulton
(Pl. 19, figs. 17, 20)

Oligothrips oreios Moulton, 1933. Pan-Pac. Ent., 9(3):139–140.

Location of type: Moulton collection. Holotype ♀, No. 4753, California Academy of Science.

Type locality: Grass Valley, Nevada County, California.

Geographic location: California, Oregon.

Discussion: The genus to date still is monotypic. The host specificity is narrow, being limited almost specifically to the blossoms of madrone and manzanita. As is the case with many western thrips, there is only one generation a year, the active feeding stages being found in the early spring.

California records:

El Dorado Co.: Clarksville, IV-7-32, (A. C. Browne, C.A.S.).

Lake Co.: Cobb Mt., IV-24-35, manzanita; Kelseyville, IV-24-35, pear.

Lassen Co.: Nubieber, V-23-49, cherry.

Marin Co.: Mt. Tamalpais, IV-17-35, manzanita.

Napa Co.: Mt. St. Helena, IV-30-49, manzanita.

Nevada Co.: Grass Valley, on blossoms of manzanita and madrone, IV-19-32, (C.A.S.); Rough and Ready, IV-24-49, manzanita; Grass Valley, IV-8-51, manzanita.

Placer Co.: Applegate, III-15-51, manzanita.

Shasta Co.: Bayles, III-16-39, manzanita (A. T. McClay).

Genus *Orothrips* Moulton

Antennae nine-segmented, all segments freely articulated. Segments III and IV each with two circular to linear sensory areas. Ocelli present. Eyes very slightly prolonged ventrally. Maxillary palpi geniculate, seven-segmented. Labial palpi four-segmented, plus a minute basal attachment. Prothorax wider than long with well-developed bristles on posterior margin. Fore femora swollen. All tibiae with spines at the tip, those on fore tibiae well-developed. Fore tarsi with fingerlike hook. Forewings broad and rounded at tip with two longitudinal veins and cross veins. Ovipositor upturned. Terminal abdominal segments taper abruptly, dorsum at last segment not split above. Male smaller than female. Sensory areas on antennal segment IV larger than in female. Abdomen slender with first segment much longer than second. Terminal segments without claspers or thornlike bristles.

Key to the World Species of *Orothrips*

1. Sensory areas on antennal segments III and IV elongated and definitely linear, 2 to each segment 2
   Sensory areas on antennal segments III and IV round or oval, 2 to each segment . 3

2(1). Sensory areas on antennal segment III about one-fourth length of segment which is about 84μ in length. Antennal segment II brown in color similar to body, segment III light brown in basal third. Total body length about 1.6 mm. (W. No. Amer.) . . . . . .*O. keeni* Moulton, 1927
   Sensory areas (about 50μ in length) on antennal segment III extending nearly to center of segment which is 91 to 130μ in length. Antennal segment II brown or with tip light brown, segment III yellowish brown in basal half. Remainder of segments brown. Total body length about 2.4 mm (W. No. Amer.) . . . . . *O. kelloggii* Moulton, 1907

3(1). Sensory areas on antennal segment III almost equal in size, irregularly oval and the smaller one from 9 to 13μ long by 6 to 11μ wide. Antennal segment II dark brown at base shading to yellowish brown at tip, segment III yellow to yellowish brown in basal half. Remainder of segments brown. Antennal segment III, 71 to 97μ in length. Total body length about 1.6 mm (W. No. Amer.). . . . . .*O. yosemitii* Moulton, 1911
   Sensory areas on antennal segments III and IV oval, and nearly all equal in size. Length of antennal segment III, 105μ, Total body length 1.58 mm. (India) . . . . . *O. raoi* Moulton, 1927

Orothrips kelloggii Moulton
(Pl. 18, fig. 8)

Orothrips kelloggii, Moulton, 1907. U.S.D.A., Tech. Ser., No. 12, pt. III, pp. 45–46.

Orothrips kelloggii, Bailey, 1949*b*. Pan-Pac. Ent., 25(3):104–112.

Location of type: Moulton collection. Holotype ♀, No. 179, California Academy of Science.

Type locality: Santa Clara Valley, California, according to original description; type slide has no data thereon.

Geographic location: British Columbia, Oregon, Arizona, California.

Discussion: This *Orothrips* is often found together with *yosemitii*.

California records:

Colusa Co.: Williams, III-6-35, manzanita; Wilbur Springs, I-29-35, manzanita flrs. (S. F. Bailey and L. J. Berry).

Contra Costa Co.: Mt. Diablo, manzanita, XII-30-48 (S. F. Bailey and H. E. Cott).

El Dorado Co.: Camino, V-12-37, *Ceanothus*.

Fresno Co.: VI-27-48, manzanita (A. T. McClay).

Lake Co.: Cobb Mt., IV-24-35, manzanita.

Mariposa Co.: Yosemite Valley, manzanita, V-17-38.

Monterey Co.: Monterey, IV-25-48, *Arbutus menziesii* (J. M. Linsdale).

Napa Co.: Mt. St. Helena, V-6-37, madrone; Mt. St. Helena, XII-21-48, manzanita (H. E. Cott and S. F. Bailey).

Nevada Co.: Nevada City, IV-27-39, madrone (S. F. Bailey and F. Andre).

Placer Co.: Lake Tahoe, V-21-48, manzanita flrs. (R. M. Bohart).

Santa Clara Co.: Santa Clara Valley, manzanita and madrone flrs. (from original description).

Shasta Co.: Bayles, III-16-39, manzanita (A. T. McClay).

Sonoma Co.: Kenwood, III-15-39, manzanita; Kellogg, IV-22-37, madrone.

Orothrips yosemitii Moulton

Orothrips kelloggii yosemitii Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser. No. 21, p. 34.

Orothrips yosemitii Moulton, 1927. Bull. Brooklyn Ent., 22(4):183.

Orothrips variabilis Moulton. Bull. Brooklyn Ent., 22(4):184.

Orothrips yosemitii, Bailey, 1949*b*. Pan-Pac. Ent., 25(3):104–112.

Location of type: Moulton collection. Holotype ♀, No. 101, California Academy of Science.

Type locality: Yosemite Valley, California.

Geographic location: British Columbia, Wyoming, Oregon, Washington, California.

Discussion: This is the most widely distributed species in the group. It is abundant in the spring and early summer in flowering shrubs.

California records:

Alpine Co.: Carson Pass, VII-1-36, wild flrs.

Contra Costa Co.: Mt. Diablo, IV-12-35, *Ceanothus*.

El Dorado Co.: Placerville, IV-13-47, live oak flrs.; Emerald Bay, VII-7-39, *Ceanothus*.

Inyo Co.: Big Pine Creek, V-19-47, grass (R. M. Bohart).

Mariposa Co.: Wawona, V-31-36, *Ceanothus*; Yosemite Valley, VI-5-38, sweeping grass, 6,000′; Nevada Falls, VI-19-37, *Prunus demissa*.

Modoc Co.: Willow Ranch, V-24-49, *Prunus*.

Monterey Co.: Monterey, Hastings Natural History Reservation, V-1-48, grass (J. M. Linsdale).

Napa Co.: Mt. St. Helena, III-7-48, oak catkins.

Nevada Co.: Grass Valley, IV-26-36, *Ceanothus*; Nevada City, IV-27-39, madrone (S. F. Bailey and F. Andre).

Placer Co.: Penryn, III-12-35, *Ceanothus*; Emerald Bay, VII-7-39, *Ceanothus*.

Sacramento Co.: Folsom, IV-3-47, grass under oak.

San Bernardino Co.: Cajon Pass, IV-12-36, *Ceanothus* (R. M. Bohart).

San Mateo Co.: Redwood City, manzanita (D. Moulton).

Santa Barbara Co.: Santa Barbara, *Brassica*.

Shasta Co.: Manzanita Lake, VII-22-47, sweeping grass.

Siskiyou Co.: Yreka, gladiolus.

Solano Co.: Mix Canyon, III-6-26, *Ceanothus*; Vacaville, III-2-34, plum (C. H. Wren); Vacaville, IV-10-48, oak catkins (S. F. Bailey and K. Sakimura).

Tulare Co.: Sequoia Park.

Yolo Co.: Rumsey, sweeping grass, IV-11-36.

Genus *Oxythrips* Uzel

Antennae eight-segmented, style two-segmented; segment VI usually with partial line of cleavage as in *Anaphothrips*, trichomes forked on segments III and IV. Head wider than long. Ocelli present. Maxillary palpi three-segmented. Prothorax wider than long with one long bristle at each outer posterior angle of pronotum. Forewings with two longitudinal veins; hind vein regularly beset with small bristles. Terminal abdominal segment long and tubular in some species. Ovipositor downturned. Comb absent on segment VIII. Male smaller than female with heavy thornlike bristles on dorsum of abdominal segment IX and sternites with oval sensory areas.

Oxythrips quercicola Bagnall
(Pl. 22, fig. 44; pl. 23, fig. 53)

Oxythrips quercicola Bagnall, 1926. Ent. Mon. Mag., 62:282.
Location of type: Bagnall collection, British Museum.
Type locality: Berwickshire, Scotland.
Geographic location: British Isles, California.
Discussion: This determination is a provisional one as we have not seen *pinicola* Hood or *pallidiventris* Hood. The one European specimen of *quercicola* in our collection does not have a partial suture in the distal part of antennal segment VI which is evident in the California specimens from pine. The collection of this genus, both in oak catkins and from pine needles, a new record for the state, indicates the need for a study and a generic review of *Oxythrips*, particularly in North America.
California records:
Kern Co.: Walker Pass, III-30-52, *Pinus montifolia* (E. I. Schlinger).
Nevada Co.: Nevada City, V-19-51, oak catkins (W. J. Wall and S. F. Bailey).

Genus *Parthenothrips* Uzel

Head, thorax, legs, and forewings heavily sculptured with network of polygons. Head wider than long, eyes protruding. Ocelli situated on raised part of vertex. Maxillary palpi two-segmented. Antennae seven-segmented, slender, sensory trichomes on segments III and IV small and simple, style one-segmented and terminating in long, threadlike seta. Bristles on head and pronotum broad and lanceolate. Forewing broad, with very heavy ring vein; fore vein fused with costa, one longitudinal vein. Costal margin without a fringe of delicate hairs and with an indentation about one-third distance from base. Legs unarmed. Abdominal segment VII without a comb. Ovipositor downturned.

Parthenothrips dracaenae (Heeger)
(Pl. 20, fig. 30)

Heliothrips dracaenae Heeger, 1852. Sitzgsb. Akad. Wiss. Wien, 14:365.
Parthenothrips dracaenae, Uzel. 1895. Monogr. Ord. Thysanop., p. 172.
The complete synonymy is to be found in Priesner's "Thysanopteren Europas," pp. 132-133.
Location of type: Vienna Museum, Austria.
Type locality: Unknown to me.
Geographical location: Chiefly in greenhouses, in Europe, India, North America, Australia. In the United States it is known from California, District of Columbia, Massachusetts, New Jersey, New York, and Oklahoma.
Discussion: The dracaena or palm thrips is a species of minor importance and is nearly always collected in greenhouses. Its native home appears to be unknown.
California records:
San Francisco Co.: San Francisco, VI-17-30 Kentia Palms (J. B. Steinweden), VI-20-39, *Hedera helix* (E. O. Essig, C.A.S.).
Yolo Co.: Davis, 1928, greenhouse (F. H. Wymore).

Genus *Plesiothrips* Hood

Head slightly wider than long, projecting forward beyond eyes. Ocelli present, anterior ocellus forward of fore margin of eyes. Maxillary palpi three-segmented. Antennae seven-segmented; style one-segmented, forked sensory trichomes on segments III and IV. Prothorax about same length as head and only slightly wider; two well-developed bristles at each outer posterior angle. Forewings narrowest in second fourth, with two longitudinal veins. Tarsi unarmed. Abdominal segment VIII without comb; terminal segments abruptly pointed. Ovipositor downcurved, somewhat reduced. Tarsi without claws. Male smaller than female and with antennal segments differently proportioned; III short, IV-VI long and covered with long, slender bristles, VII greatly reduced. Base of segments IV and V with accessory small ring segment. Abdominal segment IX with a pair of very heavily developed thornlike spurs on tergite IX arising from chitinous base.

Plesiothrips perplexus (Beach)
(Pl. 19, fig. 16; pl. 20, fig. 25; pl. 21, fig. 36)

Sericothrips perplexa Beach, 1896. Proc. Iowa Acad. Sci., 3:216-218.
Thrips perplexus, Hinds, 1902. Proc. U.S. Nat. Mus., 26(1310):184.
Plesiothrips perplexus, Hood, 1915. Proc. Ent. Soc. Wash., 17(3):128-132.
Location of type: Cornell University.
Type locality: Ames, Iowa.
Geographic location: Hawaii, Arizona, California, District of Columbia, Florida, Iowa, Illinois, Maryland, New York, Massachusetts, South Carolina, Tennessee, Texas.

Discussion: This thrips has been found in California only recently (Bailey and Cott, 1952) and is collected in company with *Chirothrips* and *Limothrips*, by sweeping grasses. The ovipositor is greatly reduced as in *Merothrips*.

California records:

Inyo Co.: Westgaard Pass, V-18-47, sweeping, (R. M. Bohart).

Stanislaus Co.: Oakdale, VIII-2-50, grass.

Genus *Psilothrips* Hood

Antennae eight-segmented, style two-segmented, very slender forked sensory trichomes on segments III and IV. Head wider than long with vertex raised forming a V-shaped ridge. Ocelli on raised circular part of head as in the heliothripids. Maxillary palpi two-segmented. Prothorax wider than long with one small bristle at each outer posterior angle of pronotum. Forewings broad, pointed at tip, with two longitudinal veins, one cross vein connecting costa near center, and without fringe on fore margin. Tarsi unarmed. Abdominal segments with microsetae laterally present as in *Sericothrips*. Ovipositor downturned. Comb absent on segment VIII.

Psilothrips pardalotus Hood

Psilothrips paradalotus Hood, 1927d. Proc. Biol. Soc. Wash., 40:198.

Location of type: Cornell University.

Type locality: Collection data on holotype unknown to me. The original description recorded the species from California, Arizona, and Texas.

Geographic location: Indicated above.

Discussion: We have studied paratypes of both species of the genus taken in this state. The types of both these *Psilothrips* need to be compared, redescribed, and illustrated.

California record:

Locality unknown, with the exception of the "desert."

Psilothrips priesneri (Moulton) (Pl. 23, fig. 50)

Anaphothrips priesneri Moulton, 1926. Trans. Amer. Ent. Soc., 52(2):123-124.

Psilothrips priesneri, Bailey, 1935. Pan-Pac. Ent., 11(4):166.

Location of type: Moulton collection. Holotype ♀, No. 340, California Academy of Science.

Type locality: Modesto, California.

Geographic location: California, Texas.

Discussion: The two California species in this genus are extremely close taxonomically, and both were collected from similar plants in the arid areas. The Moulton specimens are much darker than those from Texas. We have searched many times for this species on *Amaranthus* and *Atriplex* in California with no success. Only the original specimens are known to us.

California record:

Stanislaus Co.: Modesto, VIII-17-10, weed (A. L. Rutherford, C.A.S.).

Genus *Rhipidothrips* Uzel

Head longer than wide, slightly produced beyond eyes. Eyes prolonged ventrally. Ocelli present. Maxillary palpi three-segmented. Labial palpi three-segmented. Labial palpi four-segmented. Antennae nine-segmented, terminal three segments fused, III and IV with ventral, lense-shaped sensory areas near tip, sometimes nearly forming a band encircling segment. Pronotum wider than long with lateral suture at each side along the long axis of body. One bristle at each outer posterior angle of pronotum longer than others on posterior margin. Wings broad and rounded, typically aeolothripoid. Brachypterous forms with reduced veination. Fore tarsi with hook. Fore tibiae with broad spur at tip. Abdomen broadly joined to thorax. Ovipositor upcurved. Male smaller than female and without dorsal or lateral appendages or chitinous projections.

Key to the Species of *Rhipidothrips*

1. Antennal segment II yellow; dorsum of head with a distinct collar of polygonal reticulations at posterior (Europe, No. Amer.) . . . . . *gratiosus* Uzel, 1895

   Antennal segment II brown or gray; dorsum of head transversely striate 2

2(1). Forewing of macropterous forms with a brown crossband; abdominal segments IV and V white; antennal segment IV white (Australia) . . . . . *cinctus* Hood, 1918

   Forewing without crossbands; abdominal segments otherwise colored or uniform brown; antennal segment IV pale yellowish-brown to dark brown 3

3(2). Large species, body length 2.5 mm.; length of antennal segment III .087 mm., VIII .008 mm.; tip of antennal segment

III dark brown (Australia) . . . . . *kellyanus* Bagnall, 1924

Smaller species, body length about 1.6 mm.; antennal segment III, .064 mm., VIII, .013-.020 mm.; III, yellow . . . 4

4(3). Bristles behind eyes few, weak; intercollar bristles weak. Transverse striations on dorsum of head uniform, 1 line heavier than remainder, giving the appearance of a posterior collar (No. Europe). . . . . *niveipennis* O. M. Reuter, 1899

Cluster of short stout bristles behind eyes, intercollar bristles strong; striations on dorsum of head forming a collarlike appearance at posterior (condition unknown in *cabirensis*); remainder of surface weakly striated (Europe, No. Amer.) . . . . . *brunneus* Williams, 1913 and *cabirensis* Priesner, 1932

Rhipidothrips brunneus Williams

Rhipidothrips brunneus Williams, 1913. Jour. Econ. Biol., 8(4):216-218.

Rhipodothrips brunneus, Priesner. 1926. Thys. Eur., p. 97.

Rhipidothrips brunneus, Bailey. 1954b. Pan-Pac. Ent., 30(3):210-212.

Location of type: Oxford University Museum, England.

Type locality: Sussex, England.

Geographic location: Europe, Siberia, Oregon, California.

Discussion: In North America this thrips is very localized and is found in the spring on grasses and wild oats.

California records:

Santa Clara Co.: Stanford University, IV-27-49, grass.

Solano Co.: Vacaville, II-15-48, sweeping grass under oak (A. T. McClay). Fairfield, IV-9-47, sweeping grass under oak.

Sonoma Co.: Skaggs Island, III-15-51, oats.

Rhipidothrips gratiosus Uzel
(Pl. 17, fig. 5; pl. 18, fig. 13)

Rhipidothrips gratiosus Uzel, 1895. Monogr. Ord. Thysanop., pp. 66-68.

Rhipidothrips gratiosus, Priesner, 1926. Thys. Eur., p. 96.

Rhipidothrips gratiosus, Bailey, 1954*b*. Pan-Pac. Ent., 30(3):213-216.

Location of type: Unknown to me.

Type locality: Czechoslovakia.

Geographic location: Europe, Cyprus, North America.

Discussion: This European thrips has been found only recently in North America. Its habits are very similar to *brunneus*, but it is less common.

California records:

Riverside Co.: Beaumont, V-6-49, sweeping grass (R. M. Bohart).

San Luis Obispo Co.: San Luis Obispo, IV-24-51, wild oats; Edna, wild oats, IV-24-51; Pismo Beach, IV-24-51, sweeping grass (R. M. Bohart and S. F. Bailey).

Santa Barbara Co.: Zaca Mountain, IV-24-51, sweeping grass (R. M. Bohart and S. F. Bailey).

Genus *Rhopalandrothrips* Priesner

Antennae of female eight-segmented; male six or eight-segmented. In male segment VI very large and heavily setose. Segments V, VII, and VIII greatly reduced. Forked sensory trichomes present on segments III and IV of both sexes. Ocelli present. Interocellar bristles well developed. Postocular bristles reduced. Maxillary palpi three-segmented in female and two or three-segmented in male. Mouth cone normal. Head wider than long. Pronotum wider than long with two long bristles at each posterior outer angle as in *Taeniothrips*, remaining bristles small. Legs unarmed. Forewings with two longitudinal veins. Fore vein joined to costa in one or more places. Hind vein regularly beset with bristles. Fringe normal. Abdominal segment VIII with comb. Ovipositor downcurved. Terminal abdominal segments of male without claspers or other armature and without oval sensory areas on sternites.

Rhopalandrothrips corni Moulton
(Pl. 23, figs. 54, 55, 56)

Rhopalandrothrips corni Moulton, 1927. Pan-Pac. Ent., 4(1):34-35.

Location of type: Moulton collection. Holotype ♀, No. 967, and allotype, No. 967, California Academy of Science.

Type locality: Big Trees, Calaveras County, California.

Geographic location: California, Nevada, Utah, Oregon.

Discussion: The females are typically *Taeniothrips* in appearance. The genus has been set up on the basis of sexual diversity exhibited in the antennae of the male. It should be pointed out that the female is very close to *T. albus*

Moulton, 1911, which was based on one female specimen only. Moulton originally compared *corni* with *Taeniothrips costalis* (Jones) but apparently did not see the type. When mounted without pressure the mouth cone of *corni* does not extend beyond the posterior margin of the prothorax. Some individual specimens, however, do have larger than normal mouth parts. Should future collecting bring to light the male of *T. albus* the possible synonymy of these two species can be determined.

California records:

Calaveras Co.: Big Trees, VIII-1-1926, dogwood, maple, *Bromus* foliage (D. Moulton, C.A.S.); maple and *cornus*, VI-8-39.

El Dorado Co.: Riverton, VII-22-48, maple leaves; Meyers, VII-23-48, fir; Pacific House, VII-22-48, *Cornus;* Cisco, VII-23-48, incense cedar.

Glenn Co.: Orland, III-13-36, orange.

Kern Co.: Kern River Canyon, IV-19-49, oak leaves.

Madera Co.: Bass Lake, VI-7-38, *Sambucus* flowers.

Mariposa Co.: El Portal, V-18-38, grass; Yosemite Valley, V-17-38, incense cedar.

Napa Co.: Mt. St. Helena, III-7-48, oak catkins.

Nevada Co.: Nevada City, VII-26-50, Scotch broom.

Placer Co.: Lake Tahoe, VII-22-48, *Chrysothamnus.*

Sacramento Co.: Fair Oaks, VI-22-37, box elder.

San Bernardino Co.: Fallsvale (approx. 6,500'), IX-12-50, wild raspberry (W. W. Watkins).

Santa Clara Co.: Palo Alto, IV-27-49, manzanita.

Solano Co.: Mix Canyon, V-27-37, maple leaves and chamise; Green Valley, III-29-49, oak leaves.

Tulare Co.: Sequoia National Park, VII-3-50, *Sambucus.*

Yuba Co.: Marysville, date unknown, *Bromus.*

Yolo Co.: Knights Landing, IX-11-36, native Sycamore; Dunnigan, VII-26-39, oak.

Genus *Scirtothrips* Shull

Antennae eight-segmented, style two-segmented; segment III pedicillate, III and IV with forked sensory trichomes. Head wider than long with transverse reticulations behind eyes. Ocelli present. Maxillary palpi three-segmented. Prothorax wider than long with transverse reticulations; one or two bristles on posterior margin near each outer angle longer than others. Forewings with two longitudinal veins irregularly beset with bristles; fringe normal. Tarsi unarmed. Abdomen with microsetae on lateral surfaces as in *Sericothrips* but comb present and complete on segment VIII only. Ovipositor downcurved. Male smaller than female and usually with one pair of long, sickle-shaped bristles on abdominal segment IX as in *Drepanothrips.*

Key to the North American Species of *Scirtothrips*

1. Antennal segments I and II white or very pale yellow . . . . . *ruthveni* Shull, 1909 and *niveus* Hood, 1913
   Antennal segment I only white 2

2(1). Abdominal tergites with dark cross lines at contiguous margins 3
   Abdominal tergites without dark cross lines 4

3(2). Forewings 48μ wide in basal fourth, tapering sharply. Pronotum small, about 81μ long, deeply striate . . . . . *longipennis* (Bagnall), 1909
   Forewings 64μ in basal fourth, tapering bluntly. Pronotum about 98μ long, lightly and uniformly striate . . . . . *aceri* Moulton, 1926

4(3). Major seta at each outer posterior angle of pronotum 40μ or longer . . . . . *citri* (Moulton), 1909 and *albus* (Jones), 1912
   Major seta at each outer posterior angle of pronotum 23-32μ 5

5(4). Forewings 670μ in length; very light brown in basal half, remainder almost colorless with median light-brown streak. Antennal segments II-VIII pale gray . . . . . *prosopis* Hood, 1939
   Forewings 512μ in length; uniform smoky gray or colorless 6

6(5). Head depressed in front of median ocellus. Pronotum unshaded . . . . . *taxodii* Hood, 1954
   Head rounded in front of median ocellus. Pronotum gray . . . . . *brevipennis* Hood, 1914

Scirtothrips aceri Moulton

Scirtothrips aceri Moulton, 1926. Trans. Amer. Ent. Soc., 52(2):122-123.

Location of type: Moulton collection. Holotype ♀, No. 413, paratype ♂, No. 451, California Academy of Science.
Type locality: Redwood City, California.
Geographic location: California.
Discussion: This species is the only *Scirtothrips* in California known to us to have the pigmented areas on the abdominal tergites.
California records:

Butte Co.: Oroville, III-16-26, plum (Earle Mills, C.A.S.).

Napa Co.: Mt. St. Helena, III-7-48, oak catkins.

Placer Co.: Penryn, III-4-36, oak leaves.

San Mateo Co.: Redwood City, VIII-16-25, maple leaves (D. Moulton, C.A.S.).

Solano Co.: Fairfield, VIII-19-36, valley oak leaves.

Tuolumne Co.: Tioga Road, VII-26-26, *Frasera speciosa* (D. Moulton, C.A.S.).

Scirtothrips albus (Jones)

Anaphothrips albus, Jones, 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, pp. 16-17.
Scirtothrips albus, Karny, 1912. Zool. Ann., 4:334
Location of type: Cornell University.
Type locality: San Jose, California.
Geographic location: California.
Discussion: I find it very difficult to separate this species from *citri.* We have seen specimens other than the type collected by Jones in 1911 and determined by Moulton as *albus* but these appear to be *citri.*
California record:

Santa Clara Co.: San Jose, VI-6-10, monkey flower (*Mimulus* sp.) (C.A.S.).

Scirtothrips citri (Moulton)
(Pl. 17, fig 3; pl. 23, fig. 49)

Euthrips citri Moulton, 1909. U.S.D.A., Bur. Ent., Tech. Ser. 12, pt. VII, pp. 121-122.
Physothrips citri, Karny, 1912. Zool. Ann., 4:339.
Scirtothrips citri, Hood, 1914. Proc. Ent. Soc. Wash., 16(1):40.
Location of type: Unknown to me.
Type locality: Exeter, Tulare County, California.
Geographic location: Arizona, California.
Discussion: The biology and control of this well-known economic pest of citrus have been worked out in detail (Edeling, 1950). It appears to have been a native species which adapted itself to the newly introduced subtropical fruits many years ago. It is found on native plants many miles from citrus plantings, which is in sharp contrast to the introduced pear thrips.
California records: The citrus thrips occurs throughout the citrus-growing area on citrus and many other trees and shrubs. The following records have been selected because they illustrate how widespread it is:

Colusa Co.: Maxwell, V-22-36, lemon.

Imperial Co.: Tamarack, VI-24-41, grape (W. B. Hewitt).

Lake Co.: Nr. Clearlake Oaks, VI-10-51, chamise; sweeping.

Los Angeles Co.: Griffith Park, VI-18-50, beating chamise.

San Francisco Co.: San Francisco, misc. plants in greenhouse, collector unknown.

Solano Co.: Fairfield, III-18-36, willow.

Tulare Co.: Exeter, VI-24-35, orange; Lindsay, V-14-09, orange (D. Moulton, C.A.S.).

Yolo Co.: Davis, IX-23-36, grape; Davis, VII-18-34, greenhouse; Davis, V-25-37, aphid leaf galls on poplar (S. R. Moyer).

Scirtothrips longipennis (Bagnall)

Euthrips longipennis Bagnall, 1909. Ann Soc. Ent. Belg., 53:173.
Euthrips parvus Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, pp. 38-39.
Scirtothrips longipennis, Hood. 1914. Proc. Ent. Soc. Wash., 16(1):37, 40.
Location of type: British Museum.
Type locality: Brussels, Belgium (in hothouses in the Botanical Gardens).
Geographic location: In greenhouses in Europe, Puerto Rico, Canada, New York, and California.
Discussion: This thrips undoubtedly has a native home in some tropical country and has been introduced. We have no records out of doors.
California records:

San Francisco Co.: San Francisco, IX-3-35, *Cyclamen,* and IX-25-35, begonia (J. B. Steinweden); 1910 on various greenhouse plants (D. Moulton, C.A.S.).

Genus *Scolothrips* Hinds

Head wider than long. Ocelli on circular raised part of vertex. Interocellor bristles very long. Postocular bristles small or absent. Maxillary palpi three-segmented. Antennae eight-segmented, style two-segmented, segment III pedicillate, III and IV with forked sensory trichomes. Prothorax wider than long; notum with very long bristles on both anterior and posterior margins

and with a similar long mid-lateral bristle. Forewings broad, pointed; two longitudinal veins more or less regularly beset with long bristles. Legs unarmed. Comb on abdominal segment VIII absent. Male smaller than female and with transverse sensory areas enlarged at ends on abdominal sternites III-VIII.

Key to the North American Species of *Scolothrips*

Females
(modified from Priesner, 1950)

1. Base of antennae (segments I and II) without coloration. Body and legs pale yellow. Cross bands on wings short . 2
   Antennal segment I white, II-VIII shaded with gray. Body with pigmented areas 3

2(1). Basal crossband on forewing smaller than distal one and not reaching fore margin of wing, second (apical) band nearly always longer than broad. Secondary setae on pronotum well developed . . . . . *pallidus* (Beach), 1896
   Basal crossband on forewing smaller than distal one, sometimes not reaching hind margin but always reaching fore margin. Both bands short and spotlike. Secondary setae on pronotum wanting . . . . . *longicornis* Priesner, 1925

3(1). Prothorax uniformly gray. Setae on body and wings short. . *boodi* Priesner, 1950
   Prothorax with two spots of gray, sometimes fused. Abdominal tergites with pigmented areas but no lateral spots. Body and wing bristles longer . . . . . *sexmaculatus* (Pergande), 1894

Scolothrips

Males

1. First or median pair of bristles on posterior margin of tergite IX in 1 transverse row 2

   First pair of dorsal bristles on tergite IX, and third pair, situated basad from hind margin; the extreme hind margin bearing 2 bristles instead of 4. Dark crossbands on forewings short. Wings narrow and short . . . . . *longicornis* Priesner

2. The 3 basal glandular areas on sternites III-V, 132-153μ wide. Width of forewing at first crossband 48-50μ . . . . . *sexmaculatus* (Pergande)

   (The male of *boodi* is unknown.)

   The first 3 glandular areas 108-125μ wide. Width of forewing at first crossband 39-42μ . . . . *pallidus* (Beach)

Scolothrips longicornis Priesner

Scolothrips sexmaculatus, Priesner, 1920. Jahresbericht Mus. Francisco Carolinum, No. 78, p. 57.
Scolothrips longicornis Priesner, 1925. Konowia, 4:146.
Scolothrips longicornis, Priesner, 1950. Bull. Soc. Fouad 1er Ent., 34:50-52.
Location of type: Priesner collection, Cairo, Egypt.
Type locality: Linz, Austria.
Geographic location: Europe, Egypt, North America (California).
Discussion: Priesner points out (1950) the unusual occurence of this species in California based on specimens I collected on corn and oriental plane tree. In both instances it was feeding on red spiders. We now have a long series from an almond orchard where several *Scolothrips* per leaf were found.
California records:
Contra Costa Co.: Berkeley, VII-17-29, *Cestrum*, (J. F. Lamiman).
Yolo Co.: Davis, VIII-18-32, corn; VIII-16-49, *Plantanus* leaves; Esparto, VII-7-50, almond (F. M. Summers).

Scolothrips pallidus (Beach)
(Pl. 23, fig. 51)

Thrips pallida Beach. 1896. Proc. Iowa Acad. Sci., 3:226.
Scolothrips sexmaculatus, Hinds. 1902. Proc. U.S. Nat. Mus., 26(1310)157-158.
Scolothrips sexmaculatus, Bailey, 1939. Jour. Econ. Ent., 32(1):43-47.
Scolothrips pallidus, Priesner, 1950. Bull. Soc. Fouad 1er Ent., 34:43-45.
Location of type: Unknown to me.
Type locality: Iowa or Wisconsin.
Geographic location: New York, Florida, Iowa, Wisconsin, California.
Discussion: This *Scolothrips* now appears to be the principal predaceous species on spider mites in North America. Many of the records in the literature referring to the Pergande species should be referred to *pallidus* according to

Priesner. Near the end of the summer this thrips does a great deal of good in reducing spider populations. Earlier in the year, however, the rate of reproduction of the spiders is so much faster than the thrips that they are of limited value to the farmer.

California records:

Kern Co.: Shafter, V-22-41, cotton (R. E. Suggett).

Orange Co.: Costa Mesa, V-29-35, beans.

Yolo Co.: Davis, VIII-1-36, walnut; VIII-18-32, corn; V-20-46, rose; IX-1-54, willow; VI-18-34, hops in greenhouse.

Scolothrips sexmaculatus (Pergande)

Thrips 6-maculata Pergande, 1888-1991. Trans. Acad. Sci., St. Louis, 5(3-4):539 (as footnote in article by J. C. Duffey).

Scolothrips sexmaculatus, Priesner, 1950. Bull. Soc. Fouad 1er Ent., 34:42-43.

Location of type: United States National Museum.

Type locality: Unknown to me.

Geographic location: California, Arizona, Missouri (?).

Discussion: Priesner (1950) has recently made a careful review of the genus and we are following his interpretation of the three California species. Pergande's species appears to be the less widely distributed and therefore of much less value in controlling red spiders. It occurs sparsely among colonies of other species in California.

California records:

Placer Co.: Cisco, VII-23-48, cedar.

Tulare Co.: VII-17-36, grape (A. D. Rizzi).

Yolo Co.: Davis, V-20-46, rose; IX-1-54, willow.

Genus *Sericothrips* Haliday

Head wider than long, eyes prominent. Ocelli placed on raised part of vertex. Interocular bristles well developed, postoculars very weak. Antennae eight-segmented, style two-segmented; segments III and IV with forked sensory trichomes, VI with linear sensory area. Maxillary palpi three-segmented. Prothorax wider than long, notum with transverse striations. Posterior angles of pronotum each with one long bristle and with or without additional bristles along posterior margin or along anterior margin of "saddle" which spans center of notum. Bristles along anterior margin variable but without a long bristle at the outer angle. Forewings with one longitudinal vein which is regularly beset with bristles. One or more accessory bristles are often situated near tip, behind fore vein. Fringe normal. Tarsi unarmed. Abdomen with pair of closely placed bristles in center of tergites on segments I-V. Lateral surfaces of abdominal segments I-VIII with rows of microsetae. Comb present on posterior margins of these segments partially to wholly complete. Ovipositor downturned. Male smaller than female, abdomen without sensory areas or secondary sexual appendages.

Key to the California Species of *Sericothrips*

1. Mouth cone very long, extending onto mesosternum . . . . . *albus* Jones, 1912
   Mouth cone much shorter, not reaching mesosternum 2

2(1). Bristles on posterior margin of pronotum all nearly same length and about .020 mm. . . . . *opuntiae* Hood, 1936
   Bristles on posterior margin of pronotum of unequal lengths, the second from each outer angle nearly twice as long as those adjacent 3

3(2). Color pattern on body and appendages variable. Tip of abdomen not uniformly dark brown . . *"variabilis"* Beach, 1896
   Tip of abdomen, segments VII-IX, dark brown as are segment I, head and hind femora 4

4(3). Pronotal blotch or saddle solid brown with deep U-shaped indentation at center on posterior margin. Antennal segments III-V together .130 mm. long . . . . . *chrysothamni* Hood, 1936
   Pronotal blotch or saddle variable, sometimes nearly absent or represented by small scattered yellowish-brown areas. Antennal segments III-V together .150 mm. long . . . . . *moultoni* Jones, 1912

Sericothrips albus Jones

Sericothrips albus Jones. 1912. U.S.D.A. Bur. Ent., Tech. Ser., No. 23, pt. I, pp. 6-7

Sericothrips albus, Hartwig. 1952. So. Afr. Dept. Agr., Ent. Mem., 2(11):402-410.

Location of type: Cornell University.

Type locality: Visalia, California.

Geographic location: California.

Discussion: This species, having been described early in the race, almost certainly has synonyms. Jones described it from three specimens, none of which are in the Jones or Moulton collections. Additional collections are not recorded since a positive identification is impossible.

California record:

Tulare Co.: Visalia, elderberry and weeds, V-1910 (P. R. Jones, C.U.).

Sericothrips chrysothamni Hood

Sericothrips chrysothamni Hood. 1936. Jour. N.Y. Ent. Soc., 44:85-88.

Sericothrips chrysothamni, Hartwig, 1952. So. Afr. Dept. Agr., Ent. Mem., 2(11):403.

Location of type: Cornell University.

Type locality: Galice, Oregon.

Geographic location: California, Nevada, Oregon.

Discussion: The species is so close to *moultoni* that unless a fully pigmented specimen is at hand, dorsally mounted, it is almost sure to be determined as *moultoni.* We have collected it from *Chrysothamnus nauseosus* in Nevada.

California records:

Mono Co.: Sonora Pass, 9,000′, VIII-28-48, grass sweepings.

Sierra Co.: Webber Lake, VIII-25-46, grass sweepings, R. M. Bohart.

Sericothrips moultoni Jones
(Pl. 23, fig. 48)

Sericothrips moultoni Jones. 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I. pp. 7-8.

Sericothrips moultoni, Hartwig, 1952. So. Afr. Dept. Agr., Ent. Mem., 2(11):402-410.

Location of type: University of California, Davis. Moulton relabeled the slide, not retaining the original Jones label. It carries the number 127 and the following collection data: "Blue legume, San Jose, Cal., 16-IV-10, P. R. Jones" (See also Bailey, 1937*a*).

Type locality: San Jose, California.

Geographic location: Utah, California.

Discussion: The bright coloration of this thrips, together with its preference for lupine, makes it easy to recognize. It reaches a seasonal peak of abundance in the spring during the blooming of the native *Lupinus.* However, small numbers may be found throughout the summer on the new leaves.

California records:

Napa Co.: Mt. St. Helena, IV-2-36, grass.

Placer Co.: Penryn, III-4-36, lupine (S. F. Bailey and R. M. Bohart); Applegate and Lake Tahoe, VI-5-37, lupine.

Sacramento Co.: Folsom, IV-12-46, lupine.

Santa Clara Co.: San Jose, IV-16-10, blue legume (P. R. Jones); Los Gatos, IV-9-10 (P. R. Jones).

Solano Co.: Mix Canyon, VI-6-50, perennial lupine.

Sericothrips opuntiae Hood

Sericothrips opuntiae Hood, 1936. Jour. N.Y. Ent. Soc., 44:88-91.

Sericothrips opuntiae, Hartwig, 1952; So. Afr. Dept. Agr., Ent. Mem., 2(11):402-410.

Location of type: Cornell University.

Type locality: Papago Indian Reservation, near Comobabi, Arizona.

Geographic location: New Mexico, Arizona, California.

Discussion: In California we have found this cactus thrips on the prickly pear cactus. It runs about very rapidly making capture difficult. The adults and nymphs both feed at the base of the young pads.

California records:

Riverside Co.: Riverside, VIII-8-40, cactus (Paul de Bach); Sage, *Opuntia,* IV-27-51.

Ventura Co.: Santa Paula, IX-8-38, cactus pads; Ventura, cactus (collector unknown).

Sericothrips variabilis (Beach)

Thrips variabilis Beach, 1895. Proc. Iowa Acad. Sci., 3:220-223.

Sericothrips variabilis, Hinds, 1902. Proc. U.S. Nat. Mus., 26(1310):143-146.

Sericothrips variabilis, Hartwig, 1952. So. Afr. Dept. Afr., Ent. Mem., 2(11):402-410.

Location of type: Hood studied the types in 1927*b* and designated "var. d." of Beach as the type which is in Hood's collection.

Type locality: Ames, Iowa.

Geographic location: Maryland, Virginia, Illinois, Iowa, Massachusetts, Tennessee, Texas, Mississippi, British Columbia, California. We feel many of the identifications on which these records are based are incorrect.

Discussion: In North America the genus *Sericothrips* is well represented. Much variation occurs within the species. As is inevitable when coloration and reticulation are relied on heavily, the separation of species is very difficult. As the name *variabilis* infers, much variability is to be seen in this widespread form. In addition, when different hosts are fed upon, individual thrips vary in color. Further, it appears that the degree and extent of pigmentation varies in the hot weather as compared with cold weather.

California records: The following are representative only, even if it is found throughout the state:

Amador Co.: Jackson, III-31-36, *Ceanothus.*

Contra Costa Co.: Mt. Diablo, IV-12-35, *Ceanothus.*

Glenn Co.: Orland, IV-8-36, orange.

Imperial Co.: Bond's Corner, XII-26-48, Larrea sp. (F. M. Summers).

Madera Co.: Bass Lake, VI-7-38, *Ceanothus.*

Mariposa Co.: Yosemite Valley, V-20-36, *Ceanothus.*

Santa Clara Co.: San Jose, VI-16-10, sage (P. R. Jones).

Tulare Co.: Poplar, VI-3-36, cottonwood (J. F. Lamiman).

Tuolumne Co.: Hardin Flat, VI-9-38, *Ceanothus.*

Yolo Co.: Davis, IX-23-35, grape (R. M. Bohart).

Genus *Stomatothrips* Hood

Head about as wide as long; eyes not produced noticeably on ventral surface. Ocelli present. Antennae nine-segmented, terminal segment very small and closely attached to VIII, similar in appearance to *Erythrothrips.* Sensory areas on antennal segments as follows: on III, narrow, linear and ventral, with central row of minute lenslike areas; on IV, narrow, ventral and hooked at tip on underside, curving inward (as in *Desmothrips*), also with central row of minute disklike dots; on V and VI, cuneiform; on VII variable, linear to oval. Maxillary palpi geniculate, seven- to eight-segmented, segments sometimes fused near tip. Labial palpi five-segmented. Pronotum without strong spines. Fore tarsi with hooklike claw. Forewings expanded at tip and narrowed in basal third; veination typically aeolothripoid. Abdomen broadly expanded in center, "waist" not as narrow as in *Franklinothrips.* Ovipositor upturned. Male small and slender, first abdominal segment elongated and divided dorsally into thirds by longitudinal ridges; secondary sexual appendages absent.

Key to the World Species of *Stomatothrips*

1. Maxillary palpi 8-segmented 2
   Maxillary palpi 7-segmented 3

2(1). Antennal segment IV long and slender (.131-.147 mm. in female), usually pale yellow with brown ring at tip. Segment III yellow. Antennae of male very long and slender, all segments smoky brown. General body color yellow to light brown (No. Amer.) . . . . . *flavus* Hood, 1912

   Antennal segment IV much shorter (.080-.092 in female), shaded with dark gray or brown at tip, usually with more pigmentation than narrow ring at tip. Antennae of male bicolorous, segments II and III light yellowish-brown, I darker, IV-IX dark brown and much shorter. General color brown to dark brown with crimson subhypodermal pigment (No. Amer.) . . . . . *brunneus* J. C. Crawford, 1940

3(1). Antennal segment IV white with black line around tip. Male unknown (So. Amer.) . . . . . *angustipennis* Hood, 1949

   Antennal segment IV blackish-brown . . 4

4(3). Forewing narrow and not strongly expanded in distal third. Ring vein pigmented along entire costal margin distally. Anterior longitudinal vein of forewing with 19-22 setae. Male unknown (Central Amer.) . . . . . *septenarius* Hood, 1925

   Forewing expanded distally, greatest width 1.6 to 1.7 times the least width . . . 5

5(4). Intermediate dark-colored part of forewing without paler areas. Antennal segments V and VI each with cuneiform sensory area; VII .041 mm. in length (No. Amer,). . . . . *atratus* Hood, 1939

   Intermediate dark-colored part of forewing paler in basal third. Antennal segments V and VI each with a linear sensory area; VII .059 mm. in length (So. Amer.). . . . . *rotundus* Hood, 1929

Stomatothrips flavus Hood
(Pl. 18. fig. 10)

Stomatothrips flavus Hood, 1912. Proc. Biol. Soc. Wash., 25:63-66.

Stomatothrips flavus Bailey, 1952. Pan-Pac. Ent., 28(3):154-162.

Location of type: Cornell University.

Type locality: Monterey, Mexico.

Geographic location: Mexico, Texas, Illinois, South Dakota, Tennessee, Louisiana, Utah, Arkansas, Arizona, California, Kentucky, Virginia, Georgia.

Discussion: This representative is the most widespread of the genus. It has been collected from April to November on many hosts and is doubtless predaceous. The narrow waist and spatulate wings characterize this insect.

California record:

Imperial Co.: Imperial Valley, data unknown, grape (H. J. Quayle).

Genus *Taeniothrips* Amyot and Serville

Antennae eight-segmented, style two-segmented; sensory trichomes on segments III and IV forked. Head usually wider than long. Ocelli present with interocellar bristles usually well developed.

Maxillary palpi three-segmented. Mouth cone sometimes extending onto mesosternum. Prothorax wider than long with two well-developed bristles at outer posterior angles. Forewings with two longitudinal veins, hind vein regularly beset with bristles. Brachypterous and apterous forms also occur. Femora and tibiae without spurs or hooked claws. Abdominal segment VIII with partial or complete comb in majority of species. Ovipositor downcurved. Male smaller than female, usually with sensory areas on abdominal sternites.

This genus is a very large one and difficult to characterize simply and in such a manner that all species presently thought to belong here can be accurately keyed out.

Key to the California Species of *Taeniothrips*

1. Fore tarsus with a claw. . . . . *inconsequens* (Uzel, 1895
   Fore tarsus without a claw 2

2(1). Comb or fringe of hairs on posterior margin of abdominal tergite VIII absent . . . . . *xanthius* Williams, 1917
   Comb on abdominal tergite VIII present . 3

3(2). Cheeks strongly arched and idented immediately behind eyes 4
   Cheeks not strongly arched and not indented behind the eyes 5

4(3). Interocellar bristles very long (0.083 mm.) and placed between posterior ocelli . . *orionis* Treherne, 1924 and *aureus* Moulton, 1946
   Interocellar bristles shorter (0.040 mm.) and placed at side of and slightly to rear of anterior ocellus . . . . . *vulgatissimus* Haliday, 1836

5(3). Mouth cone long, reaching to or beyond posterior margin of pronotum 6
   Mouth cone short, not reaching to posterior margin of pronotum 7

6(5). Antennal segment I light, yellowish-brown; II brown. Mouth cone usually reaching posterior margin of pronotum. Body yellowish to golden-brown. Forewing pale yellowish-brown or smoky, setae yellowish-brown . . . . . *ebrhornii* (Moulton), 1907
   Antennal segments uniform brown, III the lightest. Mouth cone heavy and long. Body dark brown. Center of pronotum with distinct irregular suture parallel with long axis of body. Forewings white, setae pale yellow . . . . . *longirostrum* (Jones), 1912

7(5). Fore vein of forewing with 5-8 distal setae . . . . . *simplex* Morison, 1930
   Fore vein of forewing with 2-4 distal setae 8

8(7). Forewing white or pale yellow 10
   Forewing brown to grayish-brown . . . 9

9(8). Forewing, including scale, dusky brown. Intermediate antennal segments pale yellowish-brown, segments I and II dark brown; III, 0.038 mm. long . . . . . *frici* (Uzel), 1895
   Forewing brown with lighter area (or band) at base, scale darker at base. Antennae dark brown, segment III lightest, sometimes yellowish-brown; III 0.057 mm. long . . . . . *lemanis* Treherne, 1924

10(8). Interocellar bristles 0.048 mm. long and outer posterior pronotal bristles 0.041 mm. in length . . . *albipennis* Moulton, 1929
   Interocellar bristles 0.028 mm. long and outer posterior pronotal bristles 0.032 mm. in length . . . . *albus Moulton,*[4] 1911

Taeniothrips albipennis Moulton

Taeniothrips albipennis Moulton, 1929. Pan-Pac. Ent., 5(3):129-130.

Location of type: Moulton collection. Holotype ♀, No. 2975, California Academy of Science.

Type locality: Eel River, Shasta County, California.

Geographic location: California.

Discussion: The type locality is not very specific, and the Eel River does not pass through Shasta County. It would be difficult therefore to collect topotypes. In comparing it originally with *Rhopalandrothrips corni* Moulton erred in referring to the latter as having only one bristle on the posterior margin of the prothorax. The discussion under *albus,* the following species, indicates the uncertain status of *albipennis.*

California record:

Shasta Co. (?): Eel River, VIII-17-28, *Cornus* sp. (D. Moulton, C.A.S.).

Taeniothrips albus (Moulton)

Euthrips albus Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, pp. 39-40.

[4]Synonym: *costalis* (Jones), 1912.

Euthrips costalis Jones, 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, pp. 13-14.
Physothrips albus, Hood. 1914. Proc. Ent. Soc. Wash., 16:39.
Taeniothrips albus, Steinweden, 1933. Trans. Amer. Ent. Soc., 59:269-293.
Taeniothrips albus, J. C. Crawford, 1941. Proc. Ent. Soc. Wash., 43(6):143.
Location of type: Moulton collection. Holotype ♀, No. 111, California Academy of Science.
Type locality: Red Bluff, California.
Geographic location: California, Oregon.
Discussion: We have studied the type specimen and compared it with the types of *Tae. albipennis* and *Rhopalandrothrips corni.* In the Moulton collection some specimens labeled *alba* are *R. corni*, and others, originally *costalis* (Jones), have been relabeled by Moulton as *alba.* Unfortunately no males of *albus* or *albipennis* are known so that their relationship with *Rhopalandrothrips* can be settled definitely. The differences between these two Moulton species of *Taeniothrips* are very minute. The older species, *albus,* has slightly longer antennae and segments IV-VIII are dark gray in color. In *albipennis* the interocellar and outer posterior pronotal bristles are slightly longer than in *albus.* If a longer series, carefully mounted, was available for study, these small differences could be better evaluated. Neither species has a long mouth cone in the sense of *Mycterothrips;* in neither type does the tip reach the posterior margin of the prothorax.

California record:
Tehama Co.: Red Bluff, VI-19-08, peach foliage (D. Moulton, C.A.S.).

Taeniothrips aureus Moulton

Taeniothrips aureus Moulton, 1946. Pan-Pac. Ent., 22(2):59-60.
Taeniothrips aureus, Bailey, 1949. Canad. Ent., 81(6):156.
Taeniothrips aureus, Bailey, 1949c. Florida Ent., 32(3):123.
Location of type: Moulton collection. Holotype ♀, California Academy of Science.
Type locality: Echo Lake, California.
Geographic location: California.
Discussion: As I have pointed out (Bailey, 1949 and 1949c) this species is probably a synonym of *Tae. orionis* Treherne. The type specimens are mounted in such a manner, however, that positive identification is most difficult.
California record:
El Dorado Co.: Echo Lake, grass (C.A.S.).

Taeniothrips ehrhornii (Moulton)

Euthrips ehrhornii Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, pp. 54-55.
Euthrips ehrhornii forma brachyptera, Jones. 1914. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, p. 12.
Physothrips ehrhornii, Hood, 1914. Proc. Ent. Soc. Wash., 16:39.
Taeniothrips ehrhornii, Steinweden, 1933. Trans. Amer. Ent. Soc., 59:292.
Location of type: Moulton collection. Holotype ♀, no number, California Academy of Science.
Type locality: Alum Rock Canyon, Santa Clara County, California.
Geographic location: California.
Discussion: We have studied more than fifty specimens of this thrips including the material in the Jones and Moulton collections. It is difficult to separate *ehrhornii* from *longirostrum* (Jones). Both have long mouth cones, and distortion in mounting causes this character to vary in appearance. Based on Moulton's type and the series studied, we conclude that typical *ehrhornii* has a pronounced orange-yellow color, is larger than *longirostrum,* and nearly always has the first antennal segment clear light brown. The mouth cone on what we consider *longirostrum* is narrower and longer and the body color is coffee-brown. The variation in the length and pattern of the setae in these two species is extremely small. We have not seen the male described by Jones.
California records:
Humboldt Co.: Trinidad, V-13-30, purple *Ceanothus* (D. Moulton, C.A.S.).
Santa Clara Co.: San Jose, III-29-06; Alum Rock Canyon, III-29-06, grass (D. Moulton, C.A.S.).
Solano Co.: Mix Canyon, II-17-39, laurel flowers.

Taeniothrips frici (Uzel)

Physopus frici Uzel, 1895. Monogr. Ord. Thys., p. 126.
Physothrips blacki Watson, 1919. Fla. Bugg., 3(2): 32.
Taeniothrips blacki, Steinweden, 1933. Trans. Amer. Ent. Soc., 59:286.
The detailed European synonymy is given by Priesner, Thys. Eur., 1926, p. 288.
Location of type: Unknown to me.
Type locality: Czechoslovakia.
Geographic location: Europe, Hawaiian Islands, India, Washington, Oregon, California.
Discussion: It has been only in recent years that we have realized this well-known European

thrips is also fairly common in California. Its hosts are varied. It is recognized from the other dark-brown *Taeniothrips* by its small size and antennal coloration. The basal two segments are concolorous with the body, and the remaining segments yellow except at tip. In appearance it is very similar to *Thrips physapus* Linné.

California records:

Colusa Co.: Arbuckle, V-7-40, chamise.

Mariposa Co.: Yosemite Valley, VI-24-27, clover (D. Moulton).

Mendocino Co.: Philo, VII-19-49, grass.

San Mateo Co.: Woodside, VIII-25-47, composite (H. E. Cott).

Santa Clara Co.: Gilroy, VII-14-36, tomato.

Taeniothrips inconsequens (Uzel) (Pl. 23, fig. 57)

Physopus inconsequens Uzel, 1895. Mongr. Ord. Thys., pp. 117-119.

Euthrips pyri Daniel, 1904. Ent. News, 15:294.

Euthrips inconsequens Bagn., 1909. Jour. Econ. Biol., 4:4.

Physothrips pyri, Karny. 1912. Zool. Ann., 4:338.

Taeniothrips pyri, Hood. 1914. Proc. Ent. Soc. Wash., 16:39.

Physothrips alpinus Pr., 1914 (nec *alpinus* Karny). Wien. ent. Ztg., 687, 55 pp.

Taeniothrips inconsequens, Bailey. 1944, Univ. Calif., Agr. Exp. Sta. Bull. 687, 55 pp.

Location of type: Unknown to me.

Type locality: Czechoslovakia.

Geographic location: Europe, Central Asia, Cyprus, Japan, South America. In North America it is known from New York, Maryland, Virginia, Ontario, British Columbia, Washington, Oregon, Utah, California.

Discussion: This well-known economic pest of fruit trees, the pear thrips, has had much written about it. The latest complete review of its importance, biology, ecology, and control was published by me in 1944. The Utah record is more recent (Bailey and Knowlton, 1949). It is interesting to note that this insect is known in North America only from orchards or on other hosts immediately adjacent to them. The male does not occur in North America.

California records: The distribution in California is limited to the following fruit-growing counties in the northern part of the state: Mendocino, Lake, Sonoma, Napa, Marin, Solano, Yolo, Sacramento, San Joaquin, Yuba, Nevada, Placer, El Dorado, Contra Costa, Alameda, San Mateo, Santa Cruz, Monterey, San Benito, and Santa Clara.

Taeniothrips lemanis Treherne

Taeniothrips lemanis Treherne, 1924. Canad. Ent., 56(4):87-88.

Taeniothrips lemanis, Bailey. 1949. Canad. Ent., 81(6):156-157.

Location of type: Canadian National Museum, Cat. No. 679.

Type locality: Hatzic, British Columbia.

Geographic location, British Columbia, Canada, and California.

Discussion: It is a rarely collected species, and little is known about its biology or preferred hosts.

California records:

Mariposa Co.: Yosemite Valley, V-30-38, maple and manzanita leaves.

Taeniothrips (*Mycterothrips*) *longirostrum* (Jones) (Pl. 22, fig. 47)

Euthrips longirostrum Jones, 1912. U.S.D.A., Bur. Ent., Tech. Ser., No. 23, pt. I, pp. 12-13, pl. III, figs. 6-9.

Physothrips longirostrum, Hood. 1914. Proc. Ent. Soc. Wash., 16:39.

Mycterothrips longirostrum, Karny. 1921. Treubia, 1(4):216.

Taeniothrips longirostrum, Steinweden, 1933. Trans. Amer. Ent. Soc., 59:291.

Location of type: Cornell University.

Type locality: Los Gatos, California.

Geographic location: California.

Discussion: Karny placed this species in *Mycterothrips* because it had a long mouth cone but did not also include *ehrhornii* which also has elongated mouth parts. As discussed above, these two species are very closely related. As is the case with many of the species described in the early part of the century, the original description omitted characters we need to know today to accurately place (or synonymize) this thrips. Our specimens, including one labeled by Jones, have one postocular bristle longer than the others which does not agree with the Jones illustration which also omitted the interocellars. The validity of the long mouth cone as a generic character appears to be in doubt as we recall other genera in which an increasing number of species are being described with such an individually divergent character. This Jones species has a small, irregular longitudinal suture in the center of the pronotum.

We have what we believe to be two males of *longirostrum.* The description of the male of *ehrhornii* is inadequate, and the specimen is unavailable for comparison.

Extensive collecting on perennial lupine in the coastal area throughout the year should produce a series of both sexes from which more definite conclusions can be reached.

California records:

Napa Co.: Mt. St. Helena, IV-2-36, oak leaves.

Santa Barbara Co.: Zaca Mt., IV-24-51, lupine.

Santa Clara Co.: XI-17-11, lupine (P. R. Jones); Los Gatos, V-1910, lupine flrs.; San Jose, XI-17-11, lupine (P. R. Jones, C.U.).

San Luis Obispo Co.: Oceano, IV-24-51, lupine.

Taeniothrips orionis Treherne

Taeniothrips orionis Treherne, 1924. Canad. Ent., 56(4):86-87.

Taeniothrips tahoei Moulton, 1927, Bull. Brooklyn Ent. Soc., 22(4):190-191.

Taeniothrips pingreei Moulton, 1927. Bull. Brooklyn Ent. Soc., 22(4):191-192.

Taeniothrips orionis, Bailey. 1949. Canad. Ent., 81(6):154-156.

Location of type: Canadian National Museum, No. 678.

Type locality: Mt. McLean, Lillooet, British Columbia.

Geographic location: Colorado, Wyoming, Montana, Washington, Oregon, California.

Discussion: This *Taeniothrips* is one of the largest in North America. It is closely related to *vulgatissimus* and can be told from it by the very long, closely placed pair of interocellar bristles. It is found at high altitudes in wild flowers.

California records:

El Dorado Co.: Lake Tahoe, grass (D. Moulton); Tamarack Lake, VIII-7-37, *Polygonum alpinum* (E. O. Essig).

Mariposa Co.: Lukens Lake, VII-8-37, *Veratrum californica* (M. A. Stewart).

Taeniothrips simplex Morison

Physothrips simplex Morison, 1930. Bull. Ent. Res., 21:12.

Taeniothrips gladioli Moulton and Steinweden, 1931. Canad. Ent., 63:20-21.

Taeniothrips simplex, Steele. 1935. Coun. Sci. & Indus. Res., Pam. No. 54, pp. 33-36.

Location of type: British Museum.

Type locality: Urrbrae, So. Australia.

Geographic location: Australia, Europe, North America. Since its discovery it has spread rapidly throughout North America. Undoubtedly it now is to be found in many other parts of the world since it is readily transported on the corms of gladiolus.

Discussion: This insect is a severe pest of gladiolus and many reports on its control have been published. The banded wings and its preference for gladiolus makes it familiar to most entomologists.

California records: Statewide in all commercial flower plantings and in nearly every home garden growing gladiolus. Specimens in our collection are from:

Los Angeles Co.: IX-27-32, gladiolus (A. T. McClay).

San Diego Co.: Carlsbad, III-19-34, gladiolus (S. Lockwood).

Santa Clara Co.: Los Altos, VII-13-34, gladiolus.

Sonoma Co.: Petaluma, VIII-24-35, gladiolus.

Taeniothrips vulgatissimus (Haliday)

Thrips vulgatissima Haliday, 1836. Ent. Mag., 3:447.

Physopus pallipennis Uzel, 1895. Monogr. Ord. Thys., p. 110.

Taeniothrips vulgatissimus, Priesner, 1920. Jahresbereicht Mus. Francisco Carolinum, No. 78:55, Linz.

Taeniothrips vulgatissimus americanus Moulton, 1929. Pan-Pac. Ent., 5(3):130-131.

Taeniothrips vulgatissimus, Bailey. 1949*c*. Florida Ent., 32(3):124.

Location of type: Unknown to me, probably British Museum.

Type locality: Probably England.

Geographic location: Europe, Quebec, Northwest Territory, Montana, New York, Nevada, California.

Discussion: This thrips is widespread in Europe, and several subspecies have been established for its variations. In this country it has been found almost entirely at very high elevations. It is a large black species which seems to prefer lupine.

California records:

Inyo Co.: Big Pine Creek, V-19-47, grass (R. M. Bohart).

Madera Co.: Devils Postpile, VII-30-36, lupine (R. M. Bohart).

Mariposa Co.: Yosemite Valley (date unknown) (D. Moulton).

Taeniothrips xanthius (Williams)

Physothrips xanthius Williams, 1917. Bull. Ent. Res., 8:59-61.

Taeniothrips xanthius, Priesner. 1930. Bull. Soc. Roy. Ent. Egypt., 14(1):12.

Taeniothrips xanthius, Sakimura. 1955. Proc. Hawaii. Ent. Soc., 15(3):597.
Location of type: C. B. Williams' collection, Rothamsted Exp. Sta., England.
Type locality: Port of Spain, Trinidad.
Geographic location: Japan, Trinidad, Hawaii, Maryland, California.
Discussion: In California this pest of orchids is known only in greenhouses. The species is readily identified by its hosts and its yellow color and brown wings.
California records:
Los Angeles Co.: Los Angeles, orchids in greenhouse (C.A.S.).
Sacramento Co.: Sacramento, 1944, orchids in greenhouse (J. B. Steinweden).

Genus *Thrips* Linné

Antennae seven-segmented, style one-segmented; segments III and IV with forked sensory trichomes. Head about as long as wide. Maxillary palpi three-segmented. Ocelli present. Prothorax wider than long; notum with two major bristles at each outer posterior angle. Forewings with two longitudinal veins; fringe normal. Ovipositor downcurved. Male smaller than female without secondary sexual structures.

Together with *Taeniothrips* and *Frankliniella,* this is one of the largest genera in the order. In these large genera, characters used with generic reliability in smaller groups cannot be utilized Examples are the comb on the posterior margin of abdominal tergite VIII, the placement of ocelli on a circular, raised part of the vertex, presence and position of minor bristles on the pronotum, and the presence of sensory areas on the male abdominal tergites. Steinweden (1933) has pointed out how some species of *Taeniothrips* and *Thrips* intergrade. If as many specimens of *Rhopalandrothrips, Mycterothrips,* and *Toxonothrips,* for example, were available for study as there are in *Thrips,* we would probably have reason to question their identity as distinct genera. The seven-segmented antennae and the quite consistent lack of prominent bristles on the anterior outer angles of the pronotum are the most reliable generic characters.

Key to the California Species of the Genus *Thrips* Linné

1. Abdominal segment VIII without comb on posterior dorsal margin 2
   Abdominal segment VIII with comb . . . 3
   (*abdominalis* has teeth on I-VIII, see p.150)

2(1). Forewings dark brown with light-gray band at base. Comb on abdominal segment VIII sometimes sparesly present laterally. Outer posterior bristles on pronotum .057 mm. in length . . . . . .*madronii* Moulton, 1907
   Forewings uniform dark brown, large, about 1 mm. in length. Outer posterior bristles on pronotum .067 in length . . . . . *magnus* Moulton, 1911

3(1). Forewings uniformly dark brown 4
   Forewings pale-yellow or smoky-gray . . 5

4(3). Antennae uniformly dark brown . . . . . *gramineae* Moulton, 1936
   Antennal segments I and II dark brown, intermediate segments light brown . . .*hukkineni* Priesner, 1937 and *physapus* Linné, 1761

5(3). Outer posterior seta on pronotum .030-.035 mm. in length. Color of body pale yellow to brown; major setae on wings and pronotum yellow to light brown . . . . . *tabaci* Lindeman, 1888
   Outer posterior seta on pronotum .051-.054 mm. Color of body usually sulfur-yellow; major setae on wings and pronotum dark brown . . . . . *nigropilosus* Uzel, 1895 and *heraclei* Moulton, 1926

Thrips (*Microcephalothrips*) *abdominalis* (D. L. Crawford) (Pl. 22, fig. 41)

Thrips abdominalis D. L. Crawford, 1910. Pomona Coll. Jour. Ent., 2(1):157-159.
Microcephalothrips adbominalis, Bagnall. 1926. Ann. Mag. Nat. Hist., Ser. 9, 18:98, 113-114.
The complete synonymy was given by me in 1937 (Canad. Ent., 69:121-126).
Location of type: Canadian National Museum, Cat. No. 328.
Type locality: Guadalajara, Mexico.
Geographic location: Africa, Australia, Cuba, China, Egypt, Fiji, Hawaii, India, Japan, Java, Mexico, Palestine, and Sumatra. In the United States it is known from California, Colorado, Florida, Georgia, Illinois, Kansas, Maryland, Oklahoma, South Carolina, Texas, Virginia, and Washington.
Discussion: The biology and synonymy have been published by me. It is a minor pest of composite flower seeds. Obviously it is a widespread and rather common thrips in such flowers.
California records:
Colusa Co.: Colusa, VIII-31-31, zinnia.

Fresno Co.: Reedley, XI-6-36, zinnia.

Los Angeles Co.: Puente, X-31-33, Africa Daisy (A. Toyone).

Sacramento Co.: Sacramento, X-22-34, zinnia.

Yolo Co.: Davis, IX-25-36, marigold.

Thrips gramineae Moulton

Thrips gramineae Moulton, 1936. Pan-Pac. Ent., 12(3):106.

Location of type: Moulton collection. Holotype ♀, No. 2729, California Academy of Science.

Type locality: Calaveras Valley, Alameda County, California.

Discussion: This species is known only from the unique type which we have examined. It is close to *T. hukkineni* Pr., commonly taken on grasses and dandelion but can be separated by the uniformly brown antennae.

California record:

Alameda Co.: Calaveras Val., V-1-28, grass (D. Moulton, C.A.S.).

Thrips heraclei Moulton

Thrips heraclei Moulton, 1926. Pan-Pac. Ent., 3(1):25-26.

Location of type: Moulton collection. Holotype ♀, No. 418, allotype, No. 796, California Academy of Science.

Type locality: Vicinity of Spring Valley Lakes, near Belmont, California.

Geographic location: California.

Discussion: I know of no collections of this thrips other than the type series. Specimens collected by us on this host have proven to be *T. tabaci* or *madronii*. The pronotal bristles are slightly longer than those in *nigropilusus;* otherwise the two are nearly identical. The type series is somewhat teneral.

California record:

San Mateo Co.: Belmont, VII-24-25, cow parsnip, *Heracleum lanatum* (D. Moulton, C.A.S.).

Thrips hukkineni Priesner

Thrips trebernei Priesner, 1927. Thys. Eur., p. 356.

Thrips taraxaci Moulton, 1936. Pan-Pac. Ent., 12(3):109-110.

Thrips hukkineni Priesner, 1937. Konowia, 16(2): 107-112, new name for *Thrips physapus* f. *magna* Pr., 1902 (nec *magnus* Mlt., 1911).

Thrips taraxaci, Bailey. 1949*c*. Florida Ent., 32(3):125.

Location of type: Priesner collection.

Type locality: Europe, exact location unknown to me.

Geographic location: Europe, Hawaii, British Columbia, Ontario, Montana, Washington, Utah, Indiana, California, Wyoming, Kansas, Iowa, New York.

Discussion: In dandelion flowers, in areas where the plants are well established, this thrips is frequently collected. Its habits and appearance are similar to the composite thrips, *Microcephalothrips abdominalis,* from which it can be easily separated by the longer, lighter-colored antennae and the absence of teeth or scallops on the posterior margins of the abdominal tergites. It is very closely related to *T. physapus* Linné; if synonymized in the future, the western population perhaps should be considered as a distinct variety.

California records:

Marin Co.: Bolinas, IV-25-47, grass.

Nevada Co.: Grass Valley, VI-16-35, wild snapdragon (J. J. duBois).

Yolo Co.: Davis, XII-13-35, dandelion (R. M. Bohart and S. F. Bailey).

Thrips madronii Moulton

Thrips madronii Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser., No. 12, pt. III, pp. 57-58.

Thrips sambucifloris Hood, 1933. Pan-Pac. Ent., 9(4):177-178, 181-182.

Thrips madronii, Bailey. 1949*a*. Florida Ent., 32(1):25.

Location of type: Moulton collection. Lectotype ♀, No. 32, California Academy of Science.

Type locality: Wright's Station, Santa Clara County, California.

Geographic location: British Columbia, Utah, Oregon, California.

Discussion: As collections have accumulated it can be seen that this species is rather widely distributed on the Pacific Coast. It is found on a variety of hosts and has been observed injuring apples in Sonoma County. In general appearance it is similar to the pear thrips since it is dark brown with a light band at the base of the forewings. Since no type specimen was designated we are designating slide No. 32 the lectotype. It is one of the three original slides still left in the Moulton collection.

California records: The following are representative only:

Alameda Co.: Hayward, V-9-35, cow parsnip; Berkeley, X-6-35, avocado; Berkeley, IV-4-35, madrone.

El Dorado Co.: Camino, X-20-50, willow.

Humboldt Co.: Korbel, VII-28-27, *Sambucus racemosa* flrs. (J. D. Hood).

Kern Co.: Shafter, V-22-41, grape (R. E. Suggett).

Lake Co.: Lucerne, V-7-36, elderberry; Cobb Mt., V-7-36, sweeping.

Marin Co.: Muir Beach, IV-19-36, lupine; Mt. Tamalpais, IV-17-35, lupine flrs.

Napa Co.: Napa, I-29-36, Calif. laurel; Napa, V-6-37, hibiscus.

Nevada Co.: Nevada City, VII-26-50, broom flrs.

San Francisco Co.: San Francisco, IV-24-35, hawthorne (J. B. Steinweden).

San Luis Obispo Co.: Oceano, IV-24-51, sweeping.

San Mateo Co.: Woodside, VII-24-25, *Heteromeles arbutifolia* (D. Moulton); Colma, VIII-5-49, daisies (W. H. Lange).

Santa Clara Co.: Santa Clara Valley, madrone blossoms, Calif. laurel, Calif. lilac (D. Moulton); Wright's Station, III-9-06, madrone (D. Moulton, C.A.S.).

Santa Cruz Co.: Mt. Herman, VI-30-37, oak (J. J. duBois); Mt. Madrone, IV-22-37, *Ceanothus* (A. T. McClay).

Sonoma Co.: Sebastopol, V-4-46, apple (A. Hall); Forestville, V-11-36, sweeping (A. T. McClay); Geyserville, I-29-36, manzanita; Sebastopol, VI-18-36, buckeye (A. T. McClay).

Thrips magnus Moulton

Thrips magnus Moulton, 1911. U.S.D.A., Bur. Ent., Tech. Ser., No. 21, p. 36.

Location of type: Moulton collection. Holotype ♀, No. 219, California Academy of Science.

Type locality: Visalia, California.

Geographic location: California.

Discussion: This is the largest species of the genus *Thrips* in the area known to us. It can be told from *madronii* by the uniformly dark-brown forewings and the lack of scallops on the hind margins of the abdominal tergites. Almost always it is collected deep in the corolla of *Mimulus* flowers growing in meadows and at the margins of streams.

California records:

El Dorado Co.: Riverton, VIII-24-38, *Mimulus* flrs.

Fresno Co.: Cherry Gap, VIII-3-50, sweeping.

Kern Co.: Walker Pass, VI-26-49, *Mimulus* flrs, (H. E. Cott).

Los Angeles Co.: Tanbark Flat, VII-7-52, *Mimulus* (R. M. Bohart).

Madera Co.: Bass Lake, VI-7-38, grass.

Mono Co.: Mammoth, VII-1-36, sweeping (R. M. Bohart).

Nevada Co.: Grass Valley, VI-16-35, snapdragon (J. J. duBois).

Placer Co.: Roseville, VIII-24-35, *Mimulus.*

Plumas Co.: Meadow Valley, VIII-11-35, *Mimulus* (E. O. Essig),

Riverside Co.: Herkey Creek, VI-10-40, *Mimulus* (E. G. Linsley).

San Francisco Co.: San Francisco, *Mimulus.*

Santa Clara Co.: Coyote.

Shasta Co.: Round Mt., V-23-49, sweeping.

Solano Co.: Green Valley Falls.

Tulare Co.: Visalia, VI-27-09, *Mimulus* (P. R. Jones, C.A.S.).

Tuolumne Co.: Strawberry, VII-18-51, sweeping.

Thrips nigropilosus Uzel

Thrips nigropilosa Uzel, 1895. Monogr. Ord. Thys., pp. 198-200.

Thrips nigropilosus, Priesner. 1927. Thys. Eur., pp. 409-414.

Location of type: Unknown to me.

Type locality: Czechoslovakia.

Geographic location: Europe, California, Washington, Iowa, New York, New Jersey.

Discussion: This thrips has been generally referred to as the chrysanthemum thrips since it is frequently found damaging this host as well as others. The specific name refers to the dark-colored major setae which stand out in sharp contrast to the orange color of the body. Brachypterous adult forms are found among colonies of nymphs on the infested leaves and in flowers both in the greenhouse and out-of-doors.

California records:

Alameda Co.: Berkeley, V-23-35, asters in greenhouse (H. Earl Thomas); San Pablo, I-17-36, malva (H. Earl Thomas).

San Francisco Co.: San Francisco, greenhouse plants (J. B. Steinweden).

Yolo Co.: Davis, XII-17-35, dandelion.

Thrips tabaci Lind
(Pl. 22, fig. 42)

Thrips tabaci Lindeman, 1888. Shädl. Insekten d. Tabak. in Bessarabien, pp. 15, 61-75.

Thrips bremnerii Moulton, 1907. U.S.D.A., Bur. Ent., Tech. Ser. No. 12, pt. III, pp. 59-60.

Thrips bremnerii, Bailey, 1949*c*. Florida Ent., 32(3):124.

The detailed synonymy covering the literature through 1926 is to be found in Priesner's

"Thysanopteren Europas," pages 433-434. Melis (1952) presents one of the most recent reviews of the species giving detailed anatomical illustrations. The bibliography of this species is probably the largest in the entire order Thysanoptera.

Location of type: Unknown to me.

Type locality: Eastern Rumania.

Geographic location: World-wide.

Discussion: The onion thrips is probably the most common thrips in the state, next to *Frankliniella occidentalis*. It is found everywhere on innumerable plants. The following records exhibit a cross section of its occurrence.

Alameda Co.: Berkeley, VII-10-35, *Ceanothus*.

Contra Costa Co.: Antioch, X-6-35, wild buckwheat (R. M. Bohart); Danville, IV-17-36, wild mustard.

Glenn Co.: Orland, III-13-36, orange.

Imperial Co.: *Calipatria*, IV-25-39, grape (M. B. Dickson); El Centro, 1904, *Lepidium lasiocampum* (W. T. Clarke).

Kern Co.: Kern Canyon, V-19-37, yucca.

Kings Co.: Corcoran, V-20-54, cotton (G. L. Smith).

Lake Co.: Kelseyville, IV-24-35, pear.

Madera Co.: Bass Lake, VI-7-38, *Sambucus* flrs.

Mariposa Co.: Yosemite, V-22-38, grass.

Monterey Co.: Salinas, VIII-2-43, bean (W. H. Lange); Salinas, XI-24-43, broccoli (W. H. Lange).

Placer Co.: Rocklin, VIII-9-38, willow; Lincoln, VI-21-37, grass; Penryn, III-26-35, *Ceanothus*.

Plumas Co.: Bucks Lake, VII-6-35, elk grass (J. J. duBois).

Sacramento Co.: Sacramento, VIII-9-38, box elder; Galt, IV-7-36, grass.

San Francisco Co.: San Francisco, VII-24-29, pansy (H. H. Keifer).

San Mateo Co.: Colma, VIII-5-49, daisies (W. H. Lange).

Solano Co.: Green Valley, VI-12-36, *Eriogonum;* Fairfield, III-26-34, cherry (C. H. Wren); Fairfield, VII-8-36, valley oak.

Sonoma Co.: Forestville, V-11-36, beating (A. T. McClay); VI-18-38, hops (H. A. Weinland).

Stanislaus Co.: El Solyo, VI-14-35, onion.

Sutter Co.: Meridian, VII-7-36, *Sambucus* flrs.

Tuolumne Co.: Tuolumne Meadow, VII-27-26, *Artemesia tridentate* (D. Moulton).

Yolo Co.: Davis, VIII-16-50, dry grass and atriplex; I-13-36, artichoke (in store); XII-17-35, dandelion; VII-25-32, onion; V-3-39, capri figs (H. N. Hansen); Knights Landing, IX-11-36, native sycamore.

Genus *Toxonothrips* Moulton

Antennae seven-segmented, style one-segmented; segment III with pedicel, III and IV with forked sensory trichomes (that on III in the male allotype appears to be simple). Head slightly wider than long, rounded in front, cheeks rounded; all bristles reduced. Ocelli present in female. Maxillary palpi three-segmented. Prothorax wider than long; each outer posterior angle with two long bristles, all others minute. Tarsi unarmed. Forewings with two longitudinal veins, hind vein regularly beset with bristles; general appearance similar to *Thrips*. Abdominal segment VIII with comb. Male smaller than female; ocelli, wings and claspers absent, abdominal sternites III and IV with oval sensory area.

Toxonothrips gramineae Moulton
(Pl. 19, fig. 22; pl. 22, fig. 40)

Toxonothrips gramineae Moulton, 1927. Pan-Pac. Ent., 4(1):30-31.

Location of type: Moulton collection. Holotype ♀, No. 956, and allotype, No. 956, California Academy of Science.

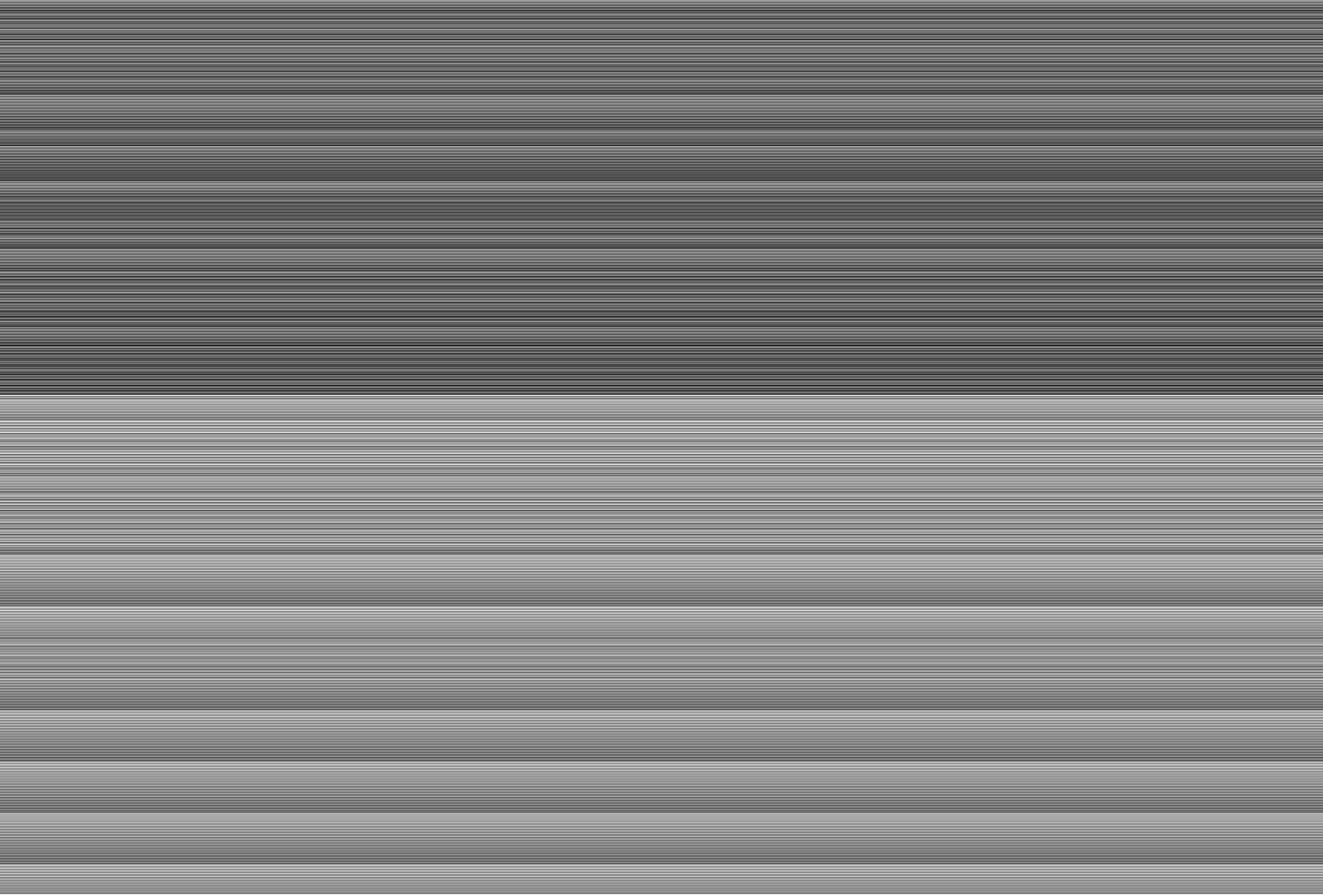
Type locality: Lake Tahoe, California.

Geographic location: California.

Discussion: On many occasions we have examined the type specimens of this monotypic genus. We have collected frequently for more than twenty years in the type locality and failed to find it. To our knowledge R. L. Post has the only other representatives of this genus, which he collected in Oregon. This very rare thrips reminds one of both *Limothrips* and *Thrips* but must be retained in this genus until more specimens are available for study, and perhaps related species are collected and described. We consider it the most rare thrips in the state.

California record:

Placer Co.: Lake Tahoe, VII-1926, grass sweepings (D. Moulton, C.A.S.).



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PLATES

MAGNIFICATION SCALE

Plate 17: Scale for fig. 4–lower line equals 0.1 mm. Fig. 2–center line equals 0.1 mm. Figs. 1, 3, 5, 6, 7–upper line equals 0.01 mm.

Plate 18: Scale for figs. 8, 9, 11, 13, 14–lower line equals 0.1 mm. Figs. 10, 12–upper line equals 0.1 mm.

Plate 19: Scale for figs. 21, 22–lower line equals 0.1 mm. Figs. 15, 16, 17, 18, 19, 20–upper line equals 0.01 mm.

Plate 20: Scale for figs. 23, 26, 27, 28, 29–lower line equals 0.1 mm. Fig. 30–center line equals 0.1 mm. Figs. 24, 25–upper line equals 0.01 mm.

Plate 21: Scale for figs. 31, 32, 34–lower line equals 0.1 mm. Figs. 33, 35, 36, 37, 38, 39–upper line equals 0.01 mm.

Plate 22: Scale for figs. 41, 42, 43, 45, 46, 47–lower line equals 0.1 mm. Figs. 40, 44–upper line equals 0.01 mm.

Plate 23: Scale for figs. 50, 51, 52, 53, 54, 57–lower line equals 0.1 mm. Figs. 48, 55–center line equals 0.1 mm. Figs. 49, 56–upper line equals 0.01 mm.

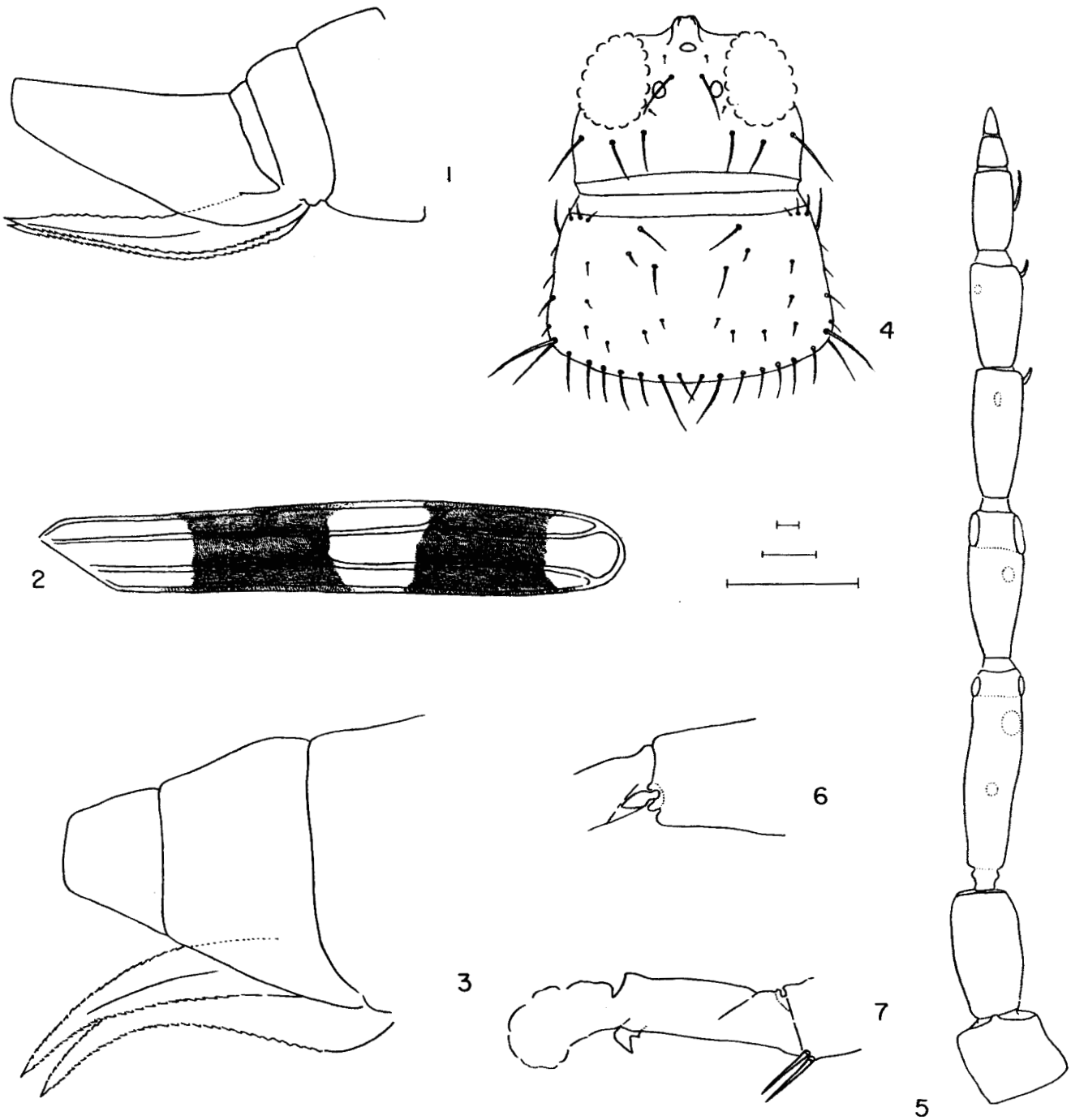

Plate 17.

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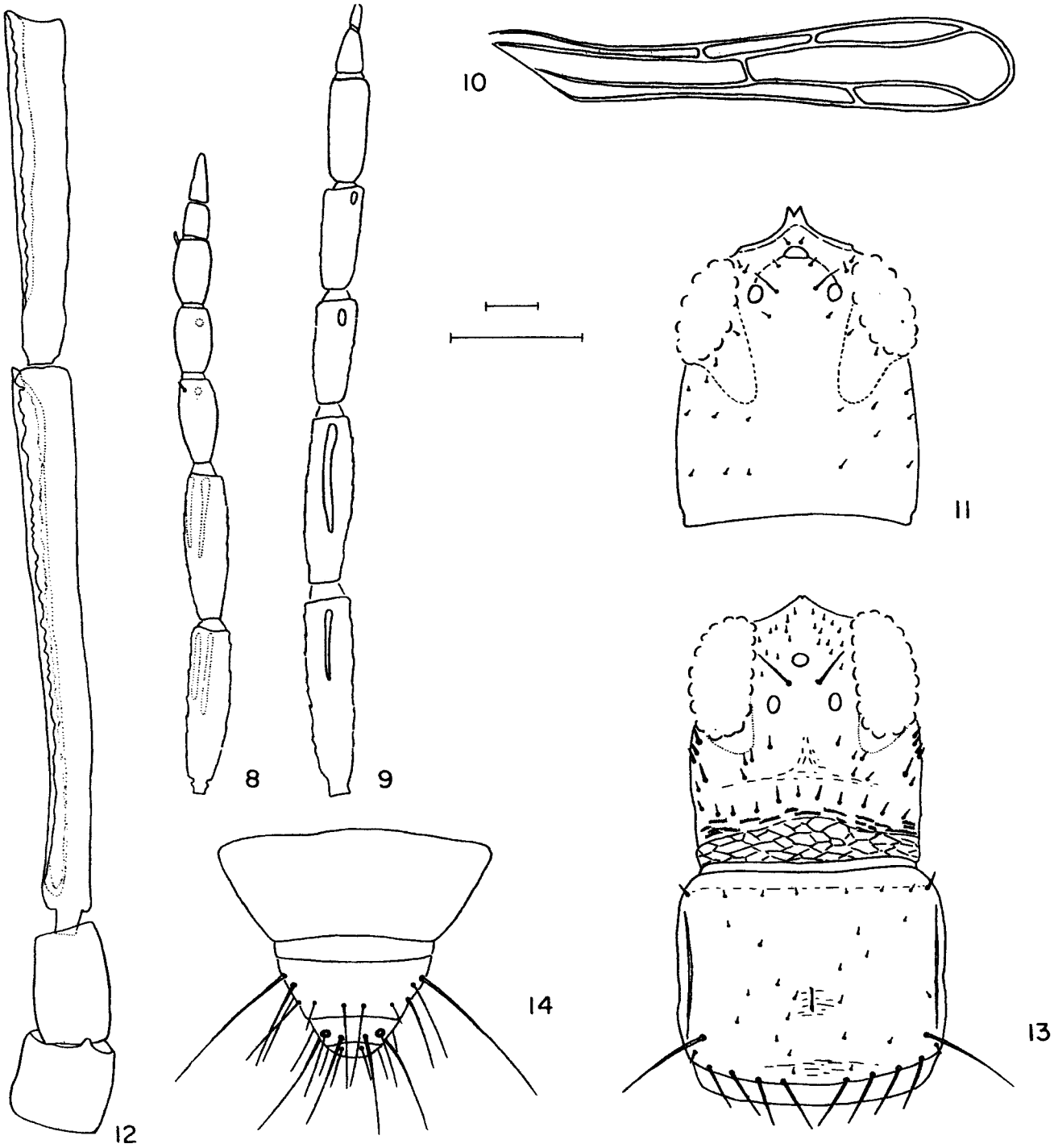

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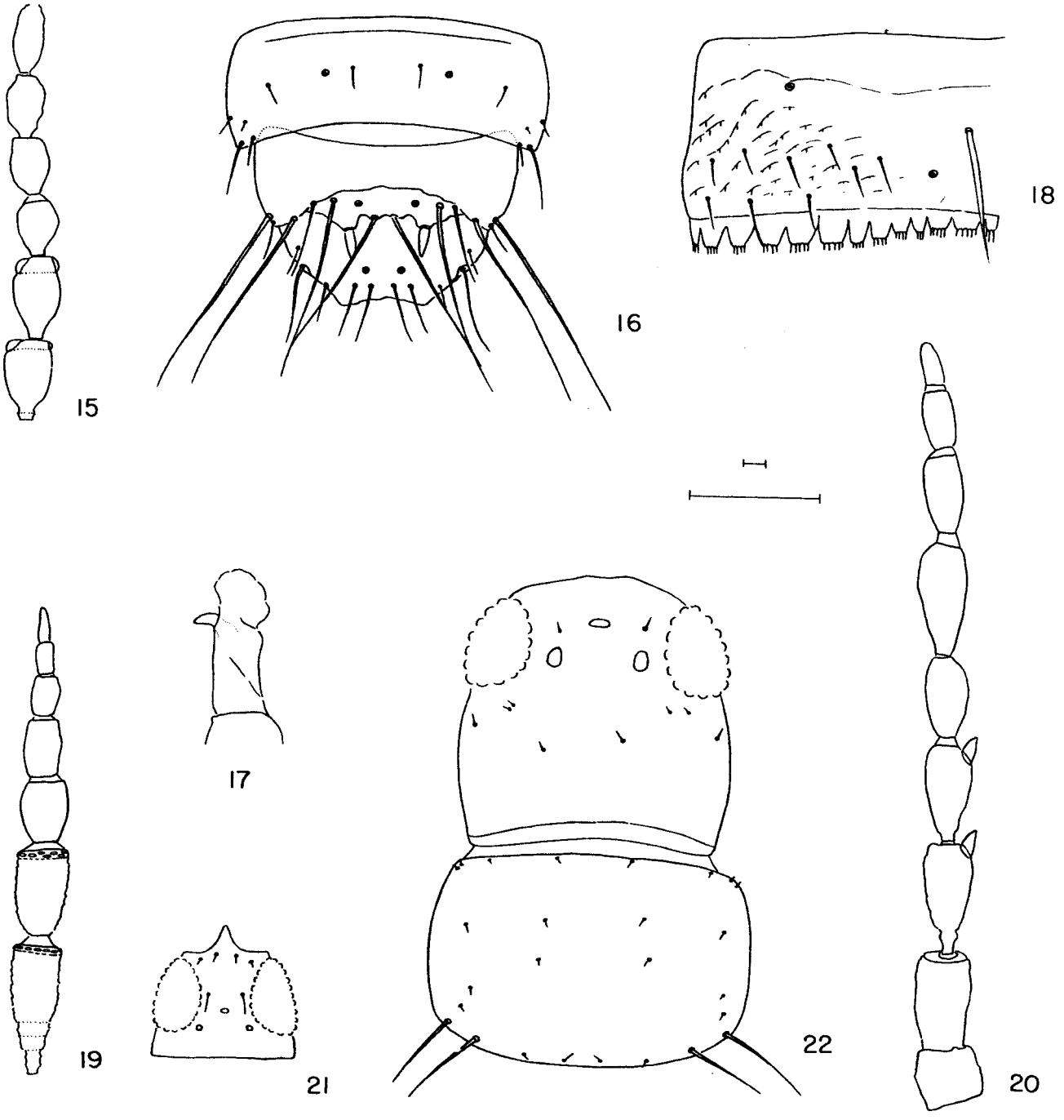

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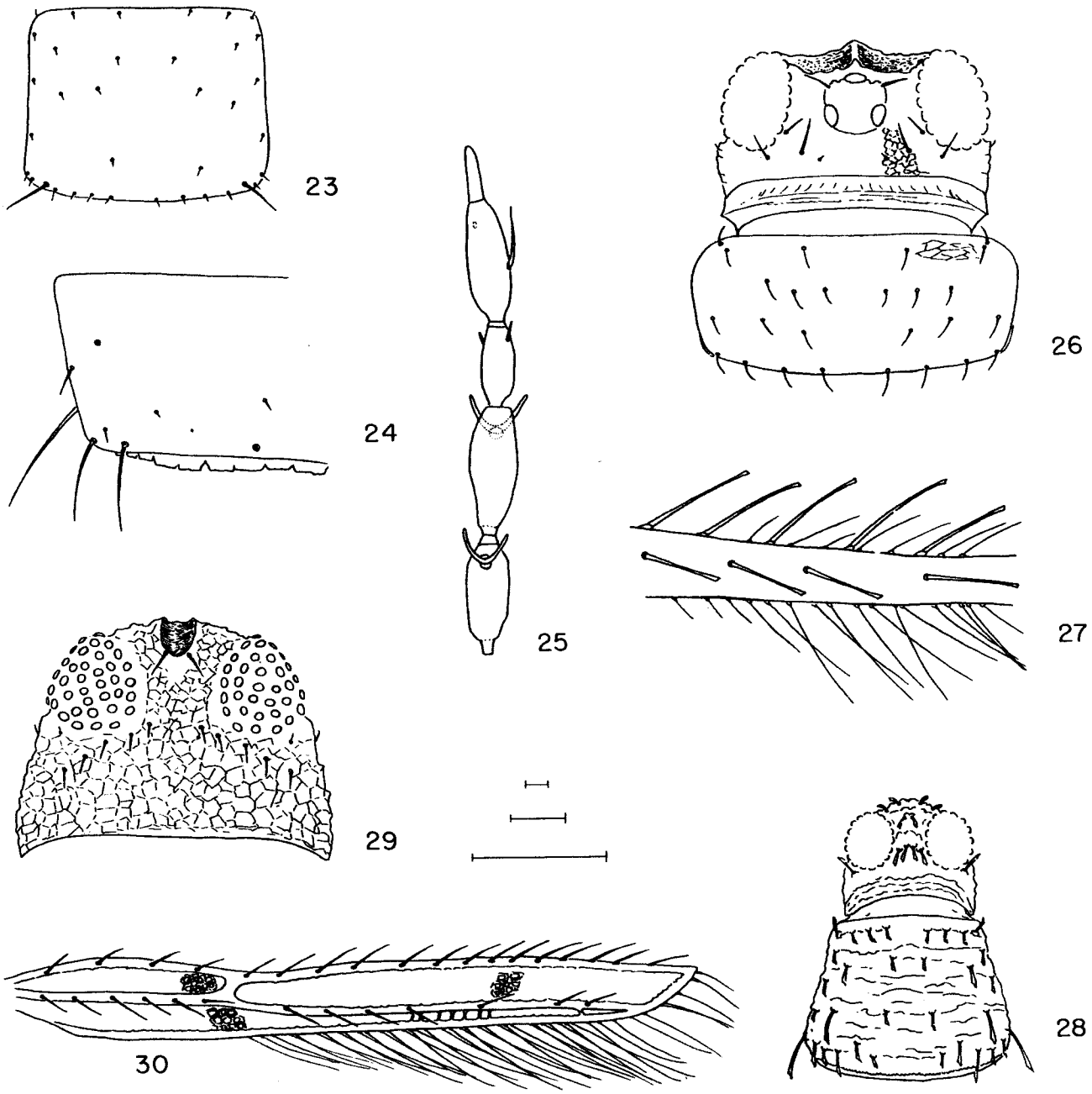

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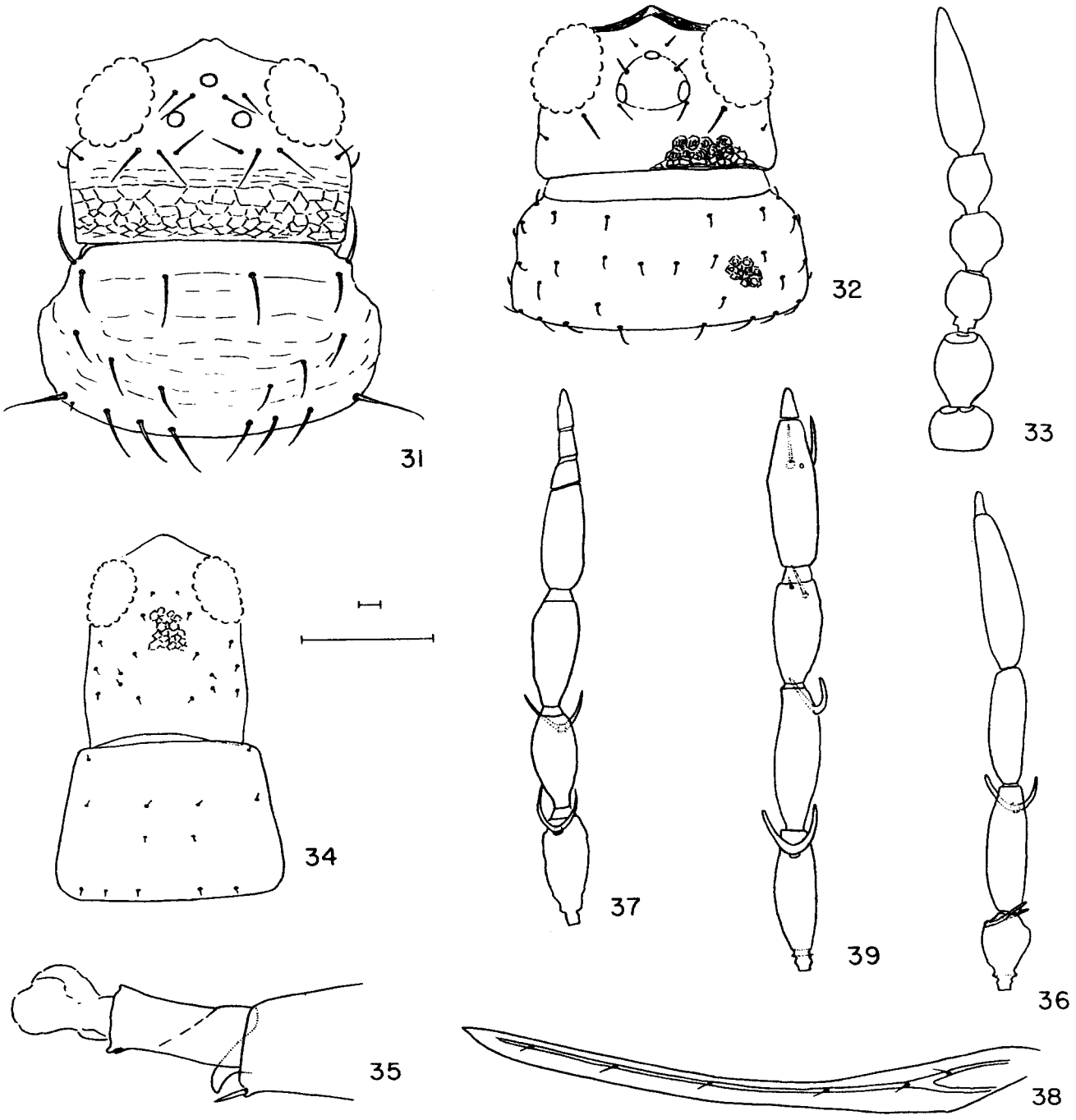

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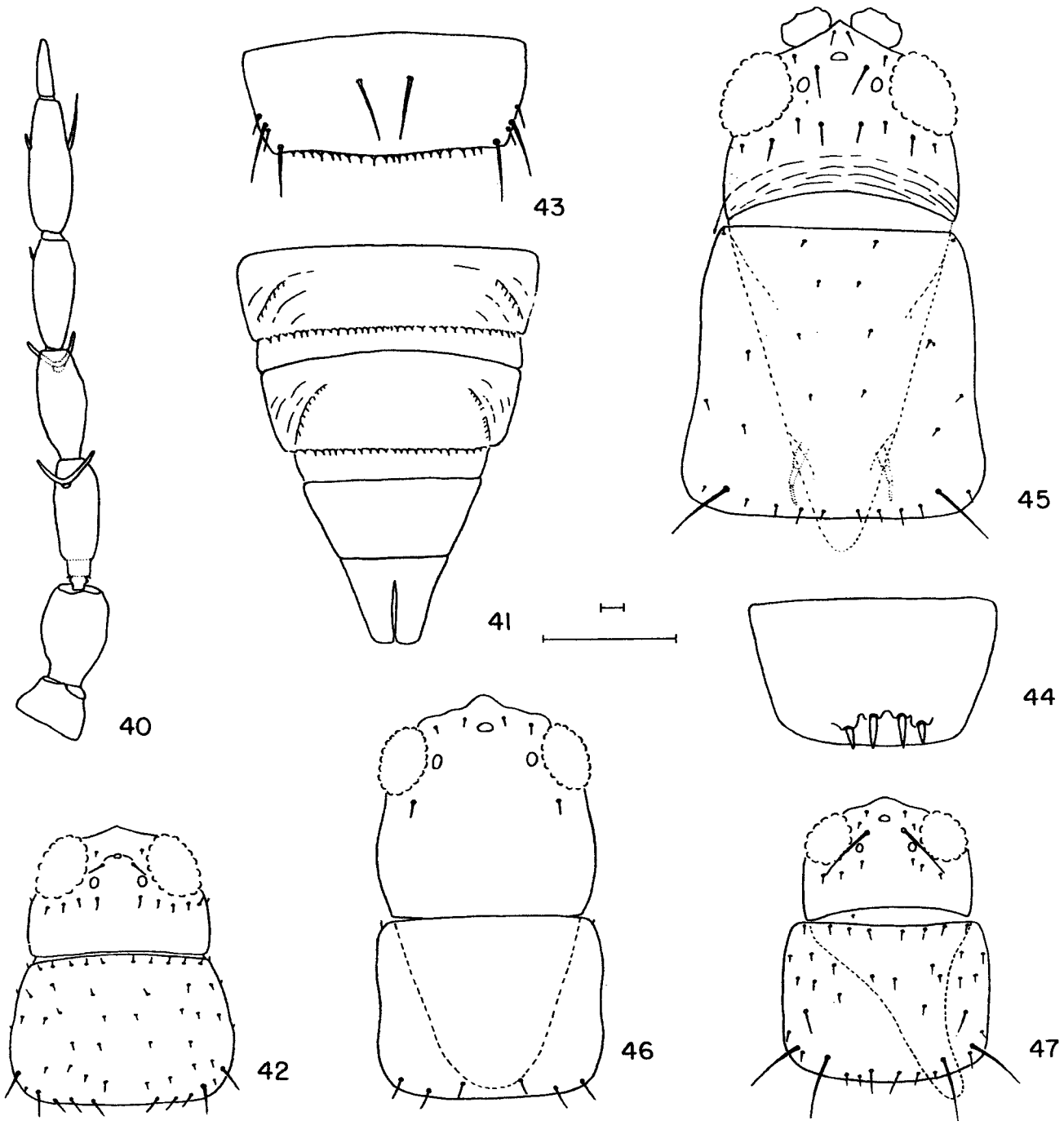

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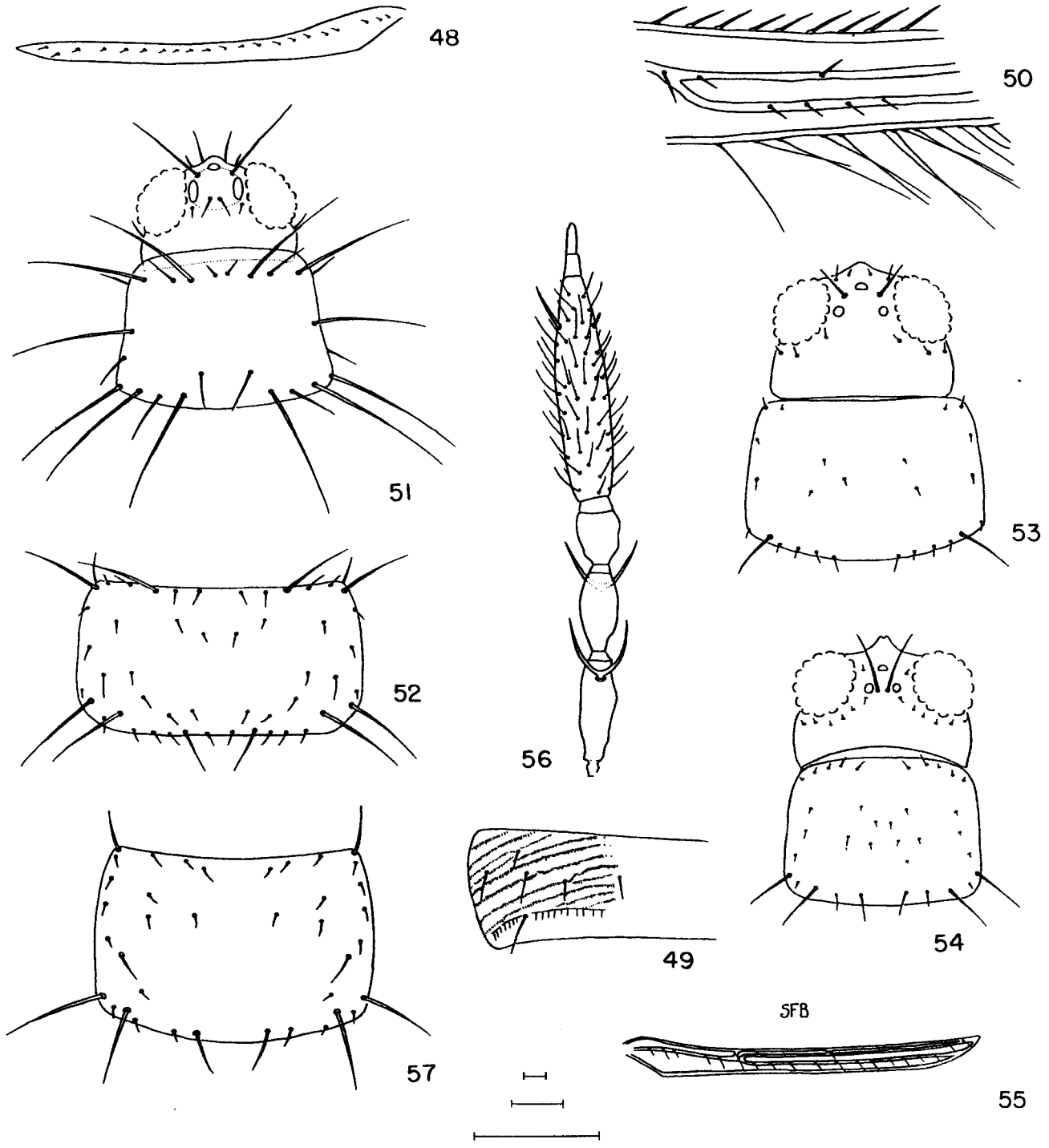

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