

THYSANOPTERA

MORPHOLOGICAL IDENTIFICATION OF ADULTS AND LARVAE,
WITH FOCUS ON *THRIPS PALMI* KARNY, 1925



APPENDICES

Training session

Montpellier, 20-21th October 2022

1. EPPO diagnostic procedure for the identification of adult *Thrips palmi*
2. Key for the identification of adult pest thrips (extracted from Mound & Kibby 1998)
3. Key for the identification of Thripidae second instar larvae (Vierbergen et al. 2010)

APPENDIX I.

EPPO diagnostic procedure for the identification of adult *Thrips palmi*

APPENDIX II.

Key for the identification of adult pest thrips
(extracted from Mound & Kibby 1998)

Thysanoptera: An Identification Guide

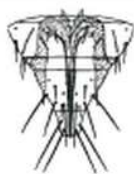
1

TEREBRANTIA (sub-Order)

- Forewing with veins & setae
- Forewing surface with microtrichia

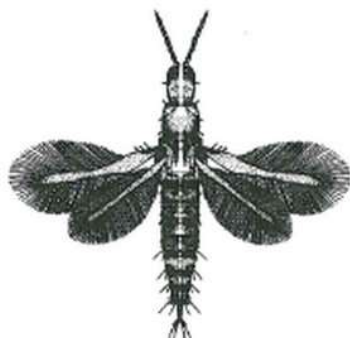


- terminal abdominal segment not tubular

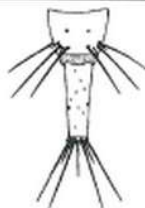


TUBULIFERA (sub-Order)

- Forewing without veins & setae
- Forewing surface smooth



- terminal abdominal segment tube-like



Family:
PHLAEOTHRIPIDAE
Go to step: 49

2

- ♀ with a very weakly developed ovipositor. Abdominal sternite VIII developed as a pair of lobes

sternite VII

sternite VIII



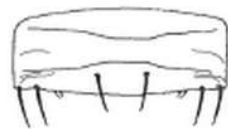
- Abdominal tergite X usually with a pair of large trichobothria



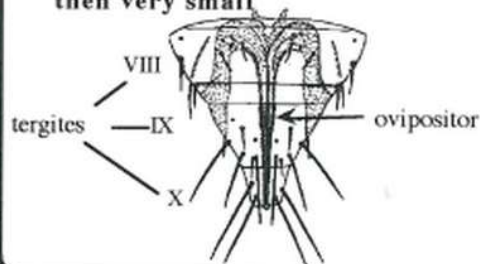
Family: **MEROTHRIPIDAE**

- ♀ with well developed saw-like ovipositor. Abdominal sternite VIII not developed

sternite VII



- Abdominal tergite X usually without a pair of trichobothria – if present then very small



Go to step: 3

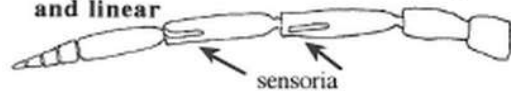
from step 2

3

- ♀ with ovipositor turned upwards



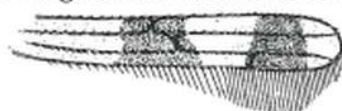
- Antennae 9-segmented, segment III usually with sensoria either elongate and linear



or transversely linear

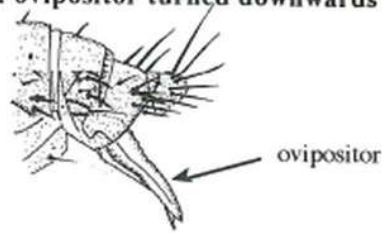


- Forewings broad with several cross-veins

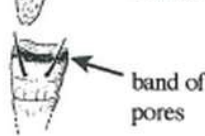
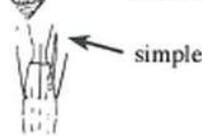


Family: **AEOLOTHRIPIDAE**

- ♀ with ovipositor turned downwards



- Antennae usually with 7 or 8 (rarely 6 or 9) segments. Sensoria on segments III + IV various, but not linear



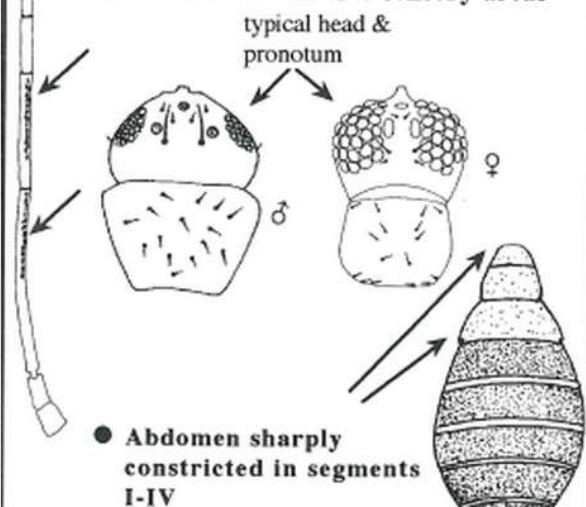
- Forewings narrow, with one cross-vein



4

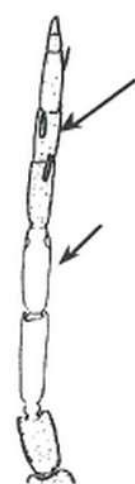
Go to step: 7

- Antennal segments III & IV very long, segment III about 15 times as long as broad with distinctive sensory areas

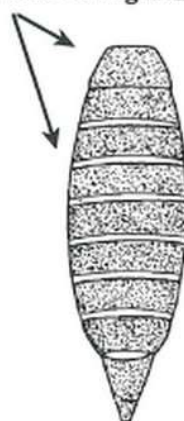


Genus: *Franklinothrips*

- Antennal segments III & IV about 3-4 times as long as broad



- Abdomen not sharply constricted in segments I-IV



Go to step: 5

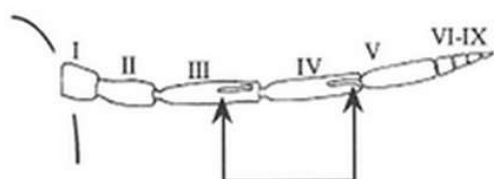
from step 4

5

- Pronotum with no long setae

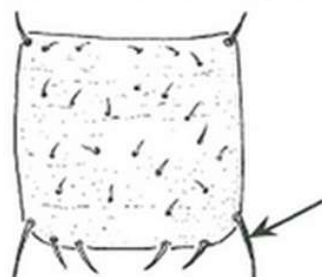


- Sensory areas on antennal segments III & IV linear

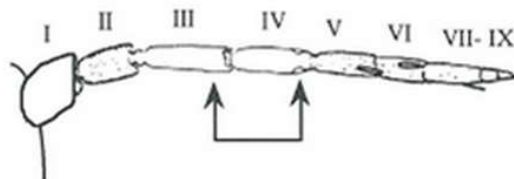


Genus: *Aeolothrips*

- Pronotum with at least one pair of long setae



- Sensory areas on antennal segments III & IV transverse

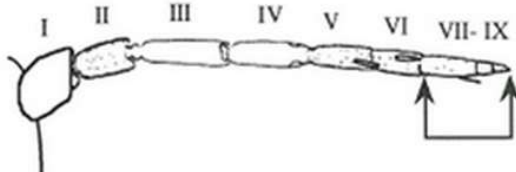


6

- Head with no long setae behind eyes



- Antennal segments VII-IX closely united



Genus: *Rhipidothrips*

- Head with at least 2 pairs of long setae behind eyes



- Antennal segments all distinct from each other

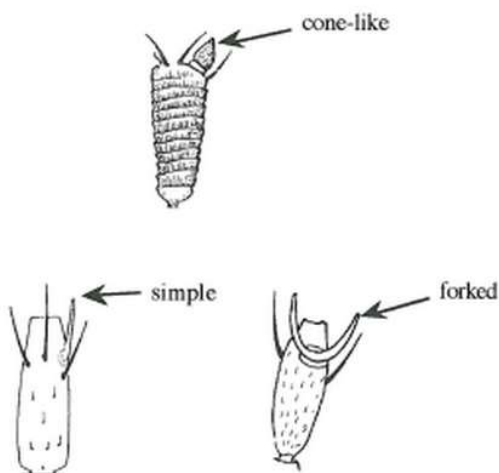


Genus: *Melanthrips*

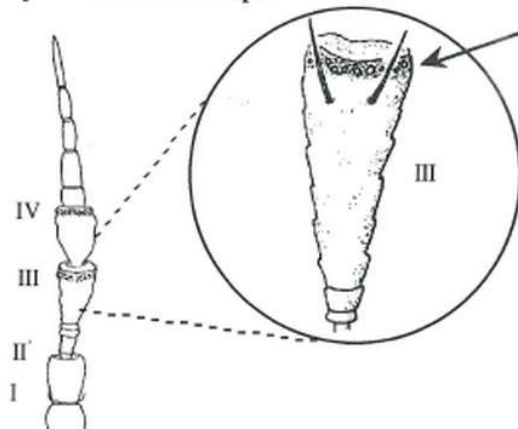
from step 3

7

- Sensory areas on antennal segments III and IV forming either cone-like, forked or simple sense cones



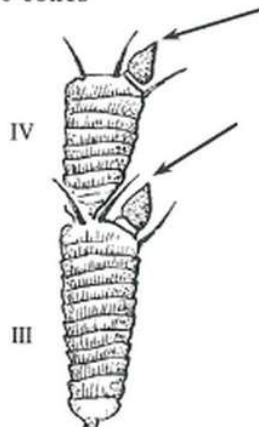
- Sensory areas on antennal segments III and IV forming a continuous band of pores around the apex



Family: HETEROTHRIPIDAE
Genus: *Heterothrips*

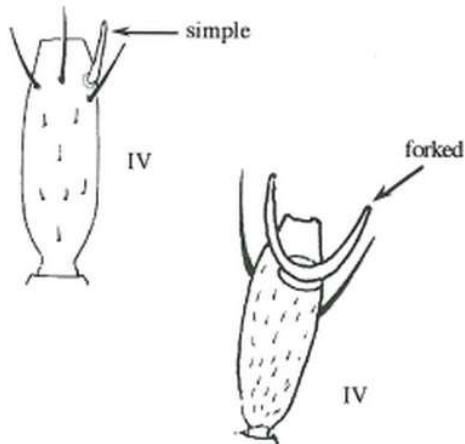
8

- Sensory areas on antennal segments III and IV developed into cone-like sense cones



Family:
ADIHETEROTHRIPIDAE

- Sensory areas on antennal segments III and IV developed into slender, simple or forked sense cones



Family: THRIPIDAE

Go to step: 9

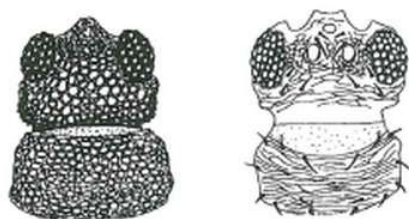
from step 8

9

- Terminal antennal segments very long

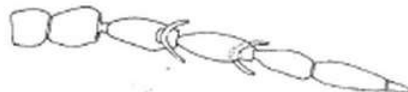


- Head and legs with strong sculpture

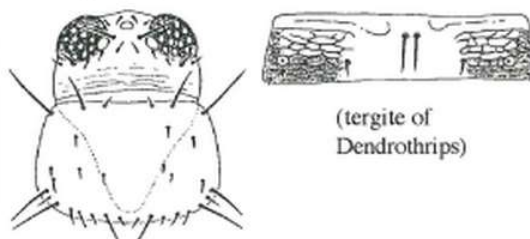


Sub-Family: PANCHAETOTHRIPINAE

- Terminal antennal segments rarely elongate



- Head and legs not strongly sculptured (but abdominal tergites may be laterally sculptured)



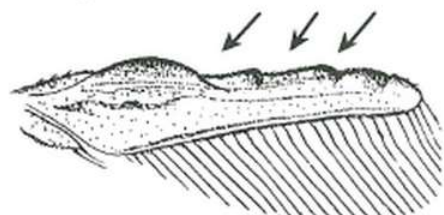
(tergite of
Dendrothrips)

Sub-Family: THRIPINAE

10

Go to step: 19

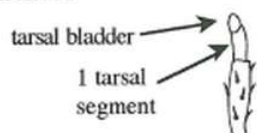
- Forewings broad with wart-like swellings



- Antennae with forked sense cones



- Tarsi one segmented

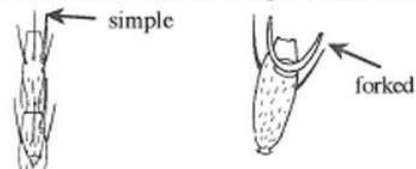


Genus: *Retithrips*

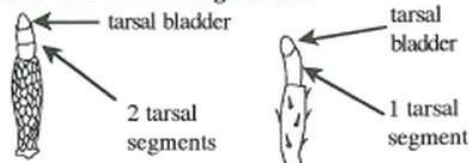
- Forewings without wart-like swellings



- Antennae with forked or simple sense cones



- Tarsi one or two segmented

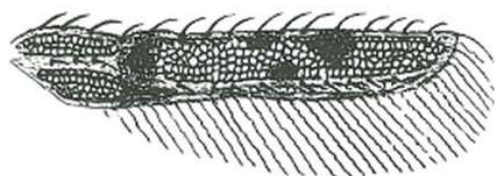


Go to step: 11

from step 10

11

- Forewing with polygonal network, with darker band and patches, base and apex pale



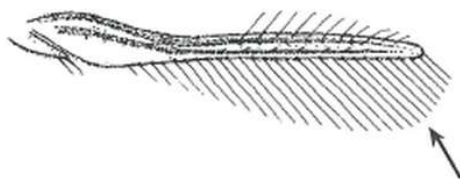
Genus: *Parthenothrips*

- Forewing without polygonal network, coloration various

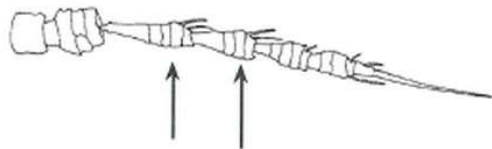


12

- Forewings with straight cilia on the posterior margin
- Forewings with minute setae on veins

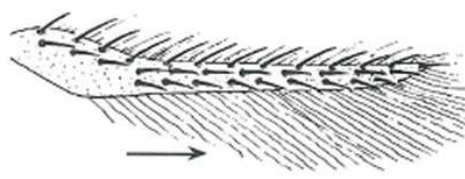


- Antennal segments III and IV with simple sense cones

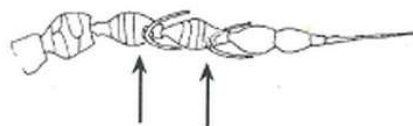


Go to step: 13

- Forewings with wavy cilia on posterior margin
- Forewings with some long setae on veins



- Antennal segments III and IV usually with forked sense cones



Go to step: 14

from step 12

13

- Forewings usually with a fringe of cilia on the anterior margin



- Head without prominent dorsal ridge
- Head with regular polygonal reticulation



- Mesonotum with an incomplete median division



Genus: *Heliiothrips*

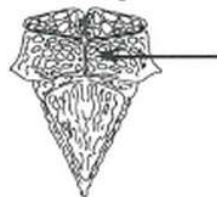
- Forewings without a fringe of cilia on the anterior margin



- Head with prominent dorsal ridge
- Head with irregular reticulation



- Mesonotum with a complete longitudinal division

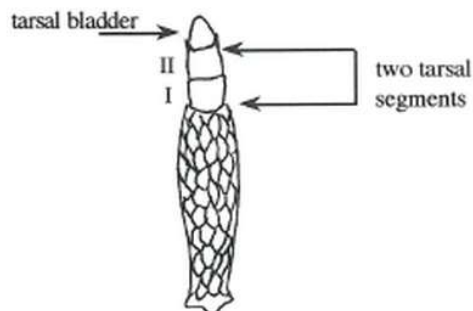


Genus: *Rhipiphorothrips*

from step 12

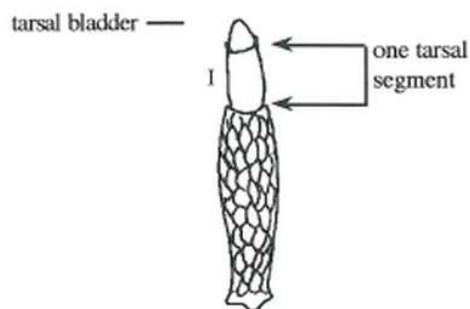
14

- Tarsi 2-segmented



Go to step: 15

- Tarsi 1-segmented

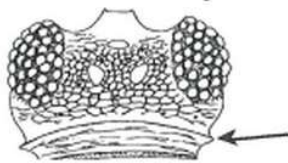


Go to step: 16

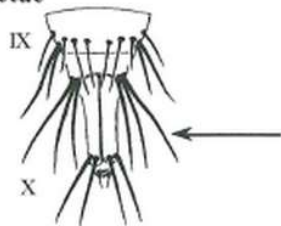
from step 14

15

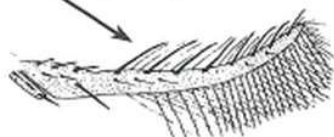
- Head with distinct occipital ridge



- Tergite X long and tubular, abdominal setae long, segments IX and X with very long dark setae



- Forewing costal setae long and dark, lower setal row missing

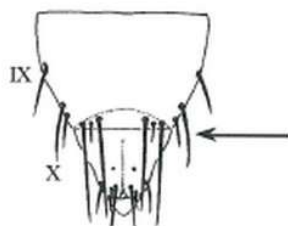


Genus: *Panchaetothrips*

- Head without occipital ridge



- Tergite X not long and tubular, abdominal setae not particularly long



- Forewing costal setae not particularly long and dark, lower setal row present

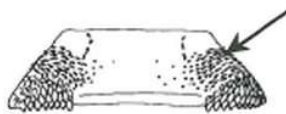


Genus: *Hercinothrips*

from step 14

16

- Abdominal tergite II with an area of specialised cuticle laterally



- Head and pronotum with elaborate raised sculpture



Genus: *Astrothrips*

- Abdominal tergite II without specialised cuticle laterally



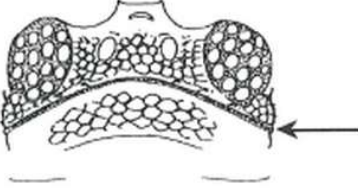
- Head and pronotum without raised sculpture




Go to step: 17

from step 16 → **17**

- Head with distinct occipital ridge




- Abdominal tergites with anterior ridge boldly crenulate




Genus: *Helionothrips*

- Head without distinct occipital ridge




- Abdominal tergites without boldly crenulate anterior ridge

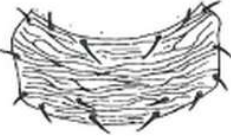


18

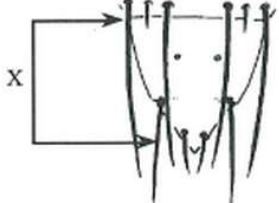
- Head constricted posteriorly



- Pronotum with transverse striate sculpture




- Abdominal tergite X undivided

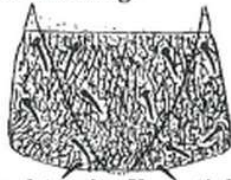


Genus: *Selenothrips*

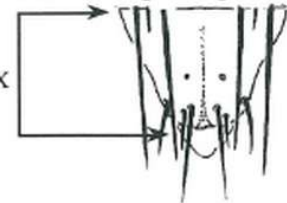
- Head without constriction posteriorly



- Pronotal sculptured reticles with internal markings



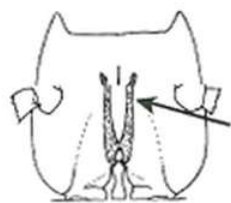
- Abdominal tergite X partially divided



Genus: *Caliothrips*

from step 9 → **19**

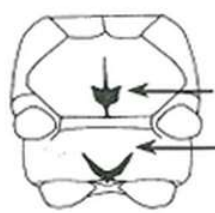
● **Metathoracic furca lyre-shaped**



● Median tergal setae on segments V-VII close together



● **Metathoracic furca not lyre-shaped**



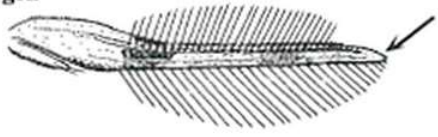
● Median tergal setae on segments V-VII usually further apart than their length



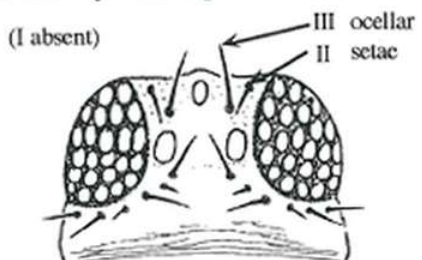
20

Go to step: **21**

● Forewing with anterior margin curved at apex to join posterior margin - all cilia at apex small - fringe cilia on anterior margin arise ventrally well behind the margin



● Head usually with 2 pairs of ocellar setae

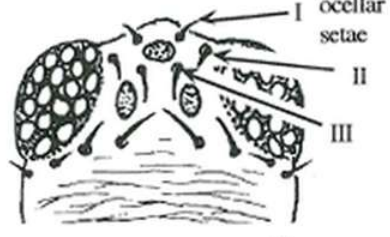


Genus: *Dendrothrips*

● Forewing not recurved at the apex, with long fringe cilia and a stout, long apical seta - fringe cilia on anterior margin arise close to the margin



● Head usually with 3 pairs of ocellar setae



Genus: *Pseudodendrothrips*

from step 19

21

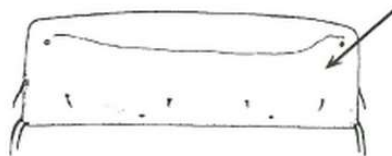
- Surface of abdominal tergites and sometimes also the sternites with numerous microtrichia



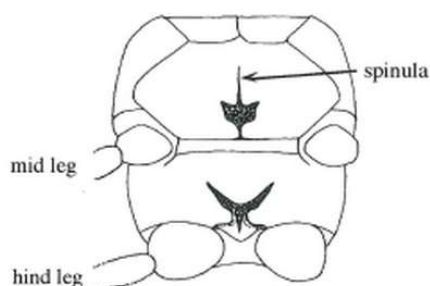
- Both meso- and metasternal furca with spinula



- Surface of abdominal tergites usually without microtrichia



- Metasternal furca rarely with spinula



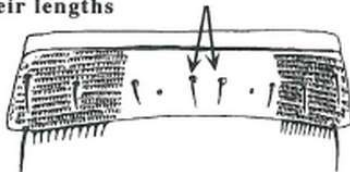
22

Go to step: 25

- Antennae 7- or 8-segmented



- Median tergal setae closer together than their lengths



- Pronotal sculpture closely striate or reticulate



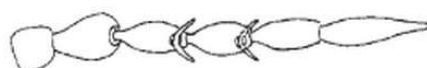
striate



reticulate

Go to step: 23

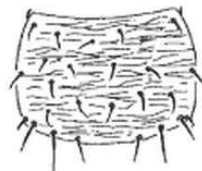
- Antennae with 6 segments



- Median tergal setae small and further apart than their lengths



- Pronotal sculpture not closely striate

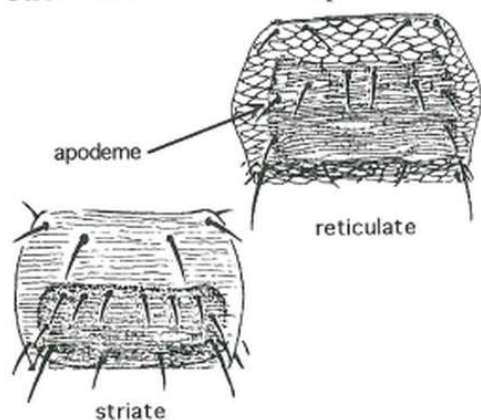


Genus: *Drepanothrips*

from step 22

23

- Often brown or bicoloured species, head and pronotum with reticulate or closely striate sculpture. Pronotum with dark apodeme, the sculpture overlying this sometimes differs from the surrounding sculpture
- First vein row of setae complete



- Small, usually pale species. Head and pronotum with sculpture of closely set transverse striations
- Forewing first vein row of setae widely interrupted



Genus: *Scirtothrips*

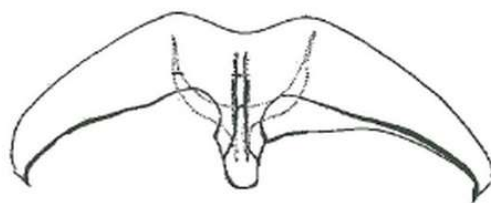
24

- Metasternum with deeply V-shaped apodeme



Genus: *Hydatothrips*

- Metasternum anterior margin almost transverse



Genus: *Neohydatothrips*

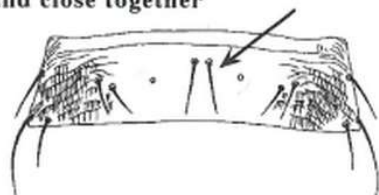
from step 21

25

- Pronotum dark and strongly reticulate



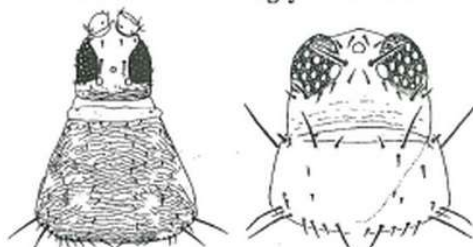
- Tergites with median pair of setae long and close together



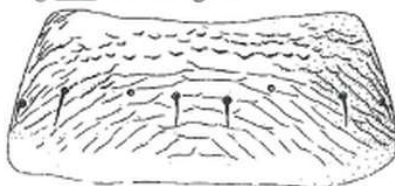
- Forewing setae long and dark with capitate apices

Genus: *Echinothrips*

- Pronotum not strongly reticulate



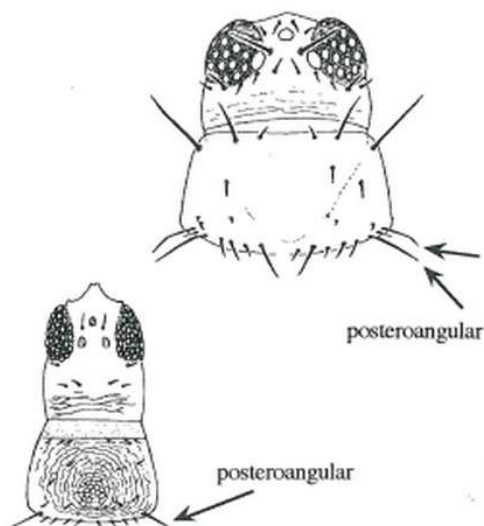
- Median pair of setae on tergites not long and close together



- Forewing setae not long and capitate

26

- Pronotum broadly rectangular, with 0, 1 or 2 pairs of posteroangular setae



Go to step: 27

- Pronotum trapezoidal with two pairs of long posteroangular setae

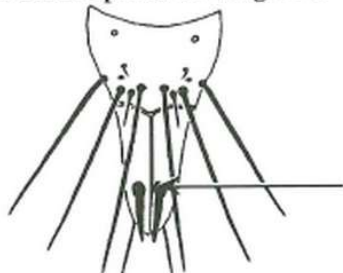


Go to step: 28

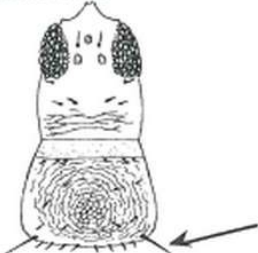
from step 26

27

- ♀ with stout spines on tergite X

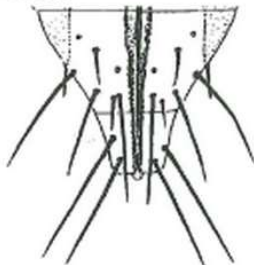


- Pronotum with one pair of long posteroangular setae

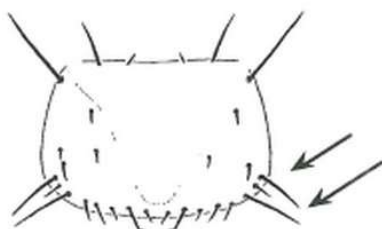


Genus: *Limothrips*

- Terminal abdominal tergites without such spine-like setae



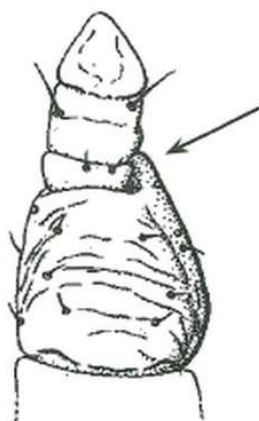
- Pronotum with 0, 1 or 2 pairs of long, posterior setae



Go to step: 29

28

- Fore tibia prolonged around external margin of fore tarsus



Genus: *Arorathrips*

- Fore tibia not prolonged around fore tarsus

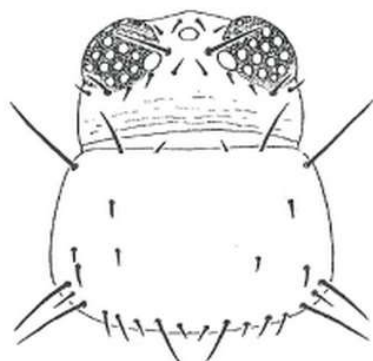


Genus: *Chirothrips*

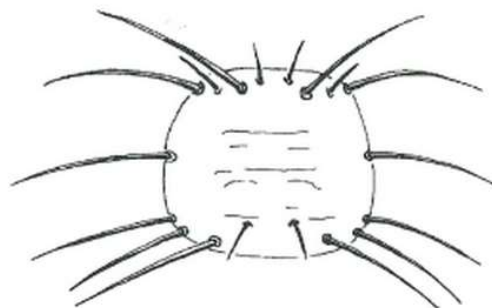
from step 27

29

- Pronotum with 0 - 5 pairs of long setae



- Pronotum with 6 pairs of long setae



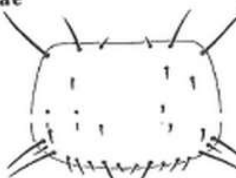
Genus: *Scolothrips*

30

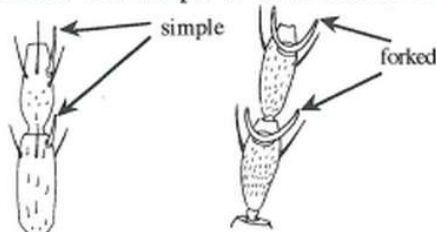
- Ocelli present



- Pronotum usually with one or more pairs of long setae



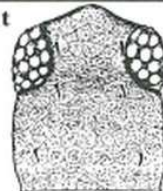
- Antennae with simple or forked sense cones



- Wings usually present, but sometimes wings reduced

Go to step: 32

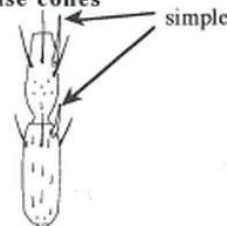
- Ocelli absent



- Pronotum without any long setae



- Antennae with 6 to 8 segments, III or IV with simple sense cones



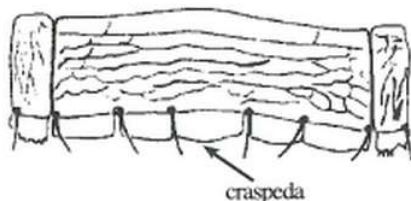
- Wings absent

Go to step: 31

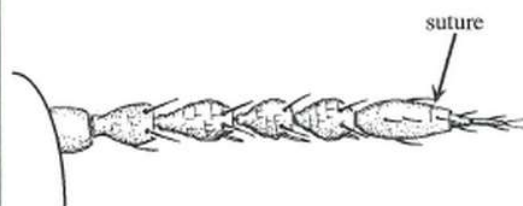
from step 30

31

- Abdominal tergites and sternites with posteromarginal craspeda, dark brown species

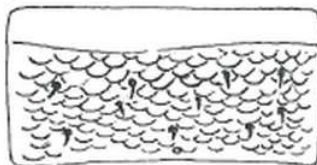


- Antennae 8-segmented, segment VI with a partial suture

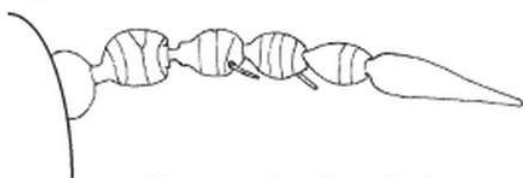


Genus: *Apterothrips*

- Abdominal tergites and sternites without posteromarginal craspeda, yellow to brown species



- Antennae 6- or 8-segmented

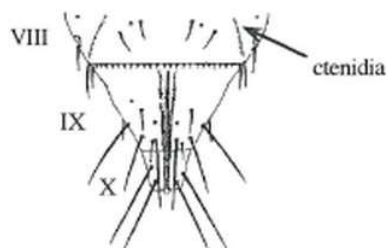


Genus: *Aptinothrips*

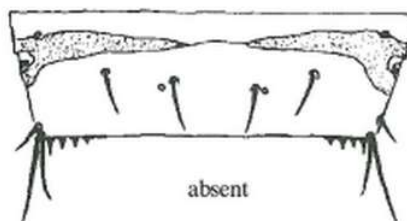
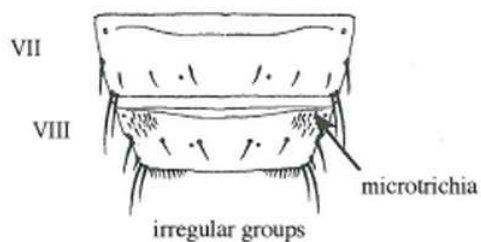
from step 30

32

- Abdominal tergite VIII with a pair of well developed ctenidia; similar ctenidia usually present on tergites IV or V - VII



- Abdominal tergite VIII without ctenidia, but sometimes with irregular groups of microtrichia laterally



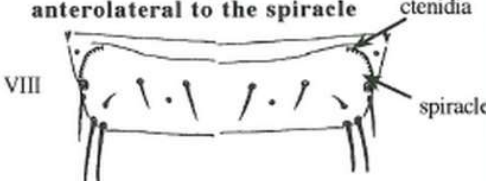
Go to step: 33

Go to step: 38


from step 32

33

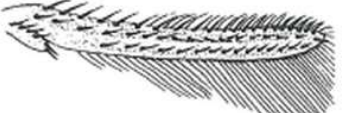
- Ctenidia on tergite VIII situated anterolateral to the spiracle



● Ocellar setae I present

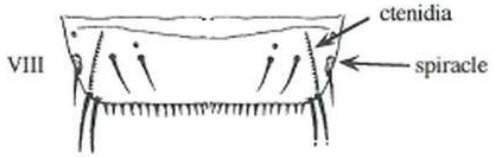


- Antennae 8-segmented.
- Forewings always with two complete rows of setae




Genus: *Frankliniella*

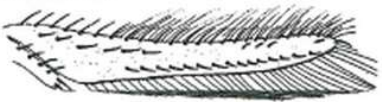
- Ctenidia on tergite VIII situated posteromedial to the spiracle



● Ocellar setae I absent

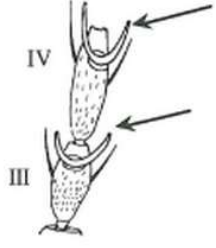


- Antennae 7-8 segmented
- Forewing usually with a gap in the first setal row

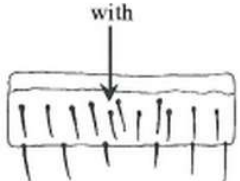
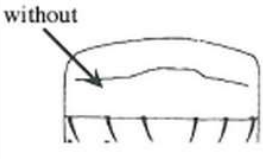


34

- Antennae 7- or 8-segmented, segments III & IV with forked sense cones

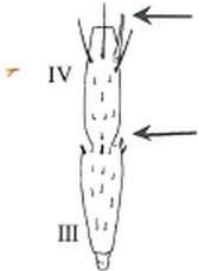


● Abdominal sternites with or without discal setae

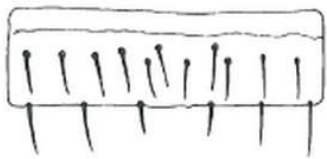


Go to step: 35

- Antennae 7-segmented, segments III & IV with simple sense cones



● Abdominal sternites II - VII with discal setae

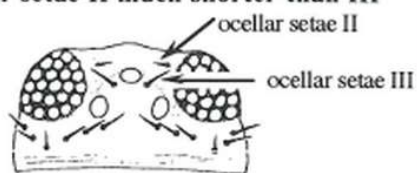


Genus: *Bolacothrips*

from step 34

35

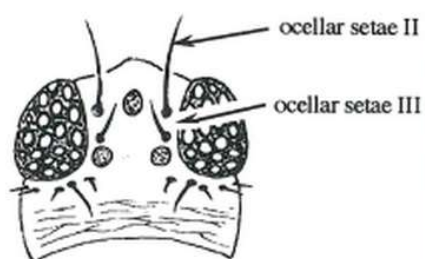
- Ocellar setae II much shorter than III



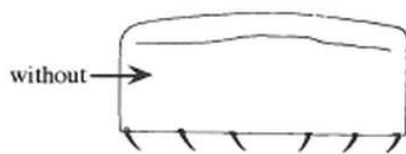
- Abdominal sternites with or without discal setae



- Ocellar setae II much longer than III



- Abdominal sternites without discal setae



36

Go to step: 37

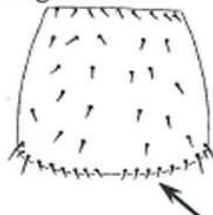
- Posteromarginal craspeda present on at least tergites IV-VI of abdomen



- Antennae 7-segmented
- Abdominal sternites with discal setae



- Pronotum with 5 - 6 pairs of posteromarginal setae

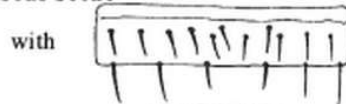


Genus: *Microcephalothrips*

- Posteromarginal craspeda not present on abdominal tergites



- Antennae 7- or 8-segmented
- Abdominal sternites with or without discal setae



- Pronotum with 3 - 4 pairs of posteromarginal setae



Genus: *Thrips*

from step 35

37

- Abdominal tergites and sternites with posteromarginal craspeda of large, regular lobes or teeth

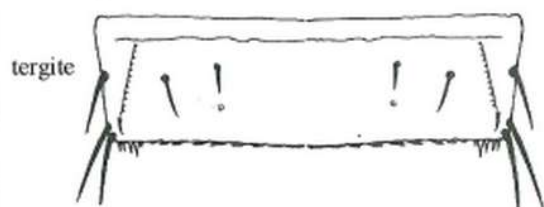


- Tergite VIII also with a craspedum

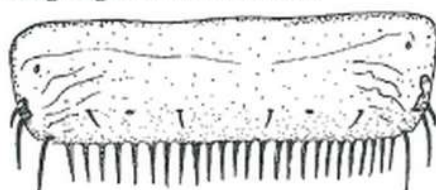


Genus: *Fulmekiola*

- Abdominal tergites and sternites without large lobed craspeda, rarely a few short irregular teeth



- Tergite VIII with posteromarginal comb of long regular microtrichia

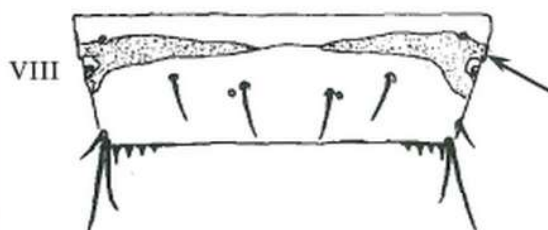


Genus: *Stenchaetothrips*

from step 32

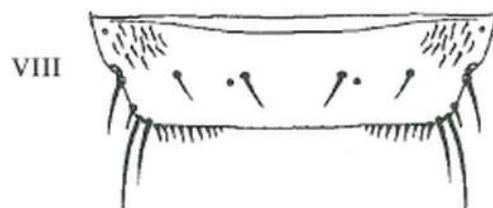
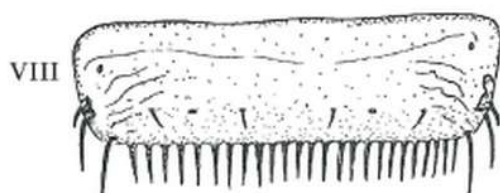
38

- Spiracles on abdominal tergite VIII with a large surrounding area of modified sculpture



Genus: *Chaetanaphothrips*

- Spiracles on tergite VIII without modified sculpture



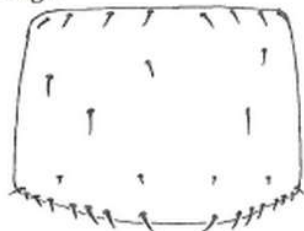
Go to step: 39

from step 38

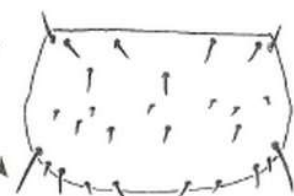
39

- Pronotum without any long setae, rarely with one pair of posteroangular setae longer

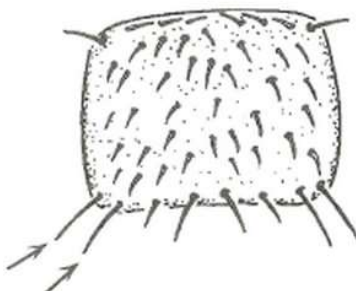
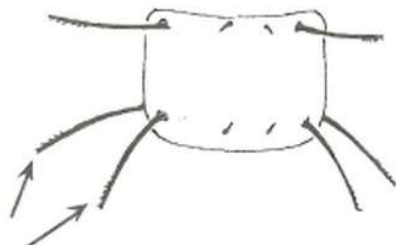
no long setae



one pair of long setae



- Pronotum with 2 pairs of long posteroangular setae



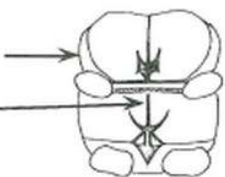
40

Go to step: 41

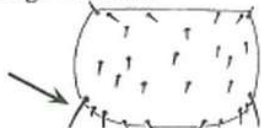
- Metasternum furca usually with a well developed internal spinula (poorly developed in *D. corbettii*)

mesothorax

metathorax



- Pronotum usually with 1 pair of long posteroangular setae



- Antennae always 8-segmented
- Ocellar setae 1 absent

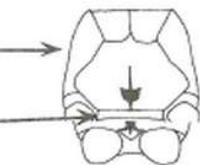


Genus: *Dichromothrips*

- Metasternum furca without a well developed spinula

mesothorax

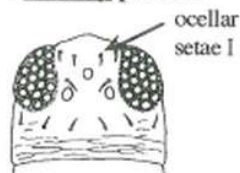
metathorax



- Pronotum without long posteroangular setae



- Antennae 8 or 9-segmented
- Ocellar setae 1 usually present



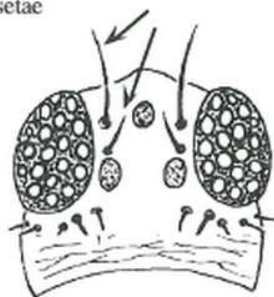
Genus: *Anaphothrips*

from step 41

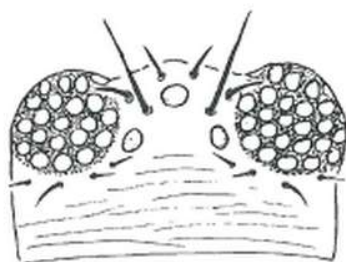
43

- Head with 2 or 3 pairs of ocellar setae

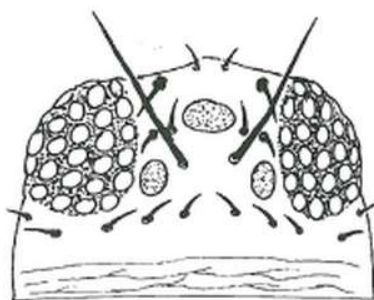
2 pairs of ocellar setae



3 pairs of ocellar setae



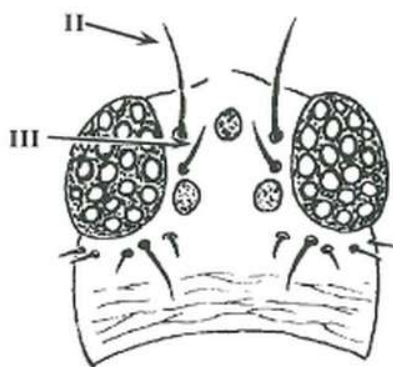
- Head with 4 or more pairs of ocellar setae



Genus: *Florithrips*

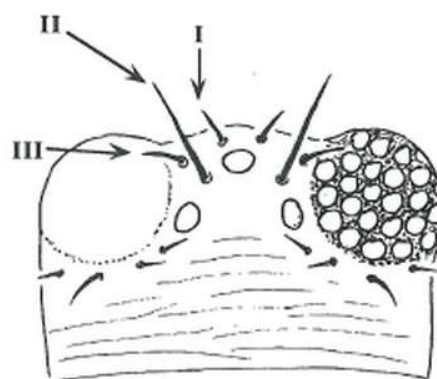
44

- Head with 2 pairs of ocellar setae, first pair absent



Go to step: 45

- Head with 3 pairs of ocellar setae



Go to step: 46

from step 44

45

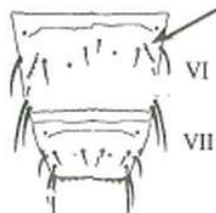
- Antennae with 7, rarely 8, segments, IV distinctly larger than III; VI unusually robust



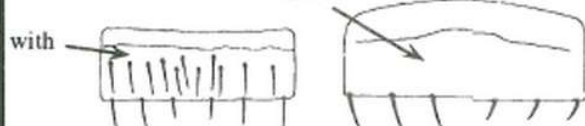
- Microtrichia absent on tergite VIII



- Tergites VI & VII usually with a weak ctenidium laterally

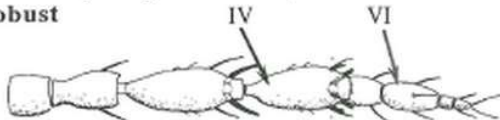


- Sternites with or without discal setae

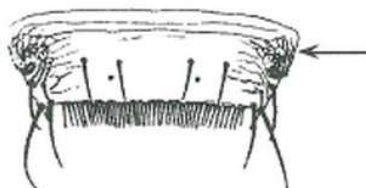


Genus: *Plesiothrips*

- Antennae 8-segmented, segment IV not distinctly larger than III, VI not unusually robust



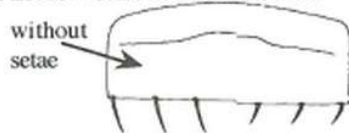
- Microtrichia on tergite VIII forming an irregular group



- Tergites VI & VII without lateral ctenidium



- Sternites without discal setae

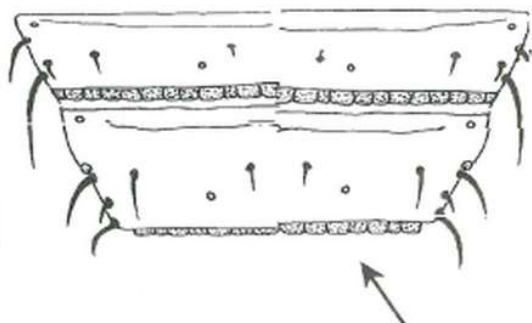


Genus: *Taeniothrips*

from step 44

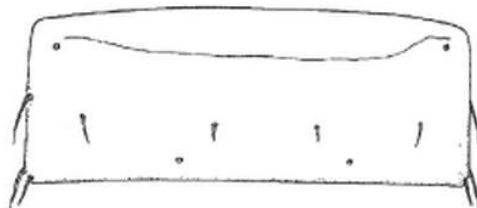
46

- Abdominal tergites and sternites with posteromarginal craspeda



Genus: *Sorghothrips*

- Abdominal tergites without posteromarginal craspeda

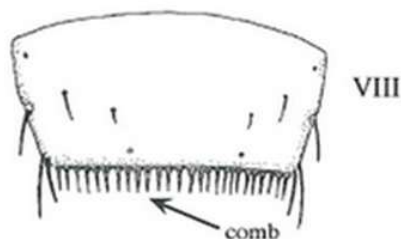


Go to step: 47

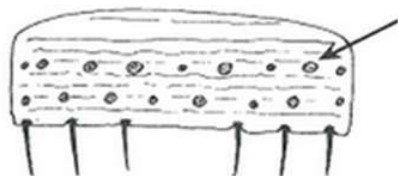
from step 46

47

- Abdominal tergite VIII posteromarginal comb complete

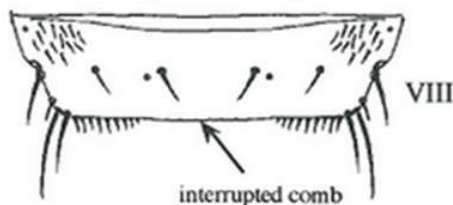


- ♂ sternites with numerous small circular glandular areas



Genus: *Ceratothripoides*

- Abdominal tergite VIII posteromarginal comb interrupted medially



- ♂ sternites without glandular areas

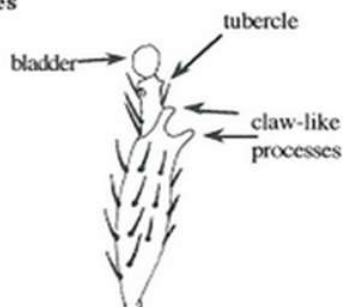


48

- Antennal segment VI sense cone with enlarged base



- Foretibia with 1 or 2 claw-like processes at apex; foretarsi often with 1 or 2 small tubercles

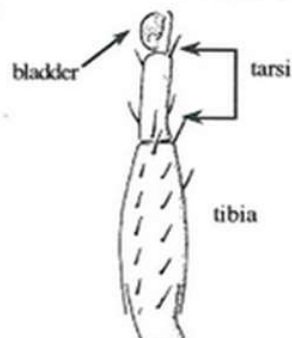


Genus: *Odontothrips*

- Antennal segment VI sense cone without a much enlarged base



- Foretibia without claw-like processes or tubercles

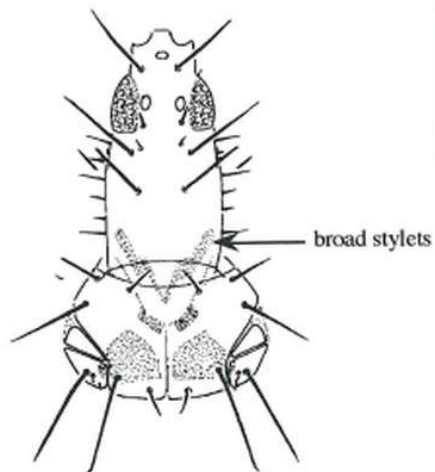


Genus: *Megalurothrips*

from step 1

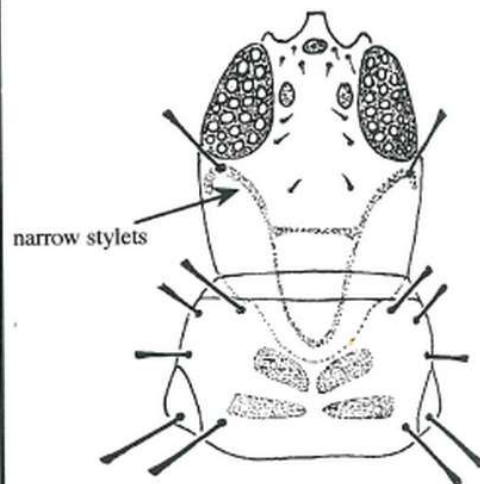
49

- Maxillary stylets broad and band-like, more than $5\ \mu\text{m}$ broad throughout their length



Sub-Family: *Idolothripinae*

- Maxillary stylets narrow, only $2-3\ \mu\text{m}$ broad for most of their length.



Sub-Family: *Phlaeothripinae*

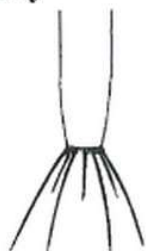
50

Go to step: 54

- Metathoracic sternopleural sutures often present



- Tube not hairy

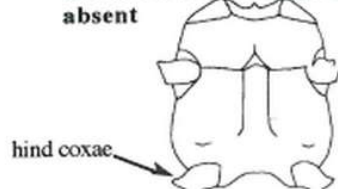


- Tergites with one pair of wing-retaining setae, often apterous

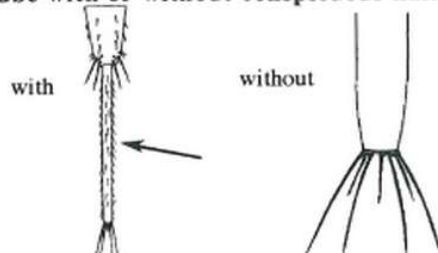


Genus: *Nesothrips*

- Metathoracic sternopleural sutures absent



- Tube with or without conspicuous hairs



- Tergites usually with 2 or more pairs of wing-retaining setae

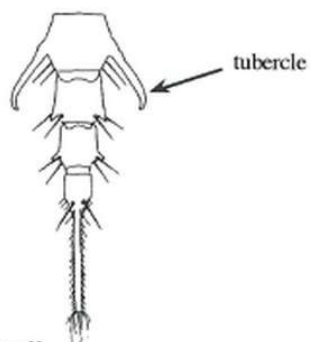


Go to step: 51

from step 50

51

- Tube with hairs laterally, ♂ often with lateral abdominal tubercles



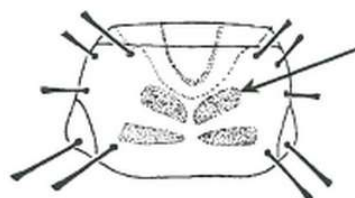
- Basantra small



- Tube without hairs laterally, ♂ without lateral abdominal tubercles



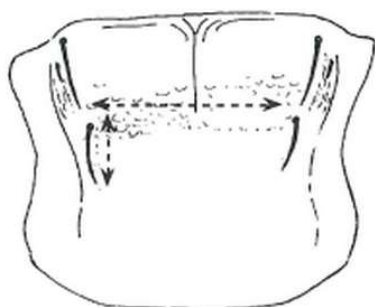
- Basantra well developed



Go to step: 53

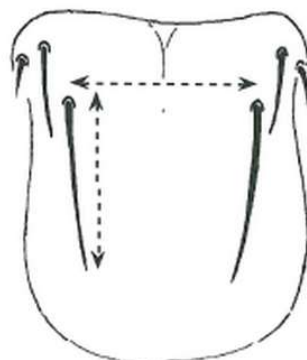
52

- Metanotal setae short, about 0.3 times the distance between their bases



Genus: *Idolothrips*

- Metanotal setae longer, 0.6 - 1.6 times the distance between their bases



Genus: *Bactrothrips*

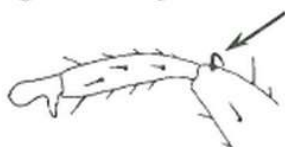
from step 51

53

- First ocellus situated anterior to major ocellar setae, head often extended in front of eyes

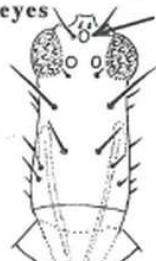


- ♂ usually with enlarged fore femora bearing sickle-shaped setae near apex



Genus: *Elaphrothrips*

- First ocellus situated between the major ocellar setae, head not greatly extended in front of eyes



- ♂ usually with an enlarged mesothoracic spiracular process

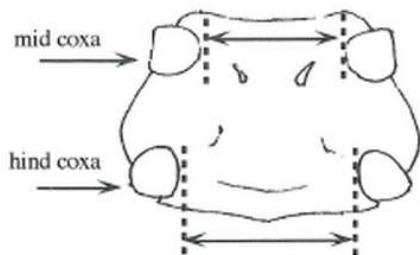


Genus: *Dinothrips*

from step 49

54

- Distance between hind coxae greater than that between mid & fore coxae

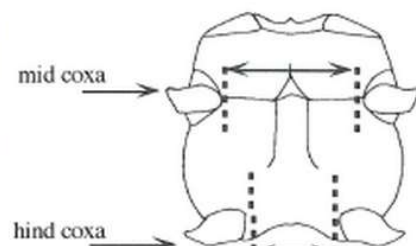


- Abdominal segment IX more than twice as long as VIII, tube often very long with particularly long terminal setae, usually without wings (apterous)

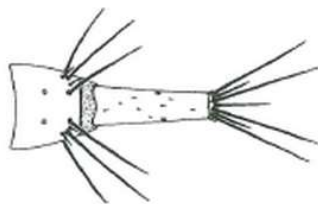


Genus: *Stephanothrips*

- Distance between hind coxae less than that between mid & fore coxae



- Abdominal segments IX & tube shorter, usually winged (macropterous)

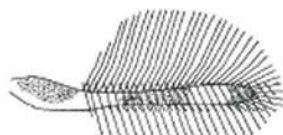


Go to step: 55

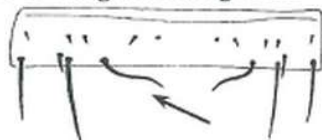
from step 54

55

- Forewings with transverse bands



- Abdominal tergites each with 1 pair of wing-retaining setae



- ♂ fore femora with a large tubercle on inner margin near base

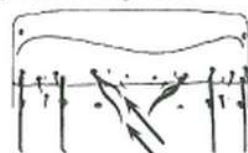


Genus: *Aleurodothrips*

- Forewings when present, not banded



- Abdominal tergites each with 2 pairs of wing-retaining setae

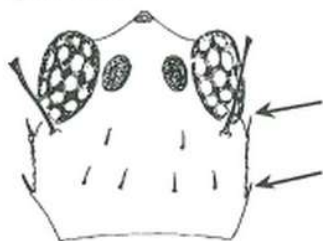


- ♂ fore femora with or without a large tubercle on inner margin near base



56

- Cheeks with at least 1 stout bristle-bearing tubercle



- Male usually with a stout tubercle at inner apex of fore femur



Genus: *Hoplandrothrips*

- Cheeks without warts, but sometimes with spines



- Male without a tubercle near apex of femur

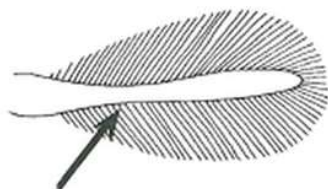


Go to step: 57

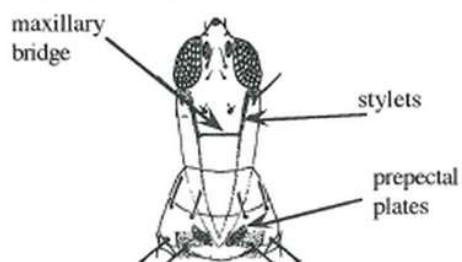
from step 56

57

- Forewings constricted medially



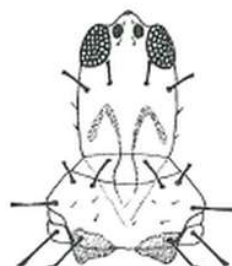
- Maxillary stylets usually well retracted into the head, maxillary bridge usually present, praepetal plates usually present



- Forewings with parallel sides



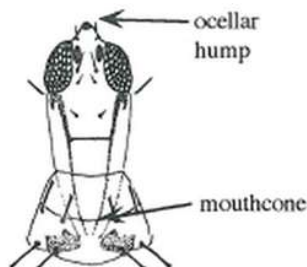
- Maxillary bridge absent, other characteristics various



58

Go to step: 61

- Ocelli usually in a conical hump overlying base of antennae, mouthcone usually long and pointed



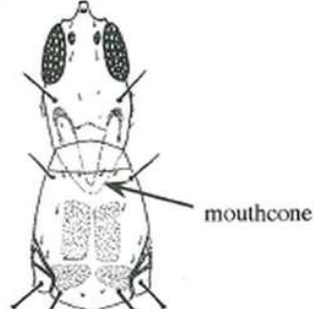
- Metanotum with longitudinally striate sculpture



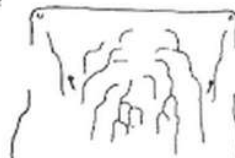
- Hypodermal pigment purple

Genus: *Leptothrips*

- Ocelli not situated on a hump, mouth cone often rounded



- Metanotum with weakly reticulate sculpture



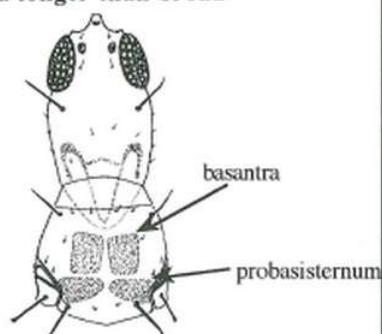
- Hypodermal pigment not purple

Go to step: 59

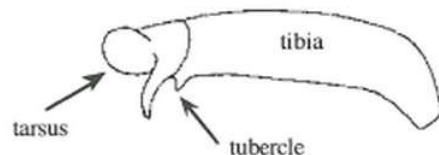
from step 58

59

- Basantra longer than broad

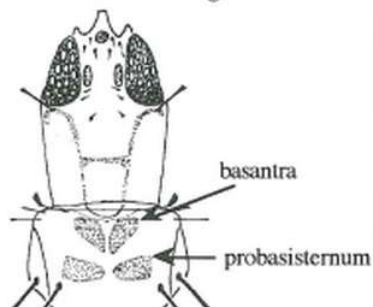


- Foretibia usually with an apical tooth or bristle-bearing tubercle on inner margin



Genus: *Podothrips*

- Basantra usually broader than long – sometimes as broad as long



- Foretibia with or without apical tooth

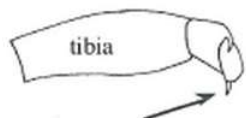


60

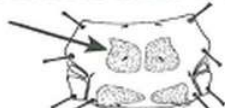
- Antennal segment IV with 2 or 3 sense cones, occasionally with an additional small sense cone



- Foretarsi with a forwardly directed curved tooth near the apex, sometimes small or difficult to see



- Basantra about as broad as long

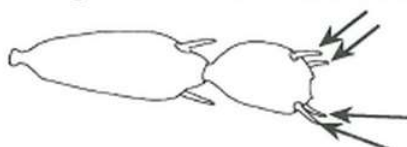


- Forewing with duplicated cilia



Genus: *Karnyothrips*

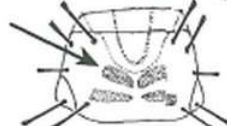
- Antennal segment IV with 4 sense cones



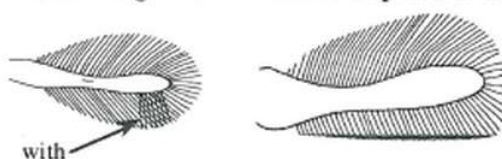
- Foretarsi without a tooth, or with a lateral tooth



- Basantra broader than long



- Forewing with or without duplicated cilia

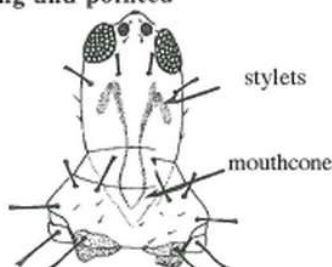


Genus: *Haplothrips*

from step 57

61

- Maxillary stylets well retracted into the head almost to the hind margin of the eyes & usually lying close together; mouthcone usually long and pointed



- Pronotum usually with 5 pairs of well-developed setae – sculpture usually more or less striate or indistinct

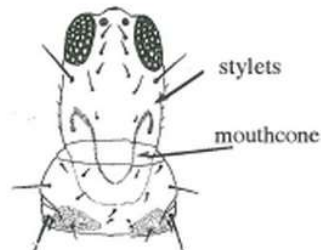


- ♂ & ♀ without foretarsal tooth



Genus: *Liothrips*

- Maxillary stylets usually not retracted so far into the head, mouthcone usually rounded



- Pronotum usually with less than 5 pairs of well-developed setae – sculpture usually distinctly irregular



- ♂ & ♀ with foretarsal tooth

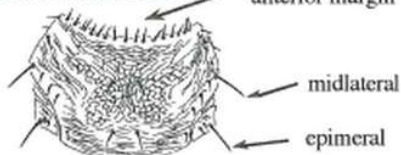


62

- Large species often with 3 pairs of wing-retaining setae, and spine-like setae at posterior angles



- Pronotum often with only epimeral setae well developed, anterior margin often with numerous small setae



- Antennal segments often elongate

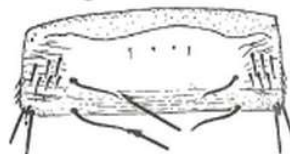


- Tube usually long and conspicuously hairy

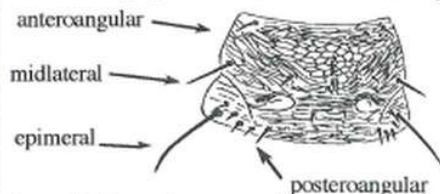


Genus: *Gigantothrips*

- Smaller species; tergites with only 2 pairs of wing-retaining setae



- Pronotum often with short anteroangular, midlateral & posteroangular setae as well as long epimerals, no anteromarginal setae



- Antennal segments usually not elongate



- Tube short & without conspicuous hairs



Genus: *Gynaikothrips*

Key to *Frankliniella* species of economic importance (Mound & Kibby 1998)

- 1 Antennal segment III with pedicel twice longer than basally wide (Fig. A-F 6)..... ***F. parvula***
 - Antennal segment III with pedicel not greatly elongate (Figs A-F7, A-F8) 2

- 2(1) Antennal segment III with distinct annular swelling on pedicel (Fig. A-F8) ***F. tritici***
 - Antennal segment III pedicel may be slightly swollen but never with annular ring (Fig. A-F 7).... 3

- 3(2) Head with ocellar setae III close, between anterior margins of hind ocelli (Fig. A-F9) . ***F. schultzei***
 - Head with ocellar setae III wider apart and arising in front of posterior ocelli (Fig. A-F10) 4

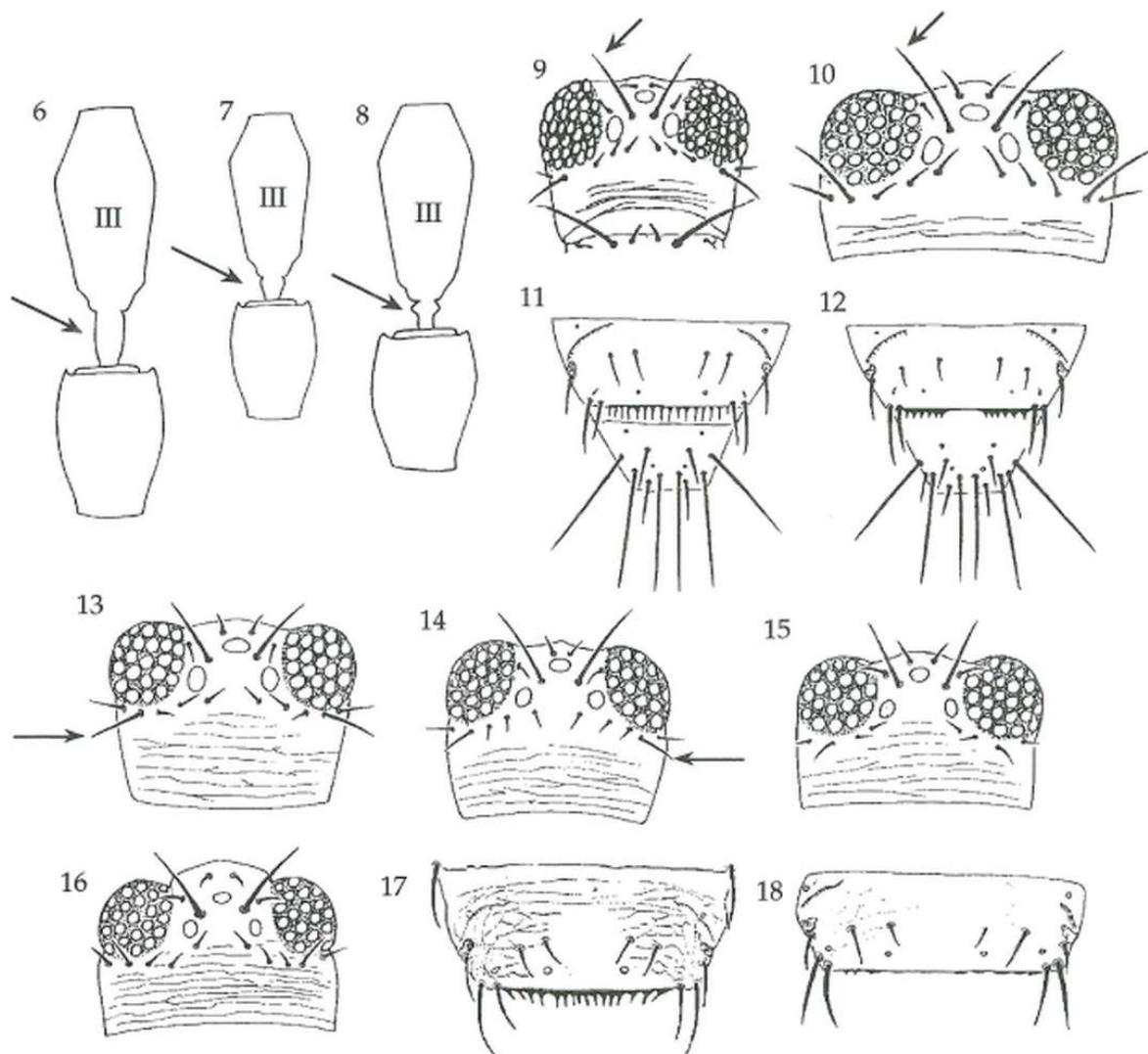
- 4(3) Body color yellow; tergite VIII with postero-marginal comb (Fig. A-F11) of long and fine, closely spaced and regular microtrichia; sternite II with 1 or 2 median discal setae ***F. williamsi***
 - Body brown or yellow; tergite VIII with postero-marginal comb absent or with broadly based microtrichia (Fig. A-F12); sternite II with no discal setae anterior to the hind margin5

- 5(4) Forewings dark with a basal pale area sharply delineated; abdominal tergite VIII with postero-marginal comb well-developed but with some teeth missing medially (Fig. A-F12)***F. insularis***
 - Forewings not sharply bicolored; tergite VIII with marginal comb different or not developed.... 6

- 6(5) Tergite VIII postero-marginal comb well developed although sometimes irregular (Fig. A-F17).. 7
 - Tergite VIII comb absent or represented only by a few lateral teeth (Fig. A-F18)8

- 7(6) Major post-ocular setae almost as long as ocellar setae III (Fig. A-F13); campaniform sensilla present on metanotum; body commonly yellow with brown spots on terga ***F. occidentalis***
 - Major post-ocular setae short, about 0.3 times as long as ocellar setae III (Fig. A-F14); metanotum without campaniform sensilla; body brown to light brown***F. intonsa***

- 8(6) Brachypterous, or if macropterous then with the comb on tergite VIII represented by a few small teeth laterally; head not prolonged in front of eyes (Fig. A-F15).....***F. fusca***
 - Macropterous, tergite VIII without a postero-marginal comb (Fig. A-F18); head relatively long and prolonged in front of eyes.....***F. tenuicornis***



Figs 6 - 18. *Frankliniella* spp.

6 *Frankliniella parvula* antennal segment III. 7 *F. schultzei*. 8 *F. tritici*. 9 *F. schultzei*. 10 *F. williamsi*.
 11 *F. williamsi* tergites VIII & IX. 12 *F. insularis*. 13 *F. occidentalis*. 14 *F. intonsa*. 15 *F. fusca*
 16 *F. tenuicornis*. 17 *F. intonsa* tergite VIII. 18 *F. tenuicornis* tergite VIII.

Figure A-F. *Frankliniella* species of economic importance

Key to *Scirtothrips* species of economic importance (Mound & Kibby 1998)

- 1 Head with ocellar setae III arising between the posterior ocelli, at least posterior to a line between the anterior margins of these ocelli (Fig. A-S19)2
- Head with ocellar setae III arising on, or more usually in front of, an imaginary line drawn between the anterior margins of the posterior ocelli (Fig. A-S20).....4

- 2(1) Metanotum irregularly reticulate medially, some of these reticles with fine internal markings. (Fig. A-S21); body color mainly brown, tergites slightly paler medially; male tergite IX with a pair of stout curved lateral horns [southern India]***S. bispinosus***
- Metanotum with sculpture transverse at anterior and longitudinal medially, usually without internal markings between the main lines (Fig. A-S22); body mainly yellow, sometimes with dark markings medially; male tergite IX without horns.....3

- 3(2) Abdominal tergites with ante-costal ridge dark and a dark median marking; lateral microtrichial field of tergites each with 3 discal setae (Fig. A-S23)***S. dorsalis***
- Abdominal tergites yellow, with no dark markings; lateral microtrichial fields each with 4 to 5 discal setae (Fig. A-S24) ***S. oligochaetus***

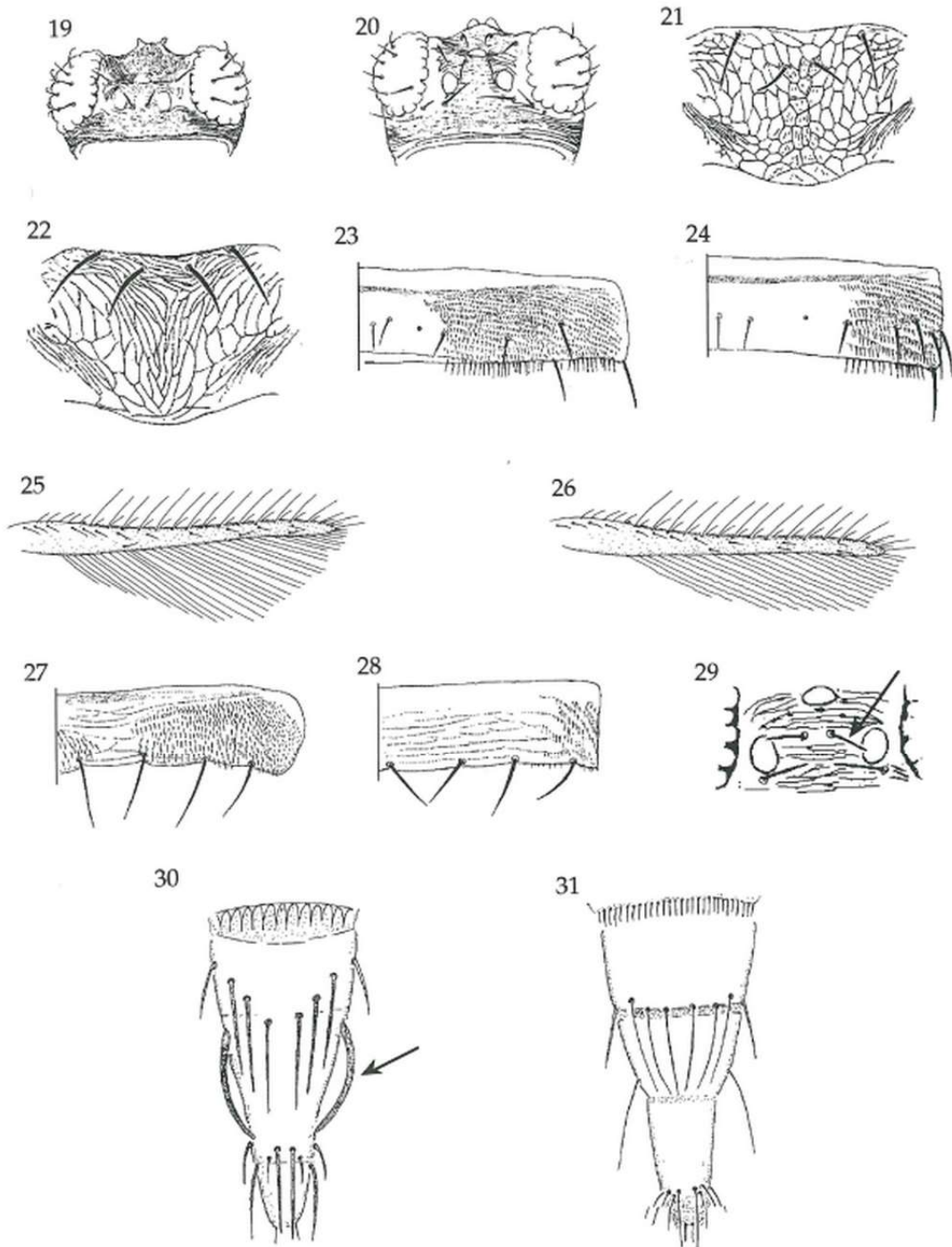
- 4(1) Forewing with posteromarginal cilia straight (Fig. A-S 25); wings and body brown ...***S. kenyensis***
- Forewing marginal cilia undulating (Fig. A-S26); body color pale..... 5

- 5(4) Sternites almost entirely covered with microtrichia; male tergite IX with curved lateral horns (Fig. A-S30); male hind femora with a comb of stout setae on posterior margin.....***S. aurantii***
- At least median area of sternites without microtrichia (figs A-S27, A-S28); male hind femora without a comb, and usually without horns on tergite IX (Fig. A-S31) 6

- 6(5) Sternites covered with microtrichia except medially on discal area anterior to the median pair of setae (Fig. A-S27); forewing second vein with only 1 or 2 setae [Brazil] ***S. manihoti***
- Median discal area of sternites between marginal S2 setae without microtrichia (Fig. A-S28); forewing second vein with 3 or 4 setae 7

- 7(6) Tergites with dark transverse ante-costal ridge, and a pair of dark spots laterally; male tergite IX with a pair of stout lateral curved horns (Fig. A-S30) [California] ***S. perseae***
- Tergites and sternites without dark lines or markings; male with or without lateral horns on abdominal tergite IX 8

- 8(7) Ocellar setae near anterior margins of ocellar triangle (Fig. A-S20); male tergite IX without a pair of stout curved lateral horns [southern USA] ***S. citri***
- Ocellar setae III between anterior margins of posterior ocelli (Fig. A-S29); male tergite IX with stout curved lateral horns (Fig. A-S30) [eastern Mediterranean] ***S. mangiferae***



Figs 19 - 31. *Scirtothrips* spp.

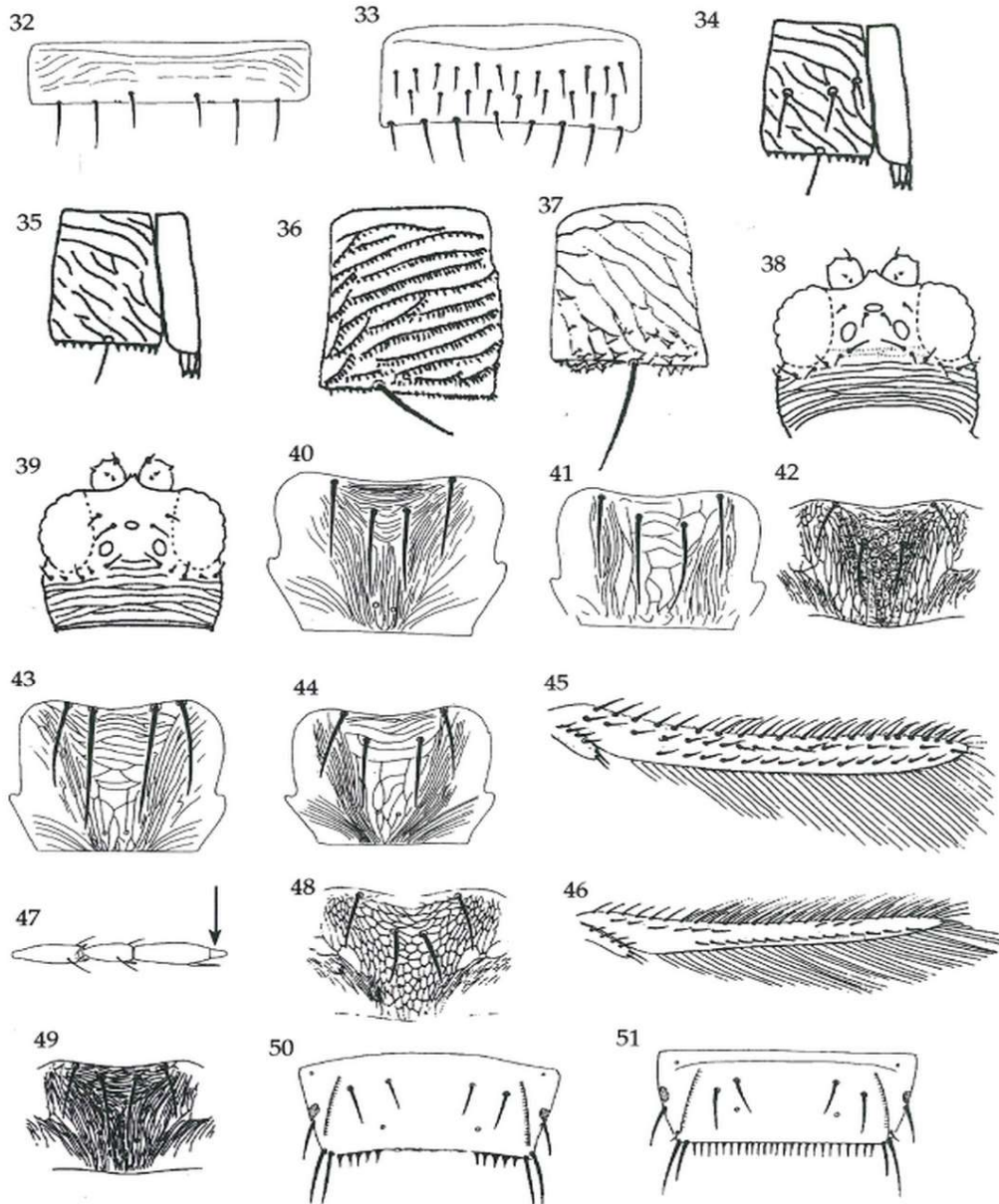
19 *Scirtothrips bispinosus*. 20 *S. citri*. 21 *S. bispinosus* metanotum. 22 *S. dorsalis* metanotum. 23 *S. dorsalis* tergite V. 24 *S. oligochaetus* tergite V. 25 *S. kenyensis* wing. 26 *S. aurantii* wing. 27 *S. manihoti* sternite V. 28 *S. citri* sternite V. 29 *S. mangiferae* ocellar triangle. 30 *Scirtothrips* sp. tergite IX. 31 *S. citri* tergite IX.

Figure A-S. *Scirtothrips* species of economic importance

Key to *Thrips* species of economic importance (Mound & Kibby 1998)

- 1 Median abdominal sternites with setae only at posterior margin (Fig. A-T32)..... 2
 - Median abdominal sternites with discal and postero- marginal setae (Fig. A-T33)6
- 2(1) Pleurotergites with discal setae (Fig. A-T34); body brown, forewings dark ***T. setosus***
 - Pleurotergites without discal setae (Fig. A-T35); body yellow to light brown 3
- 3(2) Pleurotergites with numerous rows of fine microtrichia (Fig. A-T36); forewing first vein usually with 4 distal setae; ocellar pigment grey not red.....***T. tabaci***
 - Pleurotergites without rows of fine microtrichia (Fig. A-T 37); forewing first vein with 3 distal setae; ocellar pigment red 4
- 4(3) Ocellar setae III arise within ocellar triangle, behind first ocellus (Fig. A-T38). ***T. flavus***
 - Ocellar setae III arise lateral to first ocellus, just outside ocellar triangle (Fig. A-T39)5
- 5(4) Body colour yellow with no brown markings; metanotum with 'smiling' transverse lines of sculpture at anterior (Fig. A-T40); tergite II with 4 lateral marginal setae; always macropterous ***T. palmi***
 - Body brown or yellow with brown markings; sculpture on metanotum irregularly reticulate to linear (Fig. A-T41); tergite II with 3 lateral marginal setae; brachypterous form common..... ***T. nigropilosus***
- 6(1) Sternite VII with 3 pairs of marginal setae but no discal setae ***T. orientalis***
 - Sternite VII with discal as well as marginal setae.....7
- 7(8) Pleurotergites with no discal setae (Fig. A-T34).....8
 - Pleurotergites with discal setae as well as a postero-marginal seta (Fig. A-T35) 10
- 8(7) Ocellar setae III arising within ocellar triangle; metanotal reticulate sculpture with internal markings (Fig. A-T42); forewing first vein with 4 to 7 setae..... ***T. simplex***
 - Ocellar setae III arising outside or on anterior margins of ocellar triangle; metanotum without internal markings between the major lines of sculpture (Fig. A-T43); forewing first vein with 3 distal setae 9
- 9(8) Median metanotal setae arise at anterior margin of sclerite (Fig. A-T43) ***T. hawaiiensis***
 - Median metanotal setae behind anterior margin of sclerite (Fig. A-T44) ***T. coloratus***
- 10(8) Forewing first vein with setal row almost complete (Fig. A-T 45) 11
 - Forewing first vein with a wide gap in setal row with 3-7 setae distally (Fig. A-T 46) 12
- 11(10) Metanotal sculpture reticulate, median setae small and well behind anterior margin (Fig. A-T48); antennae with 7 segments, VI 'bullet-shaped' (Fig. A-T47)***T. australis***
 - Metanotal sculpture linear medially, median setae longer and closer to anterior margin (Fig. A-T49); antennae with 7 or 8 segments, VI tapering normally [New Zealand]. ***T. obscuratus***
- 12(10) Tergite VIII with posteromarginal comb absent at least medially (Fig. A-T 50); pronotum with 4 or 5 pairs of posteromarginal setae [Australia] ***T. imaginis***
 - Tergite VIII posterior margin with complete comb of fine microtrichia (Fig. A-T51); pronotum with 3 pairs of posteromarginal setae 13

- 13(12) Forewing shaded, first vein with at least 5 setae distally *T. atratus*
 - Forewing pale or dark, first vein with 3 setae distally (Fig. A-T46)..... 14
- 14(13) Forewing pale to weakly shaded; pleurotergites with 3-4 discal setae ... *T. vulgatissimus*
 - Forewing dark; pleurotergites with 2 to 3 discal setae *T. meridionalis*



Figs 32 - 51 *Thrips* spp.

32 *Thrips parvispinosus* sternite VII. 33 *T. imaginis* sternite VI. 34 *T. setosus* pleurotergite.
 35 *Thrips* sp. pleurotergite. 36 *T. tabaci* pleurotergite. 37 *T. flavus* pleurotergite. 38 *T. flavus*.
 39 *T. palmi*. 40 *T. palmi* metanotum. 41 *T. nigropilosus* metanotum. 42 *T. simplex* metanotum.
 43 *T. hawaiiensis* metanotum. 44 *T. coloratus* metanotum. 45 *Thrips* sp. wing. 46 *Thrips* sp. wing.
 47 *T. australis* antenna. 48 *T. australis* metanotum. 49 *T. obscuratus* metanotum. 50 *T. imaginis* tergite
 VIII. 51 *Thrips* sp. tergite VIII.

Figure A-T. *Thrips* species of economic importance.

APPENDIX III.

Key for the identification of Thripidae second instar larvae
(Vierbergen *et al.* 2010)