PICTORIAL KEYS
ARTHROPODS, REPTILES, BIRDS AND MAMMALS
OF PUBLIC HEALTH SIGNIFICANCE

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
PICTORIAL KEYS TO

ARTHROPODS, REPTILES, BIRDS AND MAMMALS

OF PUBLIC HEALTH SIGNIFICANCE

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center
Atlanta, Georgia 30333

1966
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<tr>
<td>Ant</td>
<td>bite, sting; infest stored food; damage wood.</td>
</tr>
<tr>
<td>Bat</td>
<td>associated with rabies, histoplasmosis, and many other diseases.</td>
</tr>
<tr>
<td>Bed Bug</td>
<td>cause dermatitis; not known to transmit disease.</td>
</tr>
<tr>
<td>Bee, Hornet, etc.</td>
<td>bite and sting; infest stored food; damage wood.</td>
</tr>
<tr>
<td>Beetle</td>
<td>infest stored food; infest human intestine; cause dermatitis.</td>
</tr>
<tr>
<td>Bird</td>
<td>associated with histoplasmosis, ornithosis, and many other diseases.</td>
</tr>
<tr>
<td>Book Louse, Psocid</td>
<td>infest stored food.</td>
</tr>
<tr>
<td>Caterpillar</td>
<td>sting; infest intestinal tract.</td>
</tr>
<tr>
<td>Centipede</td>
<td>venomous bite; infest nasal, intestinal, and urinary tracts.</td>
</tr>
<tr>
<td>Chewing Louse</td>
<td>infest domestic birds and mammals.</td>
</tr>
<tr>
<td>Cockroach</td>
<td>transmit enteric diseases.</td>
</tr>
<tr>
<td>Collembola</td>
<td>infest stored food; used as indicator organisms for pesticide studies.</td>
</tr>
<tr>
<td>Copepod</td>
<td>involved in transmission of broad fish tapeworm and guinea worm.</td>
</tr>
<tr>
<td>Daddy Long-leg Spider</td>
<td>infest houses; harmless.</td>
</tr>
<tr>
<td>Earwig</td>
<td>household pests.</td>
</tr>
<tr>
<td>Flea</td>
<td>cause dermatitis; transmit plague, murine typhus, tapeworms.</td>
</tr>
<tr>
<td>Fly</td>
<td>some bite; larvae infest human flesh; transmit typhoid, paratyphoid, cholera, bacillary dysentery, infantile diarrhea, amebic dysentery, giardiasis, helminths, trachoma, conjunctivitis, yaws, anthrax, tularemia, African sleeping sickness, eishmaniasis, onchocerciasis, loiasis, bartonellosis, sandfly fever.</td>
</tr>
<tr>
<td>Ked or Louse Fly</td>
<td>occasionally bite man.</td>
</tr>
<tr>
<td>Kissing Bug</td>
<td>transmit Chagas disease.</td>
</tr>
<tr>
<td>Lagomorph</td>
<td>transmit tularemia and many other diseases.</td>
</tr>
<tr>
<td>Lobster, Crab, etc.</td>
<td>involved in transmission of oriental lung fluke.</td>
</tr>
<tr>
<td>Millipede</td>
<td>exude vesicating venom; infest digestive and urinary tract; intermediate host of tapeworms.</td>
</tr>
<tr>
<td>Mite</td>
<td>cause dermatitis; infest human intestine; transmit scrub typhus, rickettsialpox, epidemic hemorrhagic fever.</td>
</tr>
<tr>
<td>Mosquito</td>
<td>transmit malaria, encephalitis, yellow fever, dengue, filariasis.</td>
</tr>
<tr>
<td>Moth or Butterfly</td>
<td>infest stored food; infest human intestine; some have stinging hairs.</td>
</tr>
<tr>
<td>Pseudoscorpion</td>
<td>infest houses; harmless.</td>
</tr>
<tr>
<td>Rodent</td>
<td>transmit leptospirosis, lymphocytic choriomeningitis, etc.</td>
</tr>
<tr>
<td>Scorpion</td>
<td>sting.</td>
</tr>
<tr>
<td>Sea Spider</td>
<td>appearance causes fear; harmless.</td>
</tr>
<tr>
<td>Silverfish, Firebrat</td>
<td>infest stored food; transmit enteric diseases.</td>
</tr>
<tr>
<td>Snake</td>
<td>venomous bite; secondary infection of bites.</td>
</tr>
<tr>
<td>Sowbug, Pillbug</td>
<td>household pests; harmless.</td>
</tr>
<tr>
<td>Spider</td>
<td>venomous bite.</td>
</tr>
<tr>
<td>Sucking Louse</td>
<td>cause dermatitis; transmit epidemic typhus, trench fever, relapsing fever.</td>
</tr>
<tr>
<td>Sun Spider</td>
<td>non-venomous bite.</td>
</tr>
<tr>
<td>Termite</td>
<td>destroy wood; housing deterioration.</td>
</tr>
<tr>
<td>Thrips</td>
<td>bite man occasionally.</td>
</tr>
<tr>
<td>Tick</td>
<td>cause dermatitis, tick paralysis; transmit spotted fever, relapsing fever, tularemia, Colorado tick fever, Russian spring-summer encephalitis.</td>
</tr>
<tr>
<td>Whip Scorpion</td>
<td>appearance causes fear; harmless.</td>
</tr>
</tbody>
</table>
INTRODUCTION

Public health biologists are often responsible for teaching animal identification to personnel (sanitarians, engineers, physicians, veterinarians, etc.) without special training in taxonomy. One of the most successful devices for such training has been the pictorial key. The first U.S. Public Health Service pictorial key was devised by Stanley B. Freeborn and Eugene J. Gerberg (1943) to guide personnel in the identification of anopheline mosquito larvae during our national malaria control program.

After the Communicable Disease Center was founded (1946) additional keys were developed. At present the Center utilizes more than 75 such keys in its regular training program. These are the major items incorporated into this booklet. Apropos morphological diagrams are also included.

Precise identification of disease vectors is essential to their efficient control. In using the following keys it should be remembered that only a few of them include all species in a group, and that determinations made using them are only tentative.

The pictorial keys are typical of identification keys found in reference works and scientific papers except that they are arranged as diagrams and are illustrated. After making the first choice offered at the top of each page, follow the black lines or indicated numbers to secondary choices until the correct identification has been made. Note that, in some cases, the identification can be made in the first choice.

Note: The differing formats and typography in this publication were deliberately selected to:

(1) Provide a broad spectrum of taxonomic experience;

(2) Avoid the stultifying effect of monotonous repetition.
ARTHROPODS OF PUBLIC HEALTH IMPORTANCE: KEY TO COMMON CLASSES AND ORDERS
Harold George Scott and Chester J. Stojanovich

1. Three or - pairs of walking legs (Fig. 1 A & B) .................................................. 2
   Five or more pairs of walking legs (Fig. 1 C & D) .................................................. 3

2. Three pairs of walking legs (Fig. 2 A) ................................................................. 3
   Four pairs of walking legs (Fig. 2 B) ................................................................. 25

3. Wings present, well developed (Fig. 3 A) .......................................................... 4
   Wings absent or rudimentary (Fig. 3 B & C) .......................................................... 13

4. With one pair of membranous wings (Fig. 4 A), ORDER DIPTERA .................. 5
   With two pairs of wings (Fig. 4 B & C) .............................................................. 6

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5. Wings with scales (Fig. 5 A). FAMILY CULICIDAE........................................MOSQUITO
Wings without scales (Fig. 5 B). DIPTERA OTHER THAN MOSQUITOES........FLY

6. Mouthparts adapted for sucking, with elongate proboscis (Fig. 6 A).........................
Mouthparts adapted for chewing, without elongate proboscis (Fig. 6 B)......................

7. Wings densely covered with scales; proboscis coiled (Fig. 7 A). ORDER LEPIDOPTERA.
Wings not covered with scales; proboscis not coiled (Fig. 7 B).................................

8. Wing with fringe of long hair (Fig. 8 A). ORDER THYSANOPTERA.....................THRIPS
Wing without long hair (Fig. 8 B). ORDER HEMIPTERA...............................KISSING BUG
9. Both pair of wings membranous and similar in structure (Fig. 9 A)........................................10
   Front pair of wings shell-like or leathery, serving as covers for the second pair (Fig. 9 B)......11

Fig. 9 A

Fig. 9 B

10. Both pairs of wings similar in size (Fig. 10 A). ORDER ISOPTERA.........................................TERMITE
    Hind wing much smaller than front wing (Fig. 10 B). ORDER HYMENOPTERA................................BEE, HORNET, WASP, YELLOW JACKET, OR ANT

Fig. 10 A

Fig. 10 B

11. Front wings horny or leathery, without distinct veins (Fig. 11 A).................................12
    Front wings leathery or paper-like, with distinct veins (Fig. 11 B). ORDER ORTHOPTERA.....COCKROACH

Fig. 11 A

Fig. 11 B

12. Abdomen with prominent cerci; wings shorter than abdomen (Fig. 12 A). ORDER DERMAPTERA.....EARWIG
    Abdomen without prominent cerci; wings covering abdomen (Fig. 12 B). ORDER COLEOPTERA.....BEETLE

Fig. 12 A

Fig. 12 B
13. Mouthparts with jaws for chewing (Fig. 13 A) .................................................................14
   Mouthparts with a long beak or stylets for sucking up food (Fig. 13 B) .........................21

14. With three long terminal tails (Fig. 14 A). ORDER THYSANURA..................SILVERFISH AND FIREBRAT
   Without three long terminal tails (Fig. 14 B) ....................................................................15

15. Abdomen with prominent pair of cerci (Fig. 15 A). ORDER DERMAPTERA...........EARMIG
   Abdomen without prominent pair of cerci (Fig. 15 B) ......................................................16

16. With narrow waist (Fig. 16 A). ORDER HYMENOPTERA.................................ANT
   Without narrow waist (Fig. 16 B) .....................................................................................17
17. Antenna with fewer than 8 segments (Fig. 17 A) .............................................................. 18
   Antenna with more than 8 segments (Fig. 17 B) .............................................................. 19

   Fig. 17 A

   Fig. 17 B

18. Abdomen with 6 or fewer segments (Fig. 18 A). ORDER COLLEMBOLA ......................... SPRINGTAIL
    Abdomen with more than 6 segments (Fig. 18 B). ORDER MALLOPHAGA ........................ CHEWING LOUSE

   Fig. 18 A

   Fig. 18 B

19. Tarsus with 4-5 segments (Fig. 19 A) ................................................................................. 20
    Tarsus with 1-3 segments (Fig. 19 B). ORDER PSOCOPTERA .................................. BOOK Louse OR PSOCID

   Fig. 19 A

   Fig. 19 B

20. Pronotum narrower than head, never covering head (Fig. 20 A). ORDER ISOPTERA ........... TERMITE
    Pronotum broader than head, often covering head (Fig. 20 B). ORDER ORTHOPTERA ........ COCKROACH

   Fig. 20 A

   Fig. 20 B
21. Flattened laterally (Fig. 21 A). ORDER SIPHONATERA......................................................FLEA

22. Flattened dorso-ventrally (Fig. 21 B).................................................................22

22. Foot terminating in protrusible bladder (Fig. 22 A). ORDER THYSANOPTERA............THRIPS

23. Beak jointed (Fig. 23 A). ORDER HEMIPTERA.........................................................BEDBUG

24. Mouthparts retracted into head (Fig. 24 A). ORDER ANOPHLESA.............................SUCCING LOUSE

24. Mouthparts not retracted into head (Fig. 24 B). ORDER DIPTERA..............................RED OR LOUSE FLY
25. Abdomen well-developed (Fig. 25 A). CLASS ARACHNIDA ................................................................. 26

Abdomen peg-like (Fig. 25 B). CLASS Pycnogonida ............................................................ SEA SPIDER

26. Abdomen distinctly segmented (Fig. 26 A) ..................................................................................... 27

Abdomen not distinctly segmented (Fig. 26 B). ................................................................................. 31

27. Abdomen lengthened to form a long tail (Fig. 27 A) ........................................................................ 28

Abdomen not lengthened to form a long tail (Fig. 27 B). ................................................................. 29

28. Tail with stinger (Fig. 28 A). ORDER SCORPIONIDA ................................................................. SCORPION

Tail without stinger (Fig. 28 B). ORDER PEDIPALPIDA ............................................................ WHIP SCORPION

Fig. 25 A

Fig. 25 B

Fig. 26 A

Fig. 26 B

Fig. 27 A

Fig. 27 B

Fig. 28 A

Fig. 28 B
29. With large pincer-like claws (Fig. 29 A). ORDER PSEUDOSCORPIONIDA
Without large pincer-like claws (Fig. 29 B).

30. Legs not longer than body (Fig. 30 A). ORDER SOLPUGIDA
Legs much longer than body (Fig. 30 B). ORDER PHALANGIDA

31. Abdomen constricted to form a narrow waist (Fig. 31 A). ORDER ARANEIDA
Abdomen not constricted (Fig. 31 B)

32. Body with long hair; Haller’s organ absent (Fig. 32 A). ORDER ACARINA
Body without hair or short hair; Haller’s organ present (Fig. 32 B). ORDER ACARINA
33. Five to 7 pairs of walking legs (Fig. 33 A). CLASS CRUSTACEA ........................................ 34

More than 14 pairs of walking legs (Fig. 33 B) ................................................................. 36

34. Abdomen without appendages (Fig. 34 A). ORDER Copepoda ........................................ 35

Abdomen with appendages (Fig. 34 B) ................................................................................. 35

35. Thorax covered with a fused plate; eyes, when present, on movable stalks (Fig. 35 A & B) ........ ORDER DECAPODA ........................................................ 35

Thorax not covered with a fused plate; eyes, when present, not on movable stalks (Fig. 35 C & D) .................................................................................................................. SOWBUG, PILLBUG

36. One pair of legs per body segment (Fig. 36 A). CLASS CHILOPoda ................................ 36

Two pairs of legs per body segment (Fig. 36 B). CLASS DIPLOPODA ................................. 36
HOUSEHOLD AND STORED-FOOD PESTS: PICTORIAL KEY TO COMMON LARVAE
Chester J. Stojanovich & Harold George Scott

abdominal legs present
abdominal legs absent

MOTH LARVAE

thoracic legs present
thoracic legs absent

BEETLE, BORER & MEALWORM LARVAE

with fleshy lobes at ends of body
without fleshy lobes at ends of body

FLEA LARVAE

head capsule present
head capsule absent

WEEVIL LARVAE

MUSC OID FLY LARVAE
ECTOPARASITES OF THE DOG: PICTORIAL KEY TO COMMON SPECIES
Harold George Scott & Chester J. Stojanovich

with 6 legs, head definite
flattened laterally

with 8 legs, head indefinite
flattened dorsoventrally
under 4 mm. in length
Haller's organ absent

over 4 mm. in length
Haller's organ present

FLEA
chewing mouthparts

LOUSE
sucking mouthparts

MITE
body elongate

TICK
body globular

Linognathus setosus
DOG SUCKING LOUSE

Demodex canis
DEMODECTIC MANGE MITE

Heterodoxus spiniger
KANGAROO LOUSE

Trichodectes canis
DOG BITING LOUSE

Sarcoptes scabiei canis
SARCOPTIC MANGE MITE

Otodectes cynotis
FAR MITE

Ctenocephalides canis
DOG FLEA

Ctenocephalides felis
CAT FLEA

Echidnophaga gallinacea
STICKTIGHT FLEA

Pulex simulans
FALSE HUMAN FLEA

Amblyomma americanum
LONE STAR TICK

Dermacentor variabilis
AMERICAN DOG TICK

Rhipicephalus sanguineus
BROWN DOG TICK

Ixodes scapularis
BLACK-LEGGED TICK
REPRESENTATIVE ECTOPARASITES OF THE DOG
Chester J. Stojanovich

Trichodectes canis  DOG BITING LOUSE
Linognathus setosus  DOG SUCKING LOUSE
Ctenocephalides felis  CAT FLEA
Sarcoptes scabiei canis  SARCOPTIC MANGE MITE
Orobia megini  SPINOSE EAR TICK
Rhipicephalus sanguineus  BROWN DOG TICK

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HUMAN ECTOPARASITES: KEY TO COMMON GROUPS
Chester J. Stojanovich and Harold George Scott

**FLY LARVA**
Order Diptera
- flattened laterally
- head definite
- 3 pairs of legs
- mouthparts ventral

**FLEA**
Order Siphonaptera
- wings present
- mouthparts projected

**KISSING BUG**
Order Hemiptera
- over 4 mm. long; Haller’s organ present

**BED BUG**
Order Hemiptera
- under 4 mm. long; Haller’s organ absent

**LOUSE-FLY**
Order Diptera
- head indefinite
- 4 pairs of legs

**LOUSE**
Order Anoplura
- head definite
- 3 pairs of legs

**SOFT TICK**
Order Acarina
- Haller’s organ

**HARD TICK**
Order Acarina
- mouthparts anterior

**MITE**
Order Acarina

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1. With abdominal appendages (Fig. 1 A)………………………………………………………….. 2

   Without abdominal appendages (Fig. 1 B)………………………………………………………… 7

2. Carapace present (Fig. 2 A)…………………………………………………………………………. 3

   Carapace absent (Fig. 2 B)……………………………………………………………………………… 6

3. With dorsal shield (Fig. 3 A). SHIELD SHRIMP.………………………………………………. Order NOTOSTRACA

   Without dorsal shield (Fig. 3 B)………………………………………………………………………. 4
4. With bivalve shell (Fig. 4 A). SHELL SHRIMP. ............................................. Order CONCHOSTRACA
   Without bivalve shell (Fig. 4 B). ................................................................. 5

![Fig. 4 A](image1)

5. First pleopod rudimentary (Fig. 5 A). OPOSSUM SHRIMP. ..................... Order MYSIDACEA
   First pleopod well-developed (Fig. 5 B, C & D). SHRIMP, CRAYFISH, LOBSTERS, CRABS......
   ......................................................................................................................... Order DECAPODA

![Fig. 5 A](image2)

6. Body laterally compressed (Fig. 6 A). SAND FLEAS, ETC. .................... Order AMPHIPODA
   Body dorso-ventrally compressed (Fig. 6 B). SOWBUGS, PILLBUGS, ETC....... Order ISOPODA

![Fig. 6 A](image3)
7. Body not completely enclosed in a bivalve shell (Fig. 7 A).......................... 8
   Body completely enclosed in a bivalve shell (Fig. 7 B). OSTRACODS........... Order PODOCOPA

8. Body segmented (Fig. 8 A)........................................................................ 9
   Body not segmented (Fig. 8 B). WATER FLEAS,................................. Order CLADOCERA

9. Eyes stalked (Fig. 9 A). FAIRY SHRIMP........................................ Order ANOSTRACA
   Eyes not stalked (Fig. 9 B). COPEPODS......................................... Order EUCOPE?ODA
CENTIPEDES: KEY TO SOME IMPORTANT UNITED STATES SPECIES
Harold George Scott

1. 8 dorsal plates: 15 pairs of long legs... EASTERN HOUSE CENTIPEDE, Scutigera cleoptrata
   More than 14 dorsal plates. ................................................................. 2

   Scutigera cleoptrata

2. 15 pairs of legs (Lithobius). ............................................................... 3
   21-23 pairs of legs (Scolopendra) .......................................................... 4
   More than 30 pairs of legs (Geophilus).................................................. 5

3. Antenna 19-23 segmented ......................................................... Lithobius multidentatus
   Antenna 33-43 segmented .......................................................... Lithobius forficatus

4. Anal legs as long as or longer than 3 terminal body segments.................... WESTERN HOUSE CENTIPEDE, Scolopendra heros
   Anal legs shorter than 3 terminal body segments .......................... Scolopendra morsitans

   Scolopendra heros

5. 47-53 pairs of legs. .............................................................................. 6
   64-67 pairs of legs. .................................................................. Geophilus californicus

6. With 2 longitudinal black lines .................................................. Geophilus rubens
   Without longitudinal black lines ........................................ Geophilus umbraticus
MILLIPEDES: KEY TO SOME IMPORTANT UNITED STATES SPECIES
Harold George Scott, Ph.D.

1. 20-21 body segments ................................................................. 2
   More than 29 body segments .................................................... 3

2. Legs with basal spines .......................................................... Pleurolophia butleri (= Fontaria virginiensis)
   Legs without basal spines .................................................. Pseudopolydesmus serratus

   Narceus americanus

3. Body segment 3 with legs .................................................. Narceus americanus (= Spirobolus marginatus)
   Body segment 3 without legs ............................................... Brachyiulus pusillus (= Julus virgatus)

   Brachyiulus pusillus
SPIDERS: KEY TO SOME IMPORTANT UNITED STATES SPECIES
Harold George Scott & Chester J. Stojanovich

1. Fangs projecting horizontally (Fig. 1 A). (abdomen without tergites; tarsus with claw tufts and 2 claws) ........................................................................................Dugesiella hentzi and others, TARANTULAS

Fangs projecting vertically (Fig. 1 B). ......................................................................................2

2. Six eyes in 3 pairs; fiddle-shaped marking on cephalothorax (Fig. 2 A). .........................Loxosceles reclusa...................................................................................BROWN RECLUSE SPIDERS

Eight eyes (shiny black with red spots; usually with red hourglass on underside of abdomen) (Fig. 2 B). Latrodectus mactans......................................................................................BLACK WIDOW SPIDER
SCORPION DIAGRAM: DORSAL VIEW OF CENTRUROIDES VITTATUS
Chester J. Stojanovich

- pincer
- chelicera
- pedipalp
- ocelli
- tarsus
- preabdomen
- stinger
- subacicular spine
- caudal vesicle
- postabdomen

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COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA
Harold George Scott, Ph.D.

SUBFAMILY NEANURINAE

abd VI large, bilobed
segmental tubercles present

NEANURINI

abd VI small, rounded
segmental tubercles absent

PSEUDACHORUTINI

segmental tubercles large
segmental tubercles small

anal spines present

furcula present

furcula absent

maxilla untoothed

maxilla toothed

Logacanura Odontella Brachystomella Pseudachorutes

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COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA
Harold George Scott, Ph.D.

SUBFAMILY ISOTOMINAE - Part A

anal spines 4  

anal spines 8  

anal spines 0-2

furcula short  

furcula long  

furcula absent  

furcula present

Weberacantha

Tetracanthella  

Spinisotoma  

Anurophorus

fringed bothriotricha present  

fringed bothriotricha absent

abd V and VI  

abd V and VI  

anal spines 0  

anal spines 2

ankylosed  

not ankylosed

Archisotoma

muco with 3-4 teeth  

muco with 5 teeth

Biacanthella  

Uzelia

postantennal organ and eyes present or absent

Isotomurus  

Axelsonia

Feisomina

see part B

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COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA

SUBFAMILY ISOTOMINAE - Part B

anus ventral

manubrium with
hooks

manubrium without hooks

abd IV not shorter than III

abd V shorter than III

Isotomodes

Folsoria

mucro with 0-3 teeth

mucro with 4 teeth

mucro with 2 teeth

mucro with 3-4 teeth

Proisotoma

Metisotoma

eyes 8 and 8

eyes 2 and 2
to 4 and 4

eyes absent

Folsomides

Micrisotoma

body segments
bulging

body segments
not bulging

unguis tunicate

unguis not tunicate

Cochliella

Isotomina

Agrenia

with dental spines

mucro with 3 teeth

mucro with 4 teeth

without dental spines

Seniscerura

Tomocerura

Isotoma
COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA
Harold George Scott, Ph.D.

SUBFAMILIES TOMOCERINAE AND ENTOMOBRYINAE

TOMOCERINAE
- postantennal organ present
- dentes with large fringed scales

ENTOMOBRYINAE
- postantennal organ absent
- dentes without large fringed scales

<table>
<thead>
<tr>
<th>Subfamily</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Tomolonus</td>
<td>ant 4-segmented 4th seg annulate dark eyepatch</td>
</tr>
<tr>
<td>Tomocerus</td>
<td>ant 4-segmented 4th seg annulate no dark eyepatch</td>
</tr>
<tr>
<td>Cyphodorus</td>
<td>ant 4-segmented 6th seg not annulate</td>
</tr>
<tr>
<td>Lepidocyrtina</td>
<td>scales present 1-toothed mucro</td>
</tr>
<tr>
<td>Troglolosina</td>
<td>scales present 2-toothed mucro</td>
</tr>
<tr>
<td>Entomobryina</td>
<td>scales present 0-toothed mucro</td>
</tr>
<tr>
<td>Salina</td>
<td>scales absent mucro without basal spine</td>
</tr>
<tr>
<td>Drepanocyrtus</td>
<td>scales absent mucro with basal spine</td>
</tr>
<tr>
<td>Sine</td>
<td>dens with ventral scales</td>
</tr>
<tr>
<td>Calyx</td>
<td>dens without ventral scales</td>
</tr>
<tr>
<td>Sina</td>
<td>eyes 8 and 8</td>
</tr>
<tr>
<td>Homidia</td>
<td>eyes 5 and 5 or fewer</td>
</tr>
<tr>
<td>Lepidocyrtus</td>
<td>eyes 4 and 4 or fewer or absent</td>
</tr>
<tr>
<td>Pseudosinella</td>
<td>eyes 8 and 8 tibiotarsal patch</td>
</tr>
<tr>
<td>Isotobryoides</td>
<td>eyes 8 and 8 no tibiotarsal patch mucro</td>
</tr>
<tr>
<td>Sinella</td>
<td>eyes 8 and 8; no tibiotarsal patch mucro with antepical tooth</td>
</tr>
<tr>
<td>Entomobryoides</td>
<td>eyes 8 and 8 tibiotarsal patch mucro</td>
</tr>
<tr>
<td>Entomobrya</td>
<td>eyes 8 and 8 tibiotarsal patch mucro</td>
</tr>
<tr>
<td>Drepanura</td>
<td>eyes 8 and 8 tibiotarsal patch mucro</td>
</tr>
</tbody>
</table>
COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA
Harold George Scott, Ph.D.
FAMILY SMINTHURIDAE

NEELINAE
- ant III longer than IV
- Neelides

DICYRTOMINAE
- ant III not longer than IV
- ant III and IV fused
- claw with tunica
- Neelus
- Megalothenax
- claw without tunica

SMINTHURIDINAE
- ant III and IV ant III or IV or both subsegmented
- Dicyrtoma
- Ptenothrix

SMINTHURINAE
- ant IV subsegmented
- ant IV not subsegmented
- Neosmithirus
- ant III with strong setae
- ant III without strong setae

Sminthurides
- ant IV not subsegmented
- tentent hairs absent
- Sminthurinus
- tentent hairs present

Arthropalites
- bothriotricha present
- Katiannina
- bothriotricha absent
- Metakatiannna

Sphyrotheca
- claw tunicate
- Pararrhopalites
- claw not tunicate

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1961
COCKROACHES: PICTORIAL KEY TO SOME COMMON SPECIES

Harry D. Pratt

SMALL, ABOUT 5/8" OR SHORTER

Pronotum with 2 longitudinal black bars

GERMAN COCKROACH
(Blattella germanica)

Pronotum without longitudinal black bars

Wings covering a bout half of abdomen

FRONT WING WITHOUT PALE STREAK. PRONOTUM SOLID
COLOR, OR WITH PALE DESIGN ONLY MODERATELY CONSPICUOUS

PRONOTUM SOLID DARK COLOR. GENERAL COLOR VERY DARK BROWN TO BLACK

BROWN-BANDED COCKROACH
(Supella subfasciata)

WOOD ROACH
(Parcoblatta spp.)

WINGS COVERING NEARLY ALL OF ABDOMEN OR EXTENDING BEYOND. PRONOTUM NARROWER

FRONT WING WITH OUTER PALE STREAK AT BASE. PRONOTUM STRIKINGLY MARKED

AUSTRALIAN COCKROACH
(Periplaneta australasiae)

MEDIUM TO LARGE, LONGER THAN 5/8 INCH

Wings absent, or shorter than abdomen

Oriental Cockroach
(Blatta orientalis)

Wings shorter than abdomen

FRONT WING WITHOUT PALE STREAK. PRONOTUM SOLID COLOR, OR WITH PALE DESIGN ONLY MODERATELY CONSPICUOUS

PRONOTUM SOLID DARK COLOR. GENERAL COLOR VERY DARK BROWN TO BLACK

SMOKY BROWN COCKROACH
(Periplaneta fuliginosa)

LAST SEGMENT OF CERCUS NOT TWICE AS LONG AS WIDE

LAST SEGMENT OF CERCUS NOT TWICE AS LONG AS WIDE

LAST SEGMENT OF CERCUS NOT TWICE AS LONG AS WIDE

BROWN COCKROACH
(Periplaneta brunnea)

AMERICAN COCKROACH
(Periplaneta americana)

WINGS COVERING ABDOMEN, OFTEN EXTENDING BEYOND

PRONOTUM MORE THAN 1/4 INCH WIDE

WOOD ROACH
(Parcoblatta spp.)

PRONOTUM ABOUT 1/4 INCH WIDE WITH PALE BORDER

FRONT WING WITH OUTER PALE STREAK AT BASE. PRONOTUM STRIKINGLY MARKED
COCKROACHES: KEY TO EGG CASES OF COMMON DOMESTIC SPECIES
Harold George Scott, Ph.D. and Margery R. Borom

Blatella germanica
GERMAN COCKROACH

Supella superciliata
BROWN-BANDED COCKROACH

Blatta orientalis
ORIENTAL COCKROACH

Periplaneta brunnea
BROWN COCKROACH

Periplaneta fuliginosa
SMOKY-BROWN COCKROACH

Periplaneta americana
AMERICAN COCKROACH

Periplaneta australasiaca
AUSTRALIAN COCKROACH

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center, Training Branch
Atlanta, Georgia — 1965
COCKROACHES: KEY TO SOME COMMON SPECIES FOUND IN THE UNITED STATES

Harry D. Pratt & Chester J. Stojanovich

1. Middle and hind femora both with numerous strong spines along the ventral margin (Fig. 1 A)....2
Middle and hind femora without strong spines along the ventral margin (Fig. 1 B)............12

2. Comparatively large species 18 mm. or longer; subgenital plate of female divided longitudinally, valvular (Fig. 2 A); male styli similar, slender, elongate and straight (Fig. 2 B)....3
Species usually less than 18 mm. long; or, if longer, anterior-ventral margin of front femur with several large stout spines on basal portion, followed by a row of smaller spines (Fig. 2 C); female subgenital plate simple, not divided (Fig. 2 D); male styli variable, frequently modified, asymmetrical, or unequal in size (Fig. 2 E).................................8
3. Front wing in both sexes extending beyond tip of abdomen (Fig. 3 A) .................................................. 4
   Front wing in both sexes not reaching tip of abdomen (Fig. 3 B) .......................................................... 7

![Fig. 3 A](image1)

![Fig. 3 B](image2)

4. Uniformly dark blackish-brown, shining species (Fig. 4 A) .................................................................
   (Periplaneta fuliginosa) SMOKY BROWN COCKROACH
   Species with some yellowish markings on pronotum or front wing or both (Fig. 4 B) .................... 5

![Fig. 4 A](image3)

![Fig. 4 B](image4)

5. Front wing with yellowish stripe; pronotum with yellowish and darker areas very contrastingly
   marked (Fig. 5 A) .................................................. (Periplaneta australasiae) AUSTRALIAN COCKROACH
   Front wing entirely brownish; pronotum with yellowish and darker areas less contrastingly
   marked (Fig. 5 B) ..................................................... 6

![Fig. 5 A](image5)

![Fig. 5 B](image6)
b. Styli very long and slender, longer than space between their bases (Fig. 6 A); cercus long and slender particularly in the male; male supra-anal plate deeply notched (Fig. 6 B) ............................................................... (Periplaneta americana) AMERICAN COCKROACH

Styli shorter, not as long as space between their bases (Fig. 6 C); cercus stouter and more evenly spindle-shaped; male supra-anal plate truncate or feebly notched (Fig. 6 D) ............................................................... (Periplaneta brunnea) BROWN COCKROACH

7. Blackish species, 15-27 mm. long; male front wings covering two-thirds of abdomen (Fig. 7 A); female front wings widely separated pads (Fig. 7 B); first segment of hind tarsus longer than segments 2-5 combined, pulvilli of second and third segments small (Fig. 7 C) ............................................................... (Blatta orientalis) ORIENTAL COCKROACH

Mahogany brownish species, 30-40 mm. long; front wings reduced to short pads, not widely separated (Fig. 7 D); first segment of hind tarsus shorter than segments 2-5 combined, pulvilli of second and third segments large (Fig. 7 E) ............................................................... (Eurycotis floridana) LARGE FLORIDA COCKROACH
8. Pronotum with two conspicuous longitudinal dark bars on a pale background (Fig. 8 A).......9
Pronotum variously marked, but without two conspicuous dark longitudinal bars (Fig. 8 B)....10

Fig. 8 A

Fig. 8 B

9. Face pale (Fig. 9 A); male subgenital plate asymmetrical, styli very unequal, short and rounded (Fig. 9 B)...................................................................................(Blattella germanica) GERMAN COCKROACH

Face dark; male subgenital plate almost symmetrical, styli somewhat elongate and subequal in size (Fig. 9 C)...........................................................................(Blattella vaga) FIELD COCKROACH

Fig. 9 A

Fig. 9 B

Fig. 9 C

10. Pronotum with a broad dark central stripe; front wings of both sexes appearing to have two transverse brownish bars, some pale specimens showing bars poorly (Fig. 10 A). Width of pronotum usually not exceeding 4.5 mm..............(Supella supellectilium) BROWN-BANDED COCKROACH

Pronotum and front wings otherwise, or, if pronotum is so marked, its width exceeding 4.5 mm. (Fig. 10 B).............................................................................................................11

Fig. 10 A

Fig. 10 B
11. Larger species 9-25 mm. or more in length; front wing without small dark spots in winged specimens (Fig. 11 A); claws equal (Fig. 11 B); ventral anterior margin of front femur with 3 long apical spines (Fig. 11 C) ........................................ (Parcoblatta species) WOOD COCKROACHES

Small species, 8-9 mm. long; front wing with small dark spots (Fig. 11 D); claws unequal (Fig. 11 E); ventral anterior margin of front femur with 2 long apical spines (Fig. 11 F) ........................................ (Ectobius pallidus) SPOTTED MEDITERRANEAN COCKROACH

12. Top of eyes close together (Fig. 12 A); general color a nearly uniform greenish; posterior margin of pronotum somewhat angularly produced (Fig. 12 B) (Panchlora nivea) CUBAN COCKROACH

Top of eyes sometimes distant (Fig. 12 C); general color various shades of brown and gray; pronotum usually not angularly produced posteriorly (Fig. 12 D) ............................... 13
13. Medium sized species, 30 mm. or less in length, including folded wings (Fig. 14 A & B)......14
   Large species 40 mm. or more in length, including folded wings (Fig. 15 A & C)............15

14. Pronotum uniformly blackish except a narrow yellowish band along anterior and lateral margins
    (Fig. 14 A)..............................................................(Pycnoscelus surinamensis) SURIANAM COCKROACH
    Pronotum pale with a narrow dark longitudinal submarginal band on each side and irregular
    brownish blotches on disc (Fig. 14 B)....................(Nauphoeta cinerea) CINEROUS COCKROACH

![Fig. 14 A](image1.png)  ![Fig. 14 B](image2.png)

15. Disc or pronotum with shield-like design, sometimes skull-like design (Fig. 15 A); front
    femur with one or more stout spurs on underside (Fig. 15 B)..................................................
    (Blaberus giganteus; Blaberus craniifer) GIANT COCKROACH
    Disc of pronotum with shield-like design darkened in outline only, not solid black (Fig. 15 C);
    front femur with a line of stiff hairs on anterior-ventral margin (Fig. 15 D)...........
    (Leucophaea maderae) MADEIRA COCKROACH

![Fig. 15 A](image3.png)  ![Fig. 15 B](image4.png)  ![Fig. 15 C](image5.png)  ![Fig. 15 D](image6.png)
TERMITE: KEY TO SOME COMMON NORTH AMERICAN SPECIES

Harold George Scott

Fig. A - Winged Adult  Fig. B - Soldier  Fig. C - Worker

Key to Winged Adults

1. Radius without branches; fontanel (fig. E) usually present ................................................ 2
   Radius (fig. D) with branches; fontanel absent ................................................................... 4

2. Tibia (fig. F) slightly to plainly blackish ............................................................................. 3
   Tibia entirely pale; Ontario to Guatemala, west to Utah and Arizona
   (Reticulitermes flavipes) ........................................................................................................ EASTERN SUBTERRANEAN TERMITE

3. Tibia slightly darkened; length 9 mm.; British Columbia to Baja California,
   east to Idaho and Sonora
   (Reticulitermes hesperus) ..................................................................................................... WESTERN SUBTERRANEAN TERMITE

4. Tibia generally darkened; length 9.5-10 mm.; Oregon and Montana to western
   Mexico, Missouri, and Texas
   (Reticulitermes sibiricus) ..................................................................................................... ARID SUBTERRANEAN TERMITE

5. Ocelli (fig. E) present ........................................................................................................... 5
   Ocelli absent; western Canada to Baja California
   (Zootermopsis angusticollis) .................................................................................................. WESTERN ROTTEN-WOOD TERMITE

6. Body yellow to light brown .................................................................................................... 6
   Body blackish; California to Baja California, east to Arizona and Utah
   (Kalotermes minor) ............................................................................................................... WESTERN DRY-WOOD TERMITE

7. Transverse rows of long hairs on tergites; South Carolina to Florida,
   west to eastern Texas (Kalotermes snyderi) ......................................................................... EASTERN DRY-WOOD TERMITE
   No transverse rows of hairs on tergites; Arizona and California
   (Procryptotermes hubbardi) .................................................................................................. ARID DRY-WOOD TERMITE

Key to Soldiers

1. Fontanel (fig. E) present; eyes usually absent ................................................................. 2
   Fontanel absent; eyes (fig. E) present ............................................................................... 4

2. Gula (fig. G) not twice as broad in front as in middle .................................................. ARID SUBTERRANEAN TERMITE
   Gula twice as broad in front as in middle .......................................................................... 3

3. Head twice as long as broad .......................................................................................... WESTERN SUBTERRANEAN TERMITE
   Head less than twice as long as broad ................................................................................ EASTERN SUBTERRANEAN TERMITE

4. Antenna (fig. E) with 23-31 segments ........................................................................... 5
   Antenna with 10-20 segments ......................................................................................... WESTERN ROTTEN-WOOD TERMITE

5. Third antennal segment as long as next 3 combined .................................................. EASTERN DRY-WOOD TERMITE
   Third antennal segment shorter than next 3 combined .................................................. WESTERN DRY-WOOD TERMITE
   Third antennal segment as long as next 4 combined .................................................... ARID DRY-WOOD TERMITE
EARWIGS: PICTORIAL KEY TO COMMON DOMESTIC SPECIES
Chester J. Stojanovich and Harold George Scott

- Tarsus II prolonged beneath III
- Tarsus II not prolonged beneath III

**EUROPEAN EARWIG**
*Forficula auricularia*

- Wings present
- Wings absent

**SHORE EARWIG**
*Labidura riparia*

- Legs and antennae banded
- Legs and antennae not banded

**RING-LEGGED EARWIG**
*Euborellia annulipes*

**SEASIDE EARWIG**
*Anisolabis maritima*
PSOCIDS: KEY TO SOME SPECIES COMMONLY INFESTING STORED FOOD
Harold George Scott and Chester J. Stojanovich

1. Two distinct thoracic segments ................................................................. 2
   Three distinct thoracic segments (Trogium pulsatorium) ......................... DEATH WATCH

2. Without large pronotal bristles ............................................................... 3.
   With large pronotal bristles .................................................................... 4

3. Eye with 7 facets; head and body brown (Liposcelis bostrychopilus) ........ BANDED PSOCID
   Eye with 2–4 facets; head brown, body yellow (Liposcelis paetus) ............. WAREHOUSE PSOCID

4. Two to 5 large pronotal bristles (Liposcelis entomophilus) ..................... GRAIN PSOCID
   One large pronotal bristle (Liposcelis terricolus) .................................... BOOK LOUSE
Fig. 140  LICE COMMONLY FOUND ON MAN
Harry D. Pratt

BODY LOUSE
AND
HEAD LOUSE

CRAB LOUSE

All legs of about the same length
Abdomen elongate without hairy processes laterally

First pair of legs smaller than second and third pairs of legs
Abdomen shorter with hairy processes laterally

PEDICULUS HUMANUS

PHTHIRUS PUBIS
ANOPHLENA: PICTORIAL KEY TO SPECIES ON DOMESTIC RATS
IN SOUTHERN UNITED STATES
Roy F. Fritz and Harry D. Pratt

Abdomen with well defined ventral, lateral, and dorsal plates

Abdomen with plates poorly defined or absent

ADULTS

Lateral plates small, subtriangular. Segment II of antenna as long as wide

Lateral plates large, emarginate posteriorly. Segment II of antenna longer than wide

Polyplax spinulosa

NYMPHS

Abdomen with spiracles and two parallel rows of setae

Abdomen without spiracles or parallel rows of setae

Polyplax spinulosa

Haplopleura spp.

Lateral plates 4-6 with one large and one minute seta

Haplopleura oenothera

Lateral plates 4-6 with two large setae

Lateral plates broadly emarginate; Apical processes thorn-like

Haplopleura hirsuta

Haplopleura acanthopus

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center, Training Branch
Atlanta, Georgia - 1947
ANOPHLUSA: PICTORIAL KEY TO SOME COMMON GENERA OF SUCKING LICE
Chester J. Stojanovich and Harry D. Pratt

with eyes or ocular points

ocular points present, eyes absent

ocular points present, eyes absent, ocular points absent

without eyes or ocular points

abdomen with lateral plates

abdomen without lateral plates

Haematopinus

without hairy tubercles

with hairy tubercles

Pediculus

Pthirus

Solenopotes

Linognathus

2 groups of 2 or 3 stout spines present at base of abdomen

front of sternal plate not rounded

Hoplopleura

Polyplax

Neohaematopinus
Key to Families of Anoplura

1. Head and thorax more or less thickly covered with setae; in some species the setae are modified into scales (Fig. 1 A). On marine animals............FAMILY ECHINOPHTHIRIIDAE

   Head and thorax with only a few setae (Fig. 1 B)........................................2

   ![Fig. 1 A](image1.png)
   ![Fig. 1 B](image2.png)

2. Eyes present or with prominent ocular points (Fig. 2 A & B).........................3

   Eyes and ocular points absent (Fig. 2 C).........................................................4

   ![Fig. 2 A](image3.png)
   ![Fig. 2 B](image4.png)
   ![Fig. 2 C](image5.png)

3. Abdomen without irregular sclerotized plates on dorsum and venter (Fig. 3 A). On man. .................................................................FAMILY PEDICULIDAE

   Abdomen with irregular sclerotized plates on dorsum and venter (Fig. 3 B). On hoofed animals.................................................................FAMILY HAEMATOPINIDAE

   ![Fig. 3 A](image6.png)
   ![Fig. 3 B](image7.png)
4. Paratergal plates absent (Fig. 4 A). On hoofed animals or carnivores

FAMILY LINOGNATHIDAE

Paratergal plates present (Fig. 4 B). On rodents and lagomorphs

FAMILY HOPLOPLEURIDAE

Key to Genera of Echinophthiriidae

1. Antennae four-segmented; abdomen without scale-like setae (Fig. 1 A)

Antennae five-segmented; abdomen with scale-like setae (Fig. 1 B) Antarctophthirus

2. Legs all essentially the same size (Fig. 2 A) Echinophthirius horridus (von Olfers)

Anterior legs small; second and third legs stout (Fig. 2 B) Proechinophthirus fluctus (Ferris)
Key to Species of Antarctophthirus

1. Scale-like setae present only on abdomen (Fig. 1 A). *Antarctophthirus callorhini* (Osborn)
   Scale-like setae present on thorax and abdomen (Fig. 1 B)............................2

2. Thoracic sternum with a few long setae on posterior border (Fig. 2 A)..................
   ..............................................................*Antarctophthirus microchir* (Troussart & Neumann)
   Thoracic sternum without long setae on posterior border (Fig. 2 B)......................
   ..............................................................*Antarctophthirus trichechi* (Bohemann)
Key to Genera of Haematopinidae

1. Sternal plate of thorax present; eyes absent but with prominent ocular points (Fig. 1 A) .......................................................... Haematopinus

Sternal plate of thorax absent; eyes present (Fig. 1 B). On peccary............................. Pecaroecus javali Babcock & Ewing

Key to Species of Haematopinus

1. Thoracic sternal plate wider than long, sternal pits on plate (Fig. 1 A). Hog louse........... Haematopinus suis (Linnaeus)

Thoracic sternal plate longer than wide; sternal pits off plate (Fig. 1 B)..................... 2

2. Head at least two times as long as wide at ocular points; sternal plate without a median projection (Fig. 2 A & B). On equines. Horse sucking louse........................ Haematopinus asini (Linnaeus)

Head not two times as long as wide at ocular points; sternal plate with a median projection (Fig. 2 C & D). On cattle................................. 3

Fig. 1 A

Fig. 1 B

Fig. 2 A

Fig. 2 B

Fig. 2 C

Fig. 2 D
3. Thoracic sternal plate with median projection blunt and rounded; male genital plate with six setae (Fig. 3 A & B). Short-nosed cattle louse. .............................................. Haematopinus eurysternus (Nitzsch)

Thoracic sternal plate with median projection more acute and longer; male genital plate with four setae (Fig. 3 C & D). Cattle tail louse. ................................................... Haematopinus quadripertusus Fahrenholz

---

**Key to Genera of Hoplopleuridae**

1. Paratergal plates very small being merely slightly sclerotized points (Fig. 1 A)......

Paratergal plates on at least one abdominal segment usually as long as, or at least half as long as, the sternal plate (Fig. 1 B)..............................2

---

2. First and second pair of legs of the same size and form, both being more slender and smaller than the third pair of legs (Fig. 2 A).................................3

First pair of legs smallest of the three pairs; the second pair with stouter claws (Fig. 2 B)........................................4
3. A pair of small sclerotized plates present on venter of abdominal segment 2 (Fig. 3 A); antennae and head without hook-like processes  
Enderleinellus

Sclerotized plates entirely lacking on venter of abdominal segment 2; antennae and head with hook-like processes (Fig. 3 B)  
Microphthirus uncinatus (Ferris)

4. Antennae four-segmented (sometimes appearing three-segmented); bladder-like expansions on third leg (Fig. 4 A & B)  
Haematopinoides squamosus Osborn

Antennae five-segmented; bladder-like expansions lacking on third leg (Fig. 4 C)  

5. First sternite of abdominal segment 3 extended laterally to articulate with its corresponding paratergal plate; this sternite bearing two groups of two or three stout setae (Fig. 5 A)  
Hoplopleura

First sternite of abdominal segment 3 never articulating with paratergal plate (Fig. 5 B)  

6. Paratergal plate 2 completely divided longitudinally, one plate on the dorsum and the other on the venter of the abdomen (Fig. 6 A)  
Fahrenholzia

Paratergal plate 2 never completely divided to form two distinct plates (Fig. 6 B)
Sternal plate of thorax usually pointed posteriorly or, if truncate, always associated with a huge enlargement of the first antennal segment (Fig. 7 A & B). ..........Polyplox

Sternal plate of thorax usually emarginate posteriorly or sometimes quadrate in shape (Fig. 7 C & D). .................................................................Neohaematopinus

**Key to Species of Enderleinellus**

1. Paratergal plates present on abdominal segments 2-5 (Fig. 1 A) .................................2

Paratergal plates present on abdominal segments 2-6; abdominal sternites and tergites present in both sexes (Fig. 1 B). On Sciurus............Enderleinellus nitzschi Fahrenholz
SCORPIONS: PICTORIAL KEY TO SOME COMMON UNITED STATES SPECIES
Chester J. Stojanovich and Harold George Scott

1. Stinger with many setae
   - Hadrurus arizonensis
     Olive Hairy Scorpion
     - Body striped dorsally

2. Stinger with few setae
   - Hadrurus arizonensis
     Olive Hairy Scorpion
     - Stinger without subaculear tooth
     - Stinger with subaculear tooth

3. Vejovis spinigerus
   Strip-Tail Devil Scorpion
   - Body black dorsally

4. Vejovis carolinianus
   Southern Devil Scorpion
   - Body striped dorsally

5. Vejovis flavus
   Slender Devil Scorpion
   - Body yellow dorsally

6. Centruroides gracilis
   Margarite Scorpion

7. Centruroides vittatus
   Stripe-Back Scorpion

8. Centruroides sculpturatus
   Deadly Sculptured Scorpion

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia — 1963
1. Last segment of first leg with a depression known as Haller’s organ; most species with a toothed hypostome on capitulum; size usually over 4 mm. (Fig. 1 A). Ticks ......21

Last segment of first leg without such a depression known as Haller’s organ; hypostome not toothed; most species less than 4 mm. long (Fig. 1 B). Mites.........................2

2. Respiratory system with a spiracle on each side opening lateral to the bases of the 3rd or 4th pair of legs, frequently spiracles leading into slender tubes that extend forward laterally to the bases of the 1st or 2nd pairs of legs Fig. 2 A). Mesostigmatid Mites.3

Respiratory system without spiracles, or with spiracles opening near bases of the chelicerae (Fig. 2 B)..............................................................13

3. Anus surrounded by a plate bearing only 3 setae, one on each side and one behind the anal opening; first tarsus bearing caruncle and claws at tip (Fig. 3 A)..............4

Anus surrounded by a plate bearing more than 3 setae; first tarsus without caruncle and claws (Fig. 3 B)......................................................... Many species of Macrocheles
4. Anal opening more than its length behind anterior margin of anal plate; chelicerae strongly narrowed apically, needle-like, movable chela absent or extremely small (Fig. 4 A). Genus Dermanyssus

5. Anal opening less than its length or about its length, behind anterior margin of anal plate; chelicerae not narrowed apically and needle-like, shear-like, bearing conspicuous shear-like chelae at tip which may or may not bear teeth (Fig. 4 B).

5. Dorsal surface of body with a single plate (Fig. 5 A).

6. Peritreme tube somewhat sinuous and extending anteriorly to a point opposite coxa 2 (Fig. 6 A). Dermanyssus gallinae

6. Peritreme tube short, extending forward for a distance less than half the diameter of coxa 3 (Fig. 6 B). Dermanyssus americanus
7. Dorsal plate not covering entire dorsal surface of mite; genito-ventral plate typically narrowed posteriorly behind 4th coxae; chelae on chelicerae without teeth or setae (Fig. 7 A). Genus Ornithonyssus

Dorsal plate almost covering entire dorsal surface of mite; genito-ventral plate typically expanded posterior to 4th coxae; one or both chelae of chelicerae with teeth and a seta (Fig. 7 B). Family Laelaptidae.

8. Sternal plate with anterior and middle pairs of sternal setae on the plate, posterior pair usually just off the plate (Fig. 8 A). On Birds... Ornithonyssus sylviarum. NORTHERN FOWL MITE

Sternal plate with the usual three pairs of setae on the plate (Fig. 8 B).

9. Dorsal plate narrowed posteriorly; setae in middle dorsal row of plate longer than the distance between their bases (Fig. 9 A). Normally on mammals or man. Ornithonyssus bacoti. TROPICAL RAT MITE

Dorsal plate broader posteriorly; setae in middle dorsal row of plate much shorter than the distance between their bases (Fig. 9 B). Normally on birds. Ornithonyssus bursa. TROPICAL BIRD MITE
10. Genito-ventral plate with many fine setae; anal plate transverse, wider than long (Fig. 10 A). On domestic rats and a wide variety of wild mammals. **Eulaelaps stabularis**

Genito-ventral plate with one to four pairs of setae; anal plate longer than wide (Fig. 10 B). ................................................................. 11

![Fig. 10 A](image)

![Fig. 10 B](image)

11. Genito-ventral plate with only a single pair of setae (Fig. 11 A). On domestic rats and mice and a wide variety of mammals and birds. .................................**Haemolaelaps glasgowi**..................................................COMMON RODENT MITE

Genito-ventral plate with four pairs of setae (Fig. 11 B). Normally on domestic rats. 12

![Fig. 11 A](image)

![Fig. 11 B](image)

12. Anal plate contiguous with the genito-ventral plate, anterior margin rounded and fitting into a strong concavity in genito-ventral plate; larger species averaging 1-2 mm. long. (Fig. 12 A). **Echinolaelaps echidninus**. ................................................. SPINY RAT MITE

Anal plate somewhat separated from genito-ventral plate, anterior margin almost straight with definite anterior-lateral corners; small species averaging 0.5-1 mm long (Fig. 12 B). **Laelaps nuttalli**. ............................................. DOMESTIC RAT MITE

![Fig. 12 A](image)

![Fig. 12 B](image)
13. First pair of legs very long, much longer than other three pairs; anterior margin of body with four distinct flattened scales and somewhat flattened scales on other dorsal surfaces of body (Fig. 13 A). Plant feeders which invade buildings but do not bite man. *Bryobia praetiosa*.......................... CLOVER MITE

First pair of legs not markedly longer than the other three pairs of legs; no flattened scales on body (Fig. 13 B).............................................................14

14. Surface of body without fine parallel lines or folds; tarsi without stalked suckers (Fig. 14 A). Adults never true parasites (Cheese or Flour mites)..........................15

Surface of body with fine parallel lines or folds; tarsi often provided with stalked suckers (Fig. 14 B). Scabies or mange mites parasitic in all stages, chiefly on vertebrates ..............................................16

15. Tarsi tapering markedly to tip (Fig. 15 A).................. *Glycyphagus prunorum*

Tarsi not tapering markedly to tip (Fig. 15 B). Many cheese and flour mites which are difficult to separate except with very specialized literature and a reference collection. .................................................. Genus *Tyrophagus*, Genus *Caloglyphus*, Etc.
16. Body elongate, somewhat cigar-shaped and prolonged behind; the abdomen somewhat ringed; legs very short, apparently three-segmented; tiny species less than 1 mm. (Fig. 16 A). In hair follicles or sebaceous glands of mammals......................... DEMODEX FOLLICULORUM.........................PORÉ OR FOLLICLE MITE

Body not prolonged behind and cigar-shaped (Fig. 16 B). Occasionally female grain itch somewhat balloon-shaped; larger species not found in hair follicle or sebaceous glands of mammals.......................................................... 17

17. A club-shaped or clavate hair between bases of first and second pairs of legs, body divided into cephalothorax and abdomen, the latter often enormously enlarged (Fig. 17 A) PYEMOTES VENTRICOSUS formerly PEDICULOIDES VENTRICOSUS.............. STRAW ITCH MITE

Setae on cephalothorax normal, no club-shaped or clavate hair between bases of first and second pairs of legs; no distinct division into cephalothorax and abdomen (Fig. 17 B) .............................................................18

18. Legs short and stubby (Fig. 18 A)................................. 20

Legs longer and more slender (Fig. 18 B)............................... 19
19. Suckers of tarsi with segmented pedicels (Fig. 19 A). Non-burrowing itch mites on mammals in the genus Psoroptes, a common species causing scabs and crusts in the ears of rabbits is the Psoroptes cuniculi. ...................... RABBIT EAR MITE

Suckers of tarsi without segmented pedicels (Fig. 19 B) ................................................................. Dermatophagoides scheremetewskyi

Fig. 19 A

Fig. 19 B

20. Anal opening on the dorsal surface of the body; dorsal surface of the body with only short, sharp setae (Fig. 20 A). .................................................................................... Notoedres

Anal opening at tip of body or slightly on ventral side; dorsal surface of body with pointed scales and blunt stout spines (Fig. 20 B). Sarcoptes scabiei ................................................................. SCABIES OR MANGE MITE

Fig. 20 A

Fig. 20 B
21. Capitulum at anterior end of body, visible from above and below; scutum or dorsal shield present, short in female, long in male (Fig. 21 A & B). Family Ixodidae. HARD TICKS...22

Capitulum on under side of body, hidden by body when seen from above though palpi may project anteriorly; scutum absent (Fig. 21 C & D). Family Argasidae...SOFT TICKS...31

![Fig. 21 A](image1)
![Fig. 21 B](image2)
![Fig. 21 C](image3)
![Fig. 21 D](image4)

FAMILY IXODIDAE - HARD TICKS

22. Ornate ticks, with some white markings on dorsal shield (Fig. 22 A)..............................23

Inornate ticks, without white markings on dorsal shield (Fig. 22 B)..............................28

![Fig. 22 A](image5)
![Fig. 22 B](image6)

23. Palpi long, much longer than basis capituli; second segment of palpus about twice as long as wide (Fig. 23 A). Genus Amblyomma..........................24

Palpi short, about as long as basis capituli; second segment of palpus about as long as wide (Fig. 23 B). Genus Dermacentor..........................25

![Fig. 23 A](image7)
![Fig. 23 B](image8)
24. Next to last segment of second, third, and fourth pairs of legs without paired terminal spurs; female with a distinct pale marking near posterior end of dorsal shield (Fig. 24 A). *Amblyomma americanum* ................................................. LONE STAR TICK

Next to last segment of second, third, and fourth pairs of legs with long, paired terminal spurs; female with more diffuse markings on dorsal shield (Fig. 24 B) ..................... *Amblyomma maculatum* .................................................. GULF COAST TICK

25. Spiracular plate without dorsal prolongation (Fig. 25 A). *Dermacentor albipictus* ................................................................. WINTER TICK

Spiracular plate with dorsal prolongation (Fig. 25 B) .......................................................... 26

26. Basis capituli with long cornua (Fig. 26 A). *Dermacentor occidentalis* PACIFIC COAST TICK

Basis capituli with short cornua (Fig. 26 B) .......................................................... 27
35

Goblets of spiracular plate large and less numerous; Rocky Mountain species. (Fig. 27 A)
Dermacentor andersoni .................................................. ROCKY MOUNTAIN WOOD TICK

Goblets of spiracular plate very small and numerous; east of the Rocky Mountains and on the Pacific coast. (Fig. 27 B)
Dermacentor variabilis .................................................. AMERICAN DOG TICK

28. Sides of basis capituli laterally produced; distinctly angulate; eyes present on sides of scutum (Fig. 28 A & B) .............................................................. 29

Sides of basis capituli not laterally produced; more or less parallel (Fig. 28 C); eyes absent .............................................................. 30

29. Fore coxa deeply cleft; festoons present; easily seen in unengorged specimens; anal groove distinct in unengorged specimens (Fig. 29 A). (principally on dogs or in houses)
Rhipicephalus sanguineus .................................................. BROWN DOG TICK

Fore coxa not deeply cleft; festoons absent; anal groove indistinct (Fig. 29 B). (On cattle and deer)
Boophilus annulatus .................................................. CATTLE TICK
30. Second segment of palpus laterally produced; anal groove behind anus, not attaining posterior margins of body (Fig. 30 A & B). *Haemaphysalis leporispalustris....RABBIT TICK*

Second segment of palpus not laterally produced; anal groove extending as an inverted U from in front of anus to posterior margins of body (Fig. 30 C)...........Genus *Ixodes*

31. Margin of body with a definite sutural line separating dorsal and ventral surfaces; dorsal surface with conspicuous "discs" arranged somewhat in radiating lines (Fig. 31 A) *Argas pernicosus..................................................FOWL TICK*

Margin of body lacking definite sutural line, thick and rounded (Fig. 31 B)...........32

32. Hyposome with well-developed teeth (Fig. 32 A); integument not spinose. *Genus Ornithodoros...........................................................33*

Hyposome of adult vestigial or without effective teeth; integument of nymph (stage usually seen) spinose (Fig. 32 B). Usually on cattle and horses. *Otobius megnini...........................................SPINOSE EAR TICK*
33. Strong dorsal humps absent on all tarsi (Fig. 33 A)................................. 34
   Strong dorsal humps present on tarsi of first, second and third legs (Fig. 33 B)...... 35

Fig. 33

Fig. 33 B

34. Cheeks absent (Fig. 34 A). Ornithodoros hermsi..........................HERMS' RELAPSING FEVER TICK
   Cheeks present (Fig. 34 B)......................................................Ornithodoros talaje

Fig. 34 A

Fig. 34 B

35. Eyes present on sides of body above second and third coxae (Fig. 35 A); tarsus of fourth leg with a prominent, pointed subterminal spur (Fig. 35 B).............................. Ornithodoros coriaceus..........................PAJAROELLO TICK
   Eyes absent; tarsus of fourth leg without such subterminal spur (Fig. 35 C).......... 15

Fig. 35 A

Fig. 35 B

Fig. 35 C

36. Mammillae large, relatively few and not crowded; in mid-dorsal region about 10 per linear mm.; hypostome over 1/2 mm. long. Southeastern United States and Mexico north to Kansas and Florida. Ornithodoros turicata..........................RELAPSING FEVER TICK
   Mammillae small, crowded, and numerous; in mid-dorsal region about 18 per linear mm.; hypostome less than 1/2 mm. long. Pacific coast and Rocky Mountain states........ Ornithodoros parkeri..........................PARKER'S RELAPSING FEVER TICK
TICKS: KEY TO GENERA IN UNITED STATES
Harry D. Pratt

FAMILY ARGASIDAE - SOFT TICKS

Capitulum inferior; scutum absent

- Margin of body with definite sutureal line.
- Hypostome with well-developed teeth, integument mamillated.

- ARGAS

- Margin of body thick, rounded, without definite sutureal line.
- Hypostome vestigial or without effective teeth, integument tuberculated or granulated.

- ORNITNODOROS

FAMILY IXODIDAE - HARD TICKS

Capitulum anterior; scutum present

- Margin of body either behind anus, indistinct, or absent.
- Second segment of palpi not laterally produced.

- IXODES

- Margin of body either in front of anus.
- Second segment of palpi laterally produced.

- HAEMAPHYSALIS

Insect of adult granular, of nymph stage usually seen, very spinose. Hypostome of adult vestigial. Usually on cattle, horses, or rabbits.

- OTOBUS


- ANTRICOLA

Basis capituli laterally produced.

- AMBLYOMMA

Basis capituli not laterally produced.

- APONOMMA

Palpi ridged dorsally and laterally.

- BOOPhilUS

Palpi not ridged.

- RHIPICEPHALUS

Festoons present.

- DERMacentOR

Festoons seven

- ANOCENTOR (OTOCENTOR)

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1961
TICKS AND MITES: KEY TO SPECIES COMMONLY INFESTING PIGEONS

Harold George Scott & Chester J. Stojanovich

Argas reflexus  
PIGEON TICK

Laminosioptes cysticola  
FOWL CYST MITE

Ornithonyssus bursa  
TROPICAL FOWL MITE or
Dermanyssus gallinae  
CHICKEN MITE

Syringophilus bipectinatus  
or Syringophilus columbae  
PIGEON QUILL MITES

Pterophagus strictus  
BODY-FEATHER MITE

Falcucifer rostratus  
WING-FEATHER MITE

Megninia gingylimerra  
or Megninia cubita lis  
CONTOUR-FEATHER MITES

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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TICKS: PICTORIAL KEY TO SOME COMMON SPECIES

Harry D. Pratt

capitulum visible from above, scutum present, family Ixodidae, HARD TICKS

female
male
capitulum
scutum

capitulum not visible from above, scutum absent, family Argasidae, SOFT TICKS

ventral
dorsal

sutural line present
sutural line absent

mouthparts short, about as long as basis capituli
mouthparts much longer than basis capituli
white spot on tip of scutum of female

mou 

mouthparts
basis capitulum

scutum with white markings; basis capituli with parallel sides
scutum without white markings; basis capituli produced laterally to form an angle

Amblyomma americanum
LONE STAR TICK

Dermacentor variabilis and D. andersoni
AMERICAN DOG TICK AND WOOD TICK

Rhipicephalus sanguineus
BROWN DOG TICK

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1961
MITE DIAGRAM WITH STRUCTURES LABELED

Harry D. Pratt

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia
Mites: Pictorial Key to Some Common Species of Public Health Importance

Harold George Scott and Chester J. Stojanovich

MITES: PICTORIAL KEY TO SOME COMMON SPECIES OF PUBLIC HEALTH IMPORTANCE

with lateral spines and peritreme

without lateral spines or peritreme

anal opening at rear of anal plate

anal opening at front of anal plate

dorsal shield divided

dorsal shield undivided

genoventral plate narrowed posteriorly

genoventral plate expanded posteriorly

first pair of legs very long

first pair of legs short

Clover Mite

Bryobia praetiosa

with club between legs I & II

without club between legs I & II

Clover Mite

Bryobia praetiosa

Chicken Mite

Dermanyssus gallinae

House Mouse Mite

Dermanyssus saginatus

Straw itch Mite

Pyemotes ventricosus

Tropical Rat Mite

Ornithonyssus bacoti

Spiny Rat Mite

Echidnophaga echidninus

Itch Mite

Sarcoptes scabiei

Follicle Mite

Demodex follicularum

Cheese Mite

Tyrophagus putrescentiae

U.S. Department of Health, Education, and Welfare
Public Health Service, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1963
THE KEY TO SOME SPECIES COMMONLY INFESTING HOUSEHOLDS AND STORED FOOD

Harold George Scott

1. With club-like hair between bases of legs I and II ........................................... 5
   Without club-like hair between bases of legs I and II ........................................... 2

2. Claws, if present, not on stalks (Glycyphagus domesticus, formerly) .................... 5
   Glycyphagus prunorum) ..................................................................................... SUGAR MITE
   Claws on stalks ........................................................................................................ 3

3. Internal apical hair (on joint between femur I and tibia I) less than three times as long as external apical hair ............................................................................. 4
   Internal apical hair (on joint between femur I and tibia I) more than three times as long as external apical hair (Acarus farinae, formerly Tyroglyphus farinae) ............................................................................ HAM MITE

4. Tarsus with one stout dorsal and five small ventral terminal spines
   (Acarus siro, formerly Tyroglyphus siro) ............................................................... GRAIN MITE
   Tarsus with only three small ventral spines (Tyrophagus castellani,
   formerly Tyroglyphus longior) ............................................................................... CHEESE MITE

5. Tarsus IV of female ending in claws and a fleshy protuberance; leg
   IV of male smoothly curved inwards (Pyemotes ventricosus, formerly
   Pediculoides ventricosus) ..................................................................................... STRAWITCH MITE
   Tarsus IV of female ending in two long hairs of unequal length; leg
   IV of male sharply bent (Tarsonemus floricolus) ............................................... FLORICOLUS GRAIN MITE

Ptycoptera venetiana
MITES: PICTORIAL KEY TO ADULT FEMALES
COMMONLY FOUND ON DOMESTIC RATS IN SOUTHERN UNITED STATES
Harry D. Pratt and Chester J. Stojanovich

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1963
SILVERFISH. PICTORIAL KEY TO DOMESTIC SPECIES
Chester J. Stojanovich and Harold George Scott

Thermobia domestica
FIREBRAT
without setal combs
with setal combs

Lepisma saccharina
COMMON SILVERFISH
2 pairs of styli
3 pairs of styli

Ctenolepisma urbana
GIANT SILVERFISH
Ctenolepisma longicauda of some authors

Ctenolepisma quadriseriata
FOUR-LINED SILVERFISH
COLLEMBOLA: PICTORIAL KEY TO COMMON DOMESTIC SPECIES
Harold George Scott, and Chester J. Stojanovich

- Prothorax well developed
  - Eyes absent
  - Eyes present
- Prothorax reduced
  - Abdomen IV long
  - Abdomen IV short

- Without anal spines
- With anal spines

- Onychiurus filamentus
- Onychiurus armatus

- Unguiculus present
- Unguiculus absent

- Body marbled
- Body not marbled

- Hypogastrura manubrialis
- Hypogastrura armata
- Hypogastrura pseudarmata

- Dens with ventral scales
- Dens without ventral scales

- All blue
- Blue marked

- Lepidocyrtus curvicollii
- Sira buski
- Sira platani
- Orchestella albosa

- Body not striped
- Some body segments striped
- All body segments striped

Entomobrya griseolivata
Entomobrya atrocincta
Entomobrya nivalis

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1961
COLLEMBOLA: PICTORIAL KEY TO WORLD SUBFAMILIES
Harold George Scott, Ph.D.

body elongate, segmented

Suborder ARTHROPLEONA

prothorax well developed

PODURIDAE

furcula not reaching beyond colophore

ant III sense organ with rods and cones

ONYCHIURIDAE

mandible with molar surface

HYPOGASTRURIDAE

ant III and IV subsegmented

TOMOCERIDAE

ant III and IV not subsegmented

ISOTOMIDAE

abd IV not twice III (or terminal segments fused)

SMINTHRIDIDAE

abd IV at least twice III

ENTOMBRYIDAE
COLLEMBOLA: PICTORIAL KEY TO NEARCTIC GENERA
Harold George Scott, Ph.D.

SUBFAMILIES PODURINAE, HYPOGASTRURINAE, AND ONYCHIURINAE

PODURINAE

Postantennal organ

Podura aquatica Linnaeus
only species in subfamily

HYPOGASTRURINAE

Eyes present
Eyes absent

Postantennal organ

Stachiomella

Onychiurus

Unguiculus well developed
Unguiculus reduced or absent

Body slender
Body stout

Tullbergia

Hoffia

Mesachorutes

Hypogastrura

Postantennal tubercles 4-12
Postantennal tubercles 1

Willemia

Onychiurus

Postantennal organ present
Postantennal organ absent

Xenylla

Postantennal tubercles 4-8
Postantennal tubercles 1

Knowltonella

Neobeckerella

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PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1961
2. Paired ventral plates of abdominal segment 2 completely detached from its corresponding paratergal plate; each ventral plate bearing a single seta (Fig. 2 A). On Sciurus...

Paired ventral plates of abdominal segment 2 each extending laterally to unite with its corresponding paratergal plate; ventral plates without setae (Fig. 2 B).............5

3. Spermatheca present; arms of basal plate apically bilobed (Fig. 3 A & B).............4

Spermatheca absent; arms of basal plate not apically bilobed (Fig. 3 C)......................

..............................................................Enderleinellus kelloggi Ferris
Spermatheca a straight slightly tapering tube; arms of basal plate apically bilobed but not expanded (Fig. 4 A & B)..................Enderleinellus longiceps (Kellogg & Ferris)

Spermatheca bent and with its ends expanded; arms of basal plate apically expanded and strongly bilobed (Fig. 4 C).........................Enderleinellus arizonensis Werneck

5. Paratergal plate 5 and lateral margin of abdominal segment 6 without a pair of long setae (Fig. 5 A).............................................6

Paratergal plates or lateral margins of abdominal segments 4-8 with a pair of long setae (Fig. 5 B). On Marmota.........................Enderleinellus marmotae Ferris

6. Female with 2-4 long setae on dorsum of abdominal segment 4 reaching to apex of body (Fig. 5 A). On Citellus and Cynomys.........Enderleinellus osborni (Kellogg & Ferris)

Female without such setae. On Citellus.........................Enderleinellus suturalis (Osborn)
Key to Species of Fahrenholzia

1. Paratergal plates present only on abdominal segments 2 to 4 (Fig. 1 A) ...................... 2
   Paratergal plates present on at least abdominal segments 2–6 (Fig. 1 E) ...................... 6

\[ \begin{array}{c}
| \text{II} | \text{III} | \text{IV} | \\
- \hline
\end{array} \]

\[ \begin{array}{c}
| \text{II} | \text{III} | \text{IV} | \text{V} | \text{VI} | \\
- \hline
\end{array} \]

\begin{center}
Fig. 1 A \hspace{1cm} Fig. 1 E
\end{center}

2. Dorsal surface of abdomen with a narrow, sclerotized, median, longitudinal plate between paratergal plates 2 (Fig. 2 A). On Liomys .................................................. 3
   Dorsal surface of abdomen without such a plate (Fig. 2 B). On Perognathus and Dipodomys ........................................................ 5

\begin{center}
Fig. 2 A \hspace{1cm} Fig. 2 B
\end{center}

3. Thoracic sternal plate concave on anterior margin; dorsal lobe of paratergal plate 3 pointed apically (Fig. 3 A & B) ....................... \textit{Fahrenholzia texana} Stojanovich & Pratt
   Thoracic sternal plate convex on anterior margin; dorsal lobe of paratergal plate 3 apically truncate (Fig. 3 C & D) ................................. 4

\begin{center}
Fig. 3 A \hspace{1cm} Fig. 3 B \hspace{1cm} Fig. 3 C \hspace{1cm} Fig. 3 D
\end{center}
4. Dorsal lobe of paratergal plate 2 with the smaller seta about as long as the plate (Fig. 4 A) ................................................................. Fahrenholzia ehrlichii Johnson

Dorsal lobe of paratergal plate 2 with the smaller seta minute, much shorter than the plate (Fig. 4 B) ......................................................... Fahrenholzia microcephala Ferris

Fig. 4 A  

Fig. 4 B

5. Paratergal plates of abdominal segment 2 with a single pair of setae between dorsal and ventral lobes; male genitalia with parameres greatly expanded; female genital plate present (Fig. 5 A, B, & C) ......................................................... Fahrenholzia pinnata Kellogg & Ferris

Paratergal plates of abdominal segment 2 with 6 to 8 long setae between dorsal and ventral lobes; parameres of male genitalia not expanded; female genital plate absent (Fig. 5 D & E) ......................................................... Fahrenholzia reducta Ferris

Fig. 5 A  

Fig. 5 B  

Fig. 5 C  

Fig. 5 D  

Fig. 5 E  

Fig. 5 F

6. Paratergal plates present on abdominal segments 2 to 6; paratergal plate 3 bilobed (Fig. 6 A) ................................................................. Fahrenholzia zacatecae Ferris

Paratergal plates present on abdominal segments 2 to 7; paratergal plate 3 not bilobed (Fig. 6 B) ................................................................. Fahrenholzia tribulosa Ferris

II III IV V VI  

Fig. 6 A

II III IV V VI VII  

Fig. 6 B
Key to Species of Hoplopleura

1. Third abdominal sternal plate with two groups of two stout setae (Fig. 1 A) ............ 2
   Third abdominal sternal plate with two groups of three stout setae (Fig. 1 B) ...........
   On Glaucomys .................................................... Hoplopleura trispinosa Kellogg & Ferris

2. Posterior margins of paratergal plates 3-5 with a broad or pointed lobe on each side
   (Fig. 2 A & B) .......................................................... 3
   Posterior margins of paratergal plates 3-5 with four rounded lobes (Fig. 2 C) .........
   On Oryzomys ......................................................... Hoplopleura oryzomydis Pratt & Lane

3. Paratergal plates 4 and 5 with broad lobes on posterior margin (Fig. 3 A) ............. 4
   Paratergal plates 4 and 5 with pointed lobes on posterior margin (Fig. 3 B) .......... 7

4. Paratergal plates 4 and 5 with one large and one minute setae on posterior margin (Fig. 4 A) .......................................................... 5
   Paratergal plates 4 and 5 with two large setae on posterior margin (Fig. 4 B) .........
   On field rodents ..................................................... Hoplopleura acanthopus (Burmeister)
5. Abdomen with setae in some of the membrane between sternal and paratergal plates (Fig. 5 A). On Rattus.................................................................Hoplopleura oenomydis Ferris
Abdomen without setae in membrane between ends of sternal and paratergal plates (Fig. 5 B)........................................................................................................6

6. Thoracic sternal plate pointed posteriorly (Fig. 6 A). On Peromyscus.........................................................*Hoplopleura hesperomydis (Osborn) and *Hoplopleura ferrisi Cook & Beer
Thoracic sternal plate blunt posteriorly (Fig. 6 B). On Onychomys..........................Hoplopleura onychomydis Cook & Beer

7. Thoracic sternal plate about as long as broad; first sternal plate on abdominal segment 3 with two stout setae usually set close together on each side (Fig. 7 A)....................8
Thoracic sternal plate definitely longer than broad; first sternal plate on abdominal segment 3 with two stout setae more widely spaced on each side (Fig. 7 B)..............9

*These species are separated only in the immature stages.
8. Paratergal plate 6 with posterior angles produced into points (Fig. 8 A). On Eutamias
Hoplopleura arboricola Kellogg & Ferris
Paratergal plate 6 without points on posterior angles (Fig. 8 B). On Tamias
Hoplopleura erratica (Osborn)

9. Posterior margin of paratergal plate 6 with angles produced to form a deep emargination
(Fig. 9 A). On Sciurus
Hoplopleura sciuricola Ferris
Posterior margin of paratergal plate 6 with angles not produced to form a deep emargination
(Fig. 9 B). On Sigmodon

10. Female with paratergal plates 4-6 elongated; male with 11 tergal plates bearing a row of
setae (Fig. 10 A & B)
Hoplopleura arizonensis Stojanovich & Pratt
Female with paratergal plates 4-6 only slightly elongated; male with only 7 tergal
plates bearing a row of setae (Fig. 10 C & D)
Hoplopleura hirsuta Ferris
Key to Species of Haemodipsus

1. Thoracic sternal plate almost three times as wide as long (Fig. 1 A). On domestic rabbits (Oryctolagus) Haemodipsus ventricosus (Denny)

Thoracic sternal plate hexagonal, being almost as long as wide (Fig. 1 B). On wild rabbits and hares (Sylvilagus and Lepus) Haemodipsus setonii Ewing

Key to Species of Neohaematopinus

1. Thoracic sternal plate concave on posterior margin (Fig. 1 A) 2
Thoracic sternal plate somewhat oval, and convex on posterior margin (Fig. 1 B) 11

2. Paratergal plates 3 to 6 with three spines on posterior margins (Fig. 2 A) 3
Paratergal plates 3 to 6 with two spines on posterior margins (Fig. 2 B) 5

3. Posterior angle of first antennal segment with a stout spine (Fig. 3 A). On Eutamias Neohaematopinus pacificus (Kellogg & Ferris)
Posterior angle of first antennal segment without a stout spine (Fig. 3 B) 4
4. Abdominal tergal and sternal plates present on each segment in both sexes (Fig. 4 A)...
   On Citellus tereticaudus.................................Neohaematopinus citellinus Ferris

   Abdominal tergal and sternal plates absent in the middle segments of female; male with only sternal plates absent (Fig. 4 B). On Citellus spilosoma.................................Neohaematopinus spilosome Stojanovich & Pratt

5. First antennal segment prolonged posterio-apically, with stout spine (Fig. 5 A)........6
   First antennal segment without such a prolongation (Fig. 5 B).........................8

6. Female without sternal and tergal plates on abdominal segments except for the normal terminal and genital segments (Fig. 6 A). On Sciurus griseicolus.................................Neohaematopinus griseicolus Ferris

   Female with sternal and tergal plates on all abdominal segments (Fig. 6 B).........7
7. Second antennal segment with short spine-like seta on posterior margin (Fig. 7A)....
   On Tamias hudsonicus,.................................Neohaematopinus semifasciatus Ferris
   Second antennal segment without spine-like seta (Fig. 7B). On Sciurus niger,...........
   ......................................................Neohaematopinus sciurinus Mjöberg

8. Abdominal sternal and tergal plates absent in female; male with only sternal plates ab-
   sent (Fig. 8A). On Neotoma cinerea........................Neohaematopinus inornatus Ferris
   Abdominal sternal and tergal plates present in both sexes (Fig. 9A)......................

9. A row of setae present on membrane between most of the sternal and tergal plates of ab-
   domen (Fig. 9A).................................................................10
   Membrane between the abdominal sternal and tergal plates without a row of setae (Fig. 9
   B). On Glaucomys.................................Neohaematopinus sciuropteri (Osborn)
10. First antennal segment with a spine-like seta at the posterio-apical angle (Fig. 10 A) 
On Sciurus carolinensis. .................................................. Neohaematopinus sciuri Jancke

First antennal segment with a spine-like seta set somewhat away from the margin in the 
posterio-apical angle (Fig. 10 B). On Neotoma albigula, streatori and micropus....... 
................................................................. Neohaematopinus neotomae Ferris

Fig. 10 A

Fig. 10 B

11. Thoracic spiracle small, about one-fourth length of second coxa (Fig. 11 A) ............ 
On Citellus and Cynomys. .......................... Neohaematopinus laeviusculus (Grube)

Thoracic spiracle larger, almost one-half length of second coxa (Fig. 11 B) .............. 
On Marmota. ...................................................... Neohaematopinus marmotae Ferris

Fig. 11 A

Fig. 11 B
Key to Species of Polyplax

1. Sternal plate of thorax rounded or pointed posteriorly (Fig. 1 A) .................. 2

   Sternal plate of thorax truncate posteriorly (Fig. 1 B). On Peromyscus and Onychomys...
   Polyplax auricularis Ferris

2. Paratergal plate 4 with both setae short or subequal (Fig. 2 A) .................. 3

   Paratergal plate 4 with dorsal seta longer than ventral seta; usually as long or longer
   than plate (Fig. 2 B). On house mouse........Polyplax serrata (Burmeister)

3. Paratergal plates 3-5 with both apical angles produced into points (Fig. 3 A)........
   On microtene mice......................................................... 4

   Paratergal plates 3-5 with only dorsal apical angle produced into a point (Fig. 3 B)...
   On Rattus..............................................................Polyplax spinulosa (Burmeister)

4. First abdominal sternal plate strongly arcuate and with its lateral angles somewhat pro-
   longed (Fig. 4 A)......................................................... Polyplax borealis Ferris

   First abdominal sternal plate not arcuate, its posterior margin almost straight and
   lateral angles not produced (Fig. 4 B).............................Polyplax alaskensis Ewing
Key to Genera of Linognathidae

1. Sternal plate of thorax at least half as wide as long (Fig. 1 A)..............Solnopotes

   Sternal plate of thorax small and slender or completely lacking (Fig. 1 B).....Linognathus

---

Key to Species of Linognathus

1. Head about as broad as long; antennae almost as long as head (Fig. 1 A)........2

   Head almost twice as long as wide or longer; antennae noticeably shorter than head (Fig. 1 B)..............................3

2. Thoracic dorsum with four long setae; head slightly longer than broad (Fig. 2 A). On dogs, foxes and ferrets. Dog sucking louse..............Linognathus setosus (von Olfers)

   Thoracic dorsum with two long setae; head definitely as broad as long (Fig. 2 B)........Sheep foot louse..............................Linognathus pedalis (Osborn)
3. Fore head acutely conical and much elongated; female gonopod with a sclerotized hook (Fig. 3 A & B). On cattle. Long-nosed cattle louse....Linognathus vituli (Linnaeus)

Fore head rounded (Fig. 3 C); female gonopod rounded or with a slight tooth (Fig. 5 B & C). On sheep and goats.................................4

Fig. 3 A  Fig. 3 B  Fig. 3 C

4. Head greatly expanded behind antennae; female gonopod rounded (Fig. 4 A & B). Goat sucking louse.................................Linognathus africanus (Kellogg & Paine)

Head not greatly expanded behind antennae (Fig. 4 C)..............................5

Fig. 4 A  Fig. 4 B  Fig. 4 C

5. Thoracic spiracle large and conspicuous; female gonopod rounded (Fig. 5 A & B). Sheep louse.................................Linognathus ovis (Neumann)

Thoracic spiracle not large and conspicuous; female gonopod with a slight tooth (Fig. 5 C & D). Goat sucking louse.........................Linognathus stenopsis (Burmeister)

Fig. 5 A  Fig. 5 B  Fig. 5 C  Fig. 5 D
Key to Species of Solenopotes

1. Abdominal spiracles strongly protuberant (Fig. 1 A); female genitalia with apical processes strongly constricted near middle (Fig. 1 B); male genitalia as in figure 2 E. On cattle. Little blue cattle louse... Solenopotes capillatus Enderlein

Abdominal spiracles only slightly protuberant (Fig. 1 C); female genitalia with apical processes not constricted (Fig. 1 D & E); male genitalia as in figures 2 C & D. On deer... Solenopotes ferrisi (Fahrenholz)

2. Neck present, head with distinct posterior-lateral angles (Fig. 2 A); female genitalia as in figure 1 E; male genitalia as in figure 2 C... Solenopotes ferrisi (Fahrenholz)

Head without distinct posterior-lateral angles (Fig. 2 B); female genitalia as in figure 1 D; male genitalia as in figure 2 D... Solenopotes binipilosus (Fahrenholz)
Key to Genera of Pediculidae

1. Abdomen much longer than basal width; without hairy tubercles (Fig. 1 A). Head and body louse. .................................................. **Pediculus humanus** Linnaeus

   Abdomen about as long as basal width; with hairy tubercles (Fig. 1 B). Crab louse.... .......................................................... **Phthirius pubis** (Linnaeus)
MALLOPHAGA: PICTORIAL KEY TO SPECIES INFESTING PIGEONS
Harold George Scott and Chester J. Stojanovich

maxillary palps present

maxillary palps absent

forehead with spines

forehead without spines

femur III with comb

femur III without comb

Hohorstie1a lata Colpocephalum turbinate Bonomiella columbae
LARGE PIGEON BODY LOUSE SMALL PIGEON BODY LOUSE PIGEON VENT LOUSE

head longer than wide

head wider than long

forehead with spines

forehead without spines

Columbicola columbae Physcomeloides zenaidurae
SLENDER PIGEON LOUSE PIGEON HEAD LOUSE

male basal antennal segment small

male basal antennal segment large

Campanulotes bidentatus comper
SMALL PIGEON FeATHER LOUSE

Colocerias damicorn fahrenholzi
LARGE PIGEON FEATHER LOUSE
MALLOPHAGA: PICTORIAL KEY TO SOME COMMON SPECIES ON CHICKENS
Chester J. Stojanovich and Harry D. Pratt

Antenna 5 segmented

Antenna 4 segmented

Head longer than wide
Head not longer than wide

Abdomen densely covered with setae
Abdomen not densely covered with setae

Menacanthus stramineus
Menopon gallinae

Abdomen slender
Abdomen oval
Temple not evenly rounded
Temple evenly rounded

Lipeurus caponis
Cuculogaster heterographus
Goniocotes holagaster

Abdomen with sclerotized markings
Abdomen without sclerotized markings

Goniodes gigas
Goniodes dissimilis

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1962
Fig. 139 KISSING BUGS: PICTORIAL KEY TO SOME COMMON SPECIES IN THE UNITED STATES
Harold George Scott and Margery R. Borom

- **Triatoma recurva**
  - about 1-1/4 inch long; connexivum pale
  - first femur with thick hair

- **Triatoma gerstaeckeri**
  - about 1-1/8 inch long; connexivum yellow banded
  - first antennal segment long

- **Triatoma lecicularius**
  - eyes large

- **Triatoma rubida**
  - connexivum brown, pale banded or not
  - first femur with sparse hair
  - first antennal segment short

- **Triatoma sanguisuga**
  - eyes small

- **Triatoma protracta**
  - connexivum yellow banded

- **Triatoma neotoma**
  - less than 1 inch long
STINGING CATERPILLARS:
PICTORIAL KEY TO SOME IMPORTANT UNITED STATES SPECIES
Harold George Scott & Chester J. Stojanovich

WITH DORSAL SADDLE

SADDLEBACK CATERPILLAR
Sibine stimulae

PUSS CATERPILLAR
Megalopyge opercularis

ABOUT 3/4-INCH LONG,
YELLOWISH GREEN

ABOUT 2 INCHES LONG,
RED AND WHITE

WITHOUT DORSAL SADDLE

BODY FUR-LIKE

BODY NOT FUR-LIKE

SADDLE

10 PROLEGS

A SLUG CATERPILLAR
Euclea chloris

A MOTH CATERPILLAR
Automeris io

A FLANNEL MOTH CATERPILLAR
Ncrae cretata

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1962
MOTHS: KEY TO SOME SPECIES COMMONLY ASSOCIATED WITH STORED FOOD

Harold George Scott

1. Caterpillars ................................................................. 2
   Adult moths .............................................................. 5

2. Pinkish larvae up to 3/5-inch long living in silken tubes and producing matter webbing in the infested food (Anagasta kuhniella) ................................................................. MEDITERRANEAN FLOUR MOTH
   Whitish larvae with or without black or orange markings .......................................................... 3

3. Black head and prothorax; orange markings at both ends of the body; living in silken tubes (Pyralis farinalis) ................................................................. MEAL MOTH
   Without black head and prothorax ............................................................................................ 4

4. White to greenish-white larvae producing matter webbing in the infested food (Plodia interpunctella) ................................................................. INDIAN MEAL MOTH
   Whitish; not producing matted webbing; living inside kernels of grain (Sitotroga cerealella) ................................................................. ANGOUMOIS GRAIN MOTH

5. Wings unicolorous to slightly spotted; long fringe at rear of wings (Sitotroga cerealella) ................................................................. ANGOUMOIS GRAIN MOTH
   Wings heavily dark marked ........................................................................................................ 6

6. Distal half of front wings dark; basal half light (Plodia interpunctella) ................................................................. INDIAN MEAL MOTH
   Wings not so marked .............................................................................................................. 7

7. Basal and distal thirds of front wings dark; middle portion of front wings light (Pyralis farinalis) ................................................................. MEAL MOTH
   Front wings pale gray with transverse wavy black markings (Anagasta kuhniella) ................................................................. MEDITERRANEAN FLOUR MOTH

Angoumois Grain Moth
BLISTER BEETLES: KEY TO SOME COMMON UNITED STATES SPECIES
Harold George Scott and Chester J. Stojanovich

**Striped**
- Epicauta vittata
  - Striped Blister Beetle

**Margined**
- Epicauta pestifera
  - Margined Blister Beetle

**Spotted**
- Epicauta cinerea maculata
  - Spotted Blister Beetle

**Essentially unicolorous**
- Epicauta pennsylvanica
  - Black Blister Beetle
- Epicauta cinerea cinerea
  - Clematis Blister Beetle
- Epicauta fabrici
  - Ash-Grey Blister Beetle
- Pomphopoea sayi
  - Say Blister Beetle

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1963
BEETLES: PICTORIAL KEY TO SOME SPECIES COMMONLY ASSOCIATED WITH STORED FOODS
Harry D. Pratt

1. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK ABSENT; SPECIES ABOUT 1/8 INCH LONG
   SAW-TOOTHED GRAIN BEETLE
   Oryzaephilus surinamensis

2. PRONOTUM WITHOUT TEETH ON EACH SIDE
   BEAK ABSENT
   SMALL BROWNISH SPECIES
   LESS THAN 1/4 INCH LONG
   HEAD VISIBLE FROM ABOVE
   1/8 INCH LONG OR MORE
   CONFUSED AND RED FLOUR BEETLES
   Tribolium confusum AND castaneum

3. PRONOTUM WITHOUT TEETH ON EACH SIDE
   BEAK PRESENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH 2 PALE SPOTS
   PRONOTUM WITH ROUND PUNCTURES
   RICE WEEVIL
   Sitophilus oryzae

4. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK ABSENT; SPECIES ABOUT 1/8 INCH LONG
   LARGE BLACKISH SPECIES
   1/4 TO 3/4 INCH LONG
   EACH FORE WING DARK
   PRONOTUM WITH ELONGATE PUNCTURES
   GRANARY WEEVIL
   Sitophilus granarius

5. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK PRESENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH LINES
   PRONOTUM NOT SO STRONGLY SEPARATED FROM BASES OF WINGS
   LESSER GRAIN BORER
   Rhyzopertha dominica

6. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK ABSENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH ROUGHENED SURFACE
   PRONOTUM SEPARATED BY STRONG CONstriction FROM BASES OF WINGS
   FLATTED BEETLES
   1/4 TO 1/2 INCH LONG
   CIGARETTE BEETLE
   Lasioderma serricorne

7. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK PRESENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH LINES
   PRONOTUM NOT SO STRONGLY SEPARATED FROM BASES OF WINGS
   DRUG STORE BEETLE
   Stegobium paniceum

8. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK ABSENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH LINES
   PRONOTUM NOT SO STRONGLY SEPARATED FROM BASES OF WINGS
   CONVEX BEETLES
   1/2 INCH LONG OR MORE
   CADELLE
   Tenebroides mauritanicus

9. PRONOTUM WITH 6 TEETH ON EACH SIDE
   BEAK PRESENT; SPECIES ABOUT 1/8 INCH LONG
   EACH FORE WING WITH LINES
   PRONOTUM NOT SO STRONGLY SEPARATED FROM BASES OF WINGS
   YELLOW MEAL WORM
   Tenebrio molitor

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1958
STINGING HYMENOPTERA:
PICTORIAL KEY TO SOME COMMON UNITED STATES FAMILIES
Harold George Scott and Chester J. Stojanovich

- Wings absent
  - Body fur-like without node
  - Body not fur-like with node

- Wings present
  - Hairs not feathered (use 20 X magnification)
  - Hairs feathered (use 20 X magnification)

Mutillidae
VELVET ANTS

Formicidae
ANTS

- Pronotum long, reaching tegula
- Pronotum short, not reaching tegula

Vespidae
WASPS, YELLOW JACKETS, HORNETS

Sphecidae
SPHECID WASPS

- Hind tibia with spurs
- Hind tibia without spurs

- Eye not reaching mandible
- Eye reaching mandible

Bombidae
BUMBLE BEES

Andrenidae
SWEAT BEES

Apidae
HONEY BEES
HYMENOPTERA: KEY TO SOME COMMON SPECIES WHICH STING MAN
Harry D. Pratt and Chester J. Stojanovich

1. With wings (Fig. 1 A).......................................................................................... 2

   Without wings (Fig. 1 B).................................................................................... 3

2. First (and sometimes second) segment of the abdomen node-like, clearly separated above and below from rest of abdomen (Fig. 2 A). Nest in ground, wood, or buildings (Family Formicidae).................................................................................. ANT

   Abdomen with or without some constriction of first abdominal segments, but without true node formation of basal abdominal segments (Fig. 2 B).................................................. 3

3. All hairs on body simple, unbranched; hind tarsus slender, first segment not broadened or thickened (Fig. 3 A). (Superfamilies Vespoidea and Sphecoidea). Wasps and Hornets.......................... 4

   At least some hairs on thorax branched or plumose; hind tarsus with first segment broadened and thickened, often densely hairy (Fig. 3 B). (Superfamily Apoidea). Bees......................................................... 27

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1963
4. Pronotum extending entirely or almost back to the tegula (the scale covering base of fore-wing), its hind angles not lobed (Fig. 4 A). (Superfamily Vespoidea) ................................................................. 5

Pronotum shortened, more or less collar-like, not extending back to tegula, its hind angles often produced into lobes (Fig. 4 B). (Superfamily Sphecoidea) ........................................................................... 22

5. Fore wing almost always folded when in repose; first discoidal cell very long, as a rule much longer than the submedian cell (Fig. 5 A). Both solitary and colonial species (Family Vespidae) ........... 6

Fore wing very rarely folded; first discoidal cell shorter than submedian cell (Fig. 5 B). Solitary species ......................................................................................................................... 21

6. One spur at tip of middle tibia; claws bifid, split at tip (Fig. 6 A). (Subfamily Eumeninae)................................................. 18

Two spurs at tip of middle tibia; claws tapering to point (Fig. 6 B) ......................................................................................... 7
7. Clypeus (upper lip) broadly truncate and more or less notched at apex (Fig. 7 A); hind wing without a lobe at anal angle (Fig. 7 B). (Subfamily Vespinae). Hornets, Yellow Jackets..............8

Clypeus somewhat pointed at apex (Fig. 7 C); hind wing with a lobe at anal angle (Fig. 7 D). (Subfamily Polistinae). Paper Wasps..............................................................15

8. Oculo-malar space long, more than half the length of next to last antennal segment; vertical carina on pronotum (Fig. 8 A)..................................................................9

Oculo-malar space short, less than half the length of next to last antennal segment; no vertical carina on pronotum (Fig. 8 B)..................................................................11
9. Very large species, 20-30 mm. long, extensively reddish-brown; postocellar area of vertex at least as long as ocellar triangle in dorsal view (Fig. 9 A). Builds paper nest in homes or hollow trees. (Vespa crabro germana). ..................................................... GIANT HORNET

Smaller species, 8-20 mm. long; black species with white, ivory white, or yellowish markings; postocellar area of vertex not as long as ocellar triangle (Fig. 9 B). ................................. 10
10. Black and white species; first and second abdominal segments entirely black, continues with very narrow pale markings at tip of first segments in some males (Fig. 10 A). Builds enclosed globular nests under eaves or in trees. (Vespula maculata). BALD-FACED HORNET

Black and yellow species; yellowish posterior margins of first and second abdominal segments deeply notched (Fig. 10 B). Builds globular paper nests under eaves or in trees. (Vespula arenaria). A YELLOW JACKET

11. Black and white species (Fig. 11 A). Builds paper nest in ground or on trees. (Vespula consobrina). A HORNET

Black and yellowish species (Fig. 11 B). All build paper nests in ground. 12
12. Mesonotum with two, broad, longitudinal, curved yellowish stripes reaching almost from front to hind margins (Fig. 12 A). Eastern species (Vespula squamosa). California and Oregon species (Vespula sulphurea). A YELLOW JACKET

Mesonotum entirely black, or with two short yellowish stripes near scutellum (Fig. 12 B). 13

Fig. 12 A

13. Yellowish postero-lateral margins of pronotum usually even, parallel-sided; clypeus with broad, dark, longitudinal stripe, often anchor-shaped (Fig. 13 A & B). Northern species (Vespula vulgaris). A YELLOW JACKET

Yellowish postero-lateral margin of pronotum not parallel-sided; clypeus with short dark median stripe or one or more small dark spots (Fig. 13 C & D). 14

Fig. 13 B
14. First antennal segment largely yellowish in front; eyes encircled by yellowish band on upper three-fourths (Fig. 14 A). Western species (Vespula pennsylvanica)........... A YELLOW JACKET

First antennal segment largely or entirely blackish; eyes with a blackish area dorsally separating pale anterior and posterior orbital bands (Fig. 14 B). Eastern species (Vespula maculifrons).................................................. A YELLOW JACKET

15. Body and all legs entirely or largely orange-colored (Fig. 15 A). Builds paper combs in walls of house or hollow trees. (Polistes rubiginosus).......................... ORANGE PAPER WASP

Body with some blackish markings; at least hind tarsi pale-colored (Fig. 15 B).......................... 16
17. Large species 20-25 mm. long; propodeum with coarse transverse striae (Fig. 17 A). Builds paper combs in bushes or trees. (Polistes annularis) ........................................... LARGE PAPER WASP

Medium-sized species, 12-17 mm. long; propodeum with fine striae or essentially smooth (Fig. 17 B). Builds paper combs under eaves or in buildings. (Polistes fuscatus pallipes) ............................................................... DARK PAPER WASP
18. Slender species with extremely elongate first abdominal segment (Fig. 18 A). Builds small mud, potter nests provisioned with caterpillars. (Eumenes fraterna) .................. POTTER WASP

Stocky species, with stout first abdominal segment (Fig. 18 B). Nest in holes in ground or wood, or old mud-dauber nests provisioned with caterpillars. (Odynerus species and Monobia species) .......................................................... SOLITARY WASPS

19. Mesopleuron divided by an oblique suture into upper and lower parts (Fig. 19 A). Usually nest in holes in ground provisioned with spiders or tarantulas (Family Psammocharidae). .................. SPIDER AND TARANTULA WASPS

Mesopleuron not divided by such an oblique suture (Fig. 19 B) .................. 20
20. Bases of middle and hind coxae not covered by plates (Fig. 20 A). Parasites of other wasps and bees nesting in ground. ................................................................. VELVET ANTS

Bases of middle, and sometimes hind, coxae covered by plates (Fig. 20 B). ......................... 21

21. Wing membrane beyond cells with wrinkles; inner margin of eye with a sinus; bases of middle and hind coxae covered by plates (Fig. 21 A & B). Male with three spines at tip of abdomen. ...... (Family Scoliidae). ............................................................... SCOLIID WASPS

Wing membrane beyond cells without wrinkles; inner margin of eye essentially straight; bases of middle coxae covered by plates (Fig. 21 C & D). Male with a single upturned spine at tip of abdomen. (Family Tiphidiidae). ................................................. TIPHIID WASPS
22. Very large species, 30 mm. long or more; first abdominal segment broad and sessile (Fig. 22 A)
Nest in holes in ground provisioned with cicadas. (Sphecus speciosus)............CICADA KILLER

Smaller species, less than 25 mm. long; first abdominal segment longer and more slender (Fig. 22 B).................................................................23

23. Eyes with deep sinus on inner side; one or two clearly defined submarginal cells; dark species
with whitish tarsus (Fig. 23 A). Builds organ-pipe mud nests. (Trypoxylon species)........
..........................................................................................................................PIPE ORGAN MUD-DAUBER

Eyes nearly straight on inner side; three well-defined submarginal cells; metallic blue, or
species with some pale markings on abdomen (Fig. 23 B & C).................................24
24. Petiole of abdomen two-segmented (Fig. 24 A). Nest in holes in ground. (Sphex species) ..............
.......................................................................................................................... SOLITARY WASP

Petiole of abdomen one-segmented (Fig. 24 B). .................................................................................. 25

Fig. 24 A

25. Bright metallic-bluish species (Fig. 25 A). Builds mud nests provisioned with spiders. ............
(Chalybion californicum). .................................................................................................................. BLUE MUD-DAUBER

Darker species with yellowish or orange markings (Fig. 25 B). ...................................................... 26

Fig. 25 A

Fig. 25 B
26. Dark species with yellowish markings (Fig. 26 A). Builds mud nests provisioned with spiders. (Sceliphron caementarium) ...................................................... COMMON MUD-DAUBER

Dark hairy species with orange markings (Fig. 26 B). Nest in holes in ground. ..................... (Chlorion ichneumonea) ......................................................... ORANGE THREAD-WAISTED WASP
Hind tibia without spurs (Fig. 27 A). Colony builds wax combs in bee hives, in houses, and in trees. (Apis mellifera) ................................................................. HONEY BEE

28. Oculo-malar space longer than second segment of antenna; large hairy species with contrasting blackish and yellowish (sometimes reddish) pile (Fig. 28 A). Colony builds wax combs in nests in ground or logs, often in old mouse nests. (Family Bombidae; Bombus sp.) .... BUMBLEBEES

Oculo-malar space short, eye reaching (or nearly reaching) base of mandible (Fig. 28 B) .... 29
29. Very large species 15-25 mm. long with shiny bluish, nearly hairless upper abdomen; second submarginal cell strongly narrowed anteriorly (Fig. 29 A). Nest in holes bored in wood. (Xylocopa virginica)..............................................................................................CARPENTER BEE

Smaller species 2-14 mm. long, usually with some hairs on upper surface of abdomen, shiny greenish species; second submarginal cell not narrowed anteriorly (Fig. 29 B & C)...........30

30. Fore-wing with two submarginal cells; abdomen of female with dense hairy patches on underside (Fig. 30 A). Builds nest out of leaves in tree holes (Megachile species)... LEAFCUTTER BEEES

Fore-wing with three submarginal cells; abdomen without dense hairy patches on underside (Fig. 30 B & C).................................................................................................................................31
Metallic Solitary Bees

(fig. 31 a). Nest in ground. (Augochlora species)..........................

Solitary Bees

(fig. 31 b). Nest in ground. (Halictus and Andrena species)...SOLITARY BEES

32. First (and sometimes second) segment of abdomen node-like (fig. 32 a). Build colony nests in ground, under stones, in wood, or in buildings (Family Formicidae).................ANTS

First and second segments of abdomen not node-like (fig. 32 b)...............33
33. Larger species 3-25 mm. long, usually with definite dark and reddish or orange-colored hairs (Fig. 33 A). Parasites of ground-nesting bees and wasps (Family Mutillidae). VELVET ANTS

Smaller species 1-2 mm. long, with few sparse hairs; body various shades yellowish to brownish (Fig. 33 B). Parasites of wood-boring beetles (Family Bethylidae, Scleroderma species). PARASITIC WASPS
ANTS: KEY TO SOME COMMON SPECIES
Harold George Scott

1. Pedicel ("waist") 1-segmented .................................................. 2
   Pedicel 2-segmented ..................................................................... 4

2. Petiole (scale on pedicel) poorly developed, hidden beneath abdomen
   (Tapinoma sessile) ................................................................. ODOROUS HOUSE ANT
   Petiole well-developed, erect, not hidden beneath abdomen .................. 3

3. Tip of abdomen without circle of hairs (Iridomyrmex humilis) ........ ARGENTINE ANT
   Tip of abdomen with circle of hairs (Camponotus herculeanus
   pennsylvanicus) .......................................................... BLACK CARPENTER ANT

4. Head and thorax with numerous spines (Atta texana) .............. TEXAS LEAF-CUTTING ANT
   Head and thorax spineless or with 1 pair of spines on the posterior thorax ........... 5

5. Thorax and head covered with "fingerprints"; posterior thorax with
   single pairs of spines (Tetramorium caespitum) ................... PAVEMENT ANT
   Thorax and head without "fingerprints"; posterior thorax without spines .................. 6

   pedicel

   Monomorium pharaonis

   antennal club

   Solenopsis molesta

6. Antennal club 2-segmented ..................................................... 8
   Antennal club 3-segmented .................................................. 7

7. Shiny-black (Monomorium minimum) ..................................... LITTLE BLACK ANT
   Yellowish-red (Monomorium pharaonis) .................................. PHARAOH ANT

8. House infesting ants (Solenopsis molesta) ............................... THIEF ANT
   Outdoor mound-building ants ...................................................... 9

9. Mandibles strongly incurved (Solenopsis geminata) .................... TROPICAL FIRE ANT
   Mandibles not strongly incurved ................................................. 10

10. Dorsal surface of head with large coarse, scattered punctures
    (Solenopsis saevissima var. richteri) ....................................... IMPORTED FIRE ANT
    Dorsal surface of head without punctures (Solenopsis xyloni) .............. SOUTHERN FIRE ANT

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1963
DIPTERA: PICTORIAL KEY TO PRINCIPAL FAMILIES OF PUBLIC HEALTH IMPORTANCE

H. R. Dodge

Antennae of 3 segments or the ocellar segments more or less fused

4 or 5 posterior cells

3rd vein with 3A long, 3B ending before wing tip

3rd vein with 3A short, 3B ending before wing tip

Abdomen flat, posterior segments subequal

Abdomen cylindrical to subcylindrical

Body dull to moderately shining

Body strongly shining, usually black

Antennae apparently 2-segmented, Pedot not large and bristly, Posterior veins strong, with cross veins

Mouthparts thick and bristly

Mouthparts not thick and bristly

2nd antennal segment with tooth

Mesonotal suture incomplete or absent

Postscutellum large, swelling (See fig. for TACHINIDAE below)

Postscutellum undeveloped

Frons of segment broad

Frons of segment long, slender

Anal vein absent

Wing without cross veins beyond the basal third

Costa ending before wing tip

Wing veins reduced

Wing with costa continued around apex and veins numerous, thickly dusted with hairs or scales

Oral vibrissae usually present

Oral vibrissae absent

Oral vibrissae usually present

Oral vibrissae usually absent

Mouthparts vestigial

Mouthparts well-developed, functional

Glossa broad

Glossa narrow (Body shining black)

Glossa absent

Mouthparts vestigial

Mouthparts vestigial

Ocelli absent

Ocelli present

Wing 5 without slight irregularity. Anal vein absent

Wing not unusually fine

Wing with costa continued around apex and veins numerous, thickly dusted with hairs or scales

Abdomen flat

Abdomen tapering

Abdomen broad and flattened

Abdomen pointed basally

Antennae of 10 or more distinct segments, usually elongate

Antennae short, of 10-11 segments. Posterior veins fine

Wing with costa continued around apex and veins numerous, thickly dusted with hairs or scales

Abdomen tapering basally

Abdomen pointed basally

Abdomen broad and flattened

Antennae of 10 or more distinct segments, usually elongate

Antennae of 3 segments or the ocellar segments more or less fused

posterior cells

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1948, Revised May 1953
DOMESTIC FLIES: PICTORIAL KEY TO COMMON SPECIES
Harold George Scott and Margery R. Borom

thorax dull, abdomen dull

thorax dull, abdomen shiny

thorax shiny, abdomen shiny

Calliphora spp. and
Corrnecopius spp.

BLUE BOTTLE FLIES

small (about 1/3-inch long)
4 thoracic stripes, indistinct

medium-size (about 1/2-inch long)
4 thoracic stripes, often indistinct

large (usually over 1/3-inch long)
3 distinct thoracic stripes
abdomen with red tip

Fleshy spp.
LESSEY HOUSE FLIES

thoracic stripes distinct
sides of abdomen pale
exact when resting
thorax without pale spots

thoracic stripes indistinct
sides of abdomen dark
exact when resting
pale spot behind head
pale spot on scutellum

Stomoxys calcitrans
STABLE FLY

Musca domestica
HOUSE FLY

Muscina spp.
FALSE STABILE FLIES

color black
medium-size (1/2-inch long)
color dark blue
large (1/3-inch long)
color green to bronze

Phormia regina
BLACK BLOW FLY

Ophrya spp.
DUMP FLIES

Scyphopga spp.
GREEN BOTTLE FLY

Cochliomyia macellaria
SECONDARY SCREW WORM FLY

Phorinae serrata
BRONZE BOTTLE FLY

Phorinae cuprina
BRONZE BOTTLE FLY
DOMESTIC FLIES: PICTORIAL KEY TO COMMON SPECIES IN SOUTHERN U.S.

H. R. Dodge

Body dull, grey or brown to black

- 4th vein curved
  - Thorax dark, with 4 black stripes (Sides of abdomen usually pale)
  - Proboscis elongate, stiff, non-retractile, blood-sucking. Thorax with pale spot behind head
  - STOMOXYS CALCITRANS The stable fly

- Thorax grey, with 3 black stripes (Abdomen checkered, with tip usually red, the sides never pale)
  - Proboscis normal, retractile. Tip of scutellum more or less paler
  - MUSCA DOMESTICA The housefly

Body bicolored: thorax dark, abdomen metallic

- Scutellum with 3 pairs of marginal bristles (Squamae ash grey)
  - FANNIA SPP.
  - HYLEMYA SPP.

- Scutellum with 4-5 pairs of marginal bristles (Squamae dark, with pale hind margin of lower lobe)
  - CYNOMYOPSIS CADAVERINA
  - CALLIPHORA SPP.

Body shining, metallic or black

- 4th vein sharply angled
  - Thoax not striped. Head dark below, never yellow
    - PHORMIA REGINA
    - PHAENICIA

- 4th vein straight
  - Thorax black-striped. Head yellow below
    - CALLITROSA MACELLARIA

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center, Training Branch
Atlanta, Georgia - 1948, Revised Aug. 1953
FLY LARVAE: KEY TO SOME SPECIES OF PUBLIC HEALTH IMPORTANCE
Chester J. Stojanovich – Harry D. Pratt – Elwin E. Bennington

1. Larva with a definite, hard, sclerotized head capsule (Fig. 1 A).................................2
   Larva without a definite, hard, sclerotized head capsule (Fig. 1 B)..............................3

2. Body flattened; large larvae 12-20 mm. long (Fig. 2 A). . . (Hermetia illucens) SOLDIER FLY
   Body cylindrical with spiracles opening in a tubular segment at posterior end of body, last
   segment modified into a sclerotized air tube (Fig. 2 B)..................................................(Genus Psychoda & allies) FILTER FLIES

3. Body with spine-like dorsal and lateral processes on each segment; posterior spiracles on
   small elevations (Fig. 3 A)..........................................................................................(Genus Fannia) . . . 4
   Body smooth, or with short spines, but no long lateral processes (Fig. 3 B)... ........ 5

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PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia — 1962
4. Processes branched or feathery (Fig. 4 A)............................. *(Fannia scalaris)* LATRINE FLY

Processes without branches, spiny (Fig. 4 B).. *(Fannia canicularis)* LESSER HOUSE FLY

![Fig. 4 A](image)

![Fig. 4 B](image)

5. Posterior spiracles on peg-like tubercles or cones; smaller larvae, usually 6-9 mm. long (Fig. 5 A)................................................................................................................................. 6

Posterior spiracles not on peg-like tubercles; larger larvae, usually 9-18 mm. long (Fig. 5 B).................................................................................................................................. 7

![Fig. 5 A](image)

![Fig. 5 B](image)

6. Posterior spiracles at ends of long tubercles (Fig. 6 A).......................... (Genus Drosophila) VINEGAR FLIES

Posterior spiracles on short cones, last segment with short finger-like lateral process (Fig. 6 B).................................................................. *(Piophilia casei)* CHEESE SKIPPER

![Fig. 6 A](image)

![Fig. 6 B](image)
7. Posterior end of body extended to form a tail (Fig. 7 A) ................................................................. (Eristalis tenax) RAT-TAILED MAGGOT

Body swollen or tapered posteriorly, but never extended into a tail like process (Fig. 7 B). .. 8

8. Peritreme present, with 3 distinct slits (Fig. 8 A) ............................................................................ 9

Peritreme absent; or if present without 3 distinct slits (Fig. 8 B & C) .............................................. 23

9. Slits of posterior spiracles straight (Fig. 9 A) .................................................................................. 10

Slits of posterior spiracles strongly sinuous (Fig. 9 B) .................................................................. 22
10. Dorsal and ventral arms of cephaloskeleton almost equal (Fig. 10 A); peritreme with two non-sclerotized areas away from the button (Fig. 10 B). (Genus Ophyra) DUMP FLY

Dorsal arm of cephaloskeleton longer than ventral arm (Fig. 10 C); peritreme complete or with one weakly sclerotized area (Fig. 10 D & E).

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11. Posterior spiracles with peritreme complete, sometimes weak in area of button (Fig. 11 A)

Posterior spiracles with peritreme incomplete, not enclosing a sometimes ill-defined button (Fig. 11 B).

---

12. Spiracular plate and button heavily sclerotized; accessory oral sclerite present (Fig. 12 A & B).

Spiracular plate and button not heavily sclerotized; accessory oral sclerite absent (Fig. 12 C & D).
13. Mandibular sclerite with tooth longer than greatest width of basal portion (Fig. 13 A)..........
.................................................................................................. (Calliphora vicina) A BLUE BOTTLE FLY
Mandibular sclerite with tooth only as long as greatest width of basal portion (Fig. 13 B)..........
................................................................................... (Cynomyopsis cadaverina) A BLUE BOTTLE FLY

14. Peritreme thick with rounded or sharp projections which extend inward toward spiracular slits (Fig. 14 A); cephaloskeleton as in figure 14 B.................................................................................... (Phaenicia caeruleiviridis) A GREEN BOTTLE FLY
Peritreme thin, usually with no projections or if present only slightly sclerotized (Fig. 14 C)......................................................

15. At least one of the prothoracic spiracles with 8 or more openings (Fig. 15 A); peritreme and cephaloskeleton as in figures 15 B & C. (Phaenicia sericata) A GREEN BOTTLE FLY
At least one of the prothoracic spiracles with 6 or less openings (Fig. 15 D); peritreme and cephaloskeleton as in figures 15 E & F..................................................... (Syn. P. pallescens)............... (Phaenicia cuprina) A BRONZE BOTTLE FLY
16. Spiracular slits not pointing toward opening in peritreme (Fig. 16 A).................................17
Spiracular slits pointing toward opening in peritreme (Fig. 16 B).................................18

Fig. 16 A  Fig. 16 B

17. Very large size, about 20 mm. long; mandibular sclerite as in figure 17 A............................
..................................................................................(Sarcophaga citellivora or S. bullata) A FLESH FLY
Smaller size, about 10 mm. long; mandibular sclerite as in figure 17 B............................
..........................................................................................(Sarcophaga haemorrhoidalis) A FLESH FLY

Fig. 17 A  Fig. 17 B

18. At least one of the prothoracic spiracles with 9 or less openings (Fig. 18 A).........................19
At least one of the prothoracic spiracles with 10 or more openings (Fig. 18 B).......................20

Fig. 18 A  Fig. 18 B

19. Mandibular sclerite with tooth longer than width of basal portion (Fig. 19 A)....................
...........................................................................................................(Wohlfahrtia opaca) A FLESH FLY
Mandibular sclerite with tooth only as long as greatest width of basal portion (Fig. 19 B).
...........................................................................................................(Wohlfahrtia vigil) A FLESH FLY

Fig. 19 A  Fig. 19 B
131

Button is distinct or absent; walls of slits with lateral swellings (Fig. 20 A).................21

Button present, walls of slits without lateral swellings (Fig. 20 B)..........................

.............................................................................................................. (Phormia regina) BLACK BLOW FLY

21. Tracheal trunks pigmented (Fig. 21 A).................................................................

.............................................................................................................. (Cochliomyia hominivorax) PRIMARY SCREW-WORM

Tracheal trunks not pigmented (Fig. 21 B).................................................................

.............................................................................................................. (Cochliomyia macellaria) SECONDARY SCREW-WORM

22. Peritreme thick (Fig. 22 A)............................................................ (Musca domestica) HOUSE FLY

Peritreme thin (Fig. 22 B)............................................................ (Haematobia irritans) HORN FLY
23. Small or slender, round larvae, usually less than 13 mm. long, tapering anteriorly (Fig. 23 A). ................................................................. 24

Large, robust larvae, over 15 mm long, with very stout spines (Fig. 23 B). ................................................................. 26

Fig. 23 A

Fig. 23 B

24. Button centrally located (Fig. 24 A). ............................. (Stomoxys calcitrans) STABLE FLY

Button not centrally located (Fig. 24 B). ................................................................. 25

Fig. 24 A

Fig. 24 B

25. Slits of posterior spiracles strongly sinuous (Fig. 25 A). .... (Musca autumnalis) FACE FLY

Slits of posterior spiracles not strongly sinuous (Fig. 25 B) ................................................................. 26

................................................................................................................ (Genus Mucina) FALSE STABLE FLY

Fig. 25 A

Fig. 25 B

26. Posterior spiracles with 3 distinct slits (Fig. 26 A). ................................................................. 27

Posterior spiracles without 3 distinct slits (Fig. 26 B). ................................................................. 28

Fig. 26 A

Fig. 26 B
27. Spiracular slits straight and sunken in deep cavity (Fig. 27 A); body shape as in figure 27 B. .................................................................(Genus Dermatobia) HUMAN BOT FLY

Spiracular slits curved and at most in shallow cavity (Fig. 27 C); body shape as in figure 27 D. .................................................................(Genus Gasterophilus) HORSE BOT FLY

Fig. 27 A  Fig. 27 B  Fig. 27 C  Fig. 27 D

28. Each spiracle divided into several plates (Fig. 28 A) .................................................................(Genus Cuterebra) RABBIT AND RODENT BOT FLY

Each spiracle not divided into several plates (Fig. 28 B) .................................................................29

Fig. 28 A  Fig. 28 B

29. Button centrally located (Fig. 29 A) .......................(Oestrus ovis) SHEEP BOT FLY

Button not centrally located (Fig. 29 B) .................................................................30

Fig. 29 A  Fig. 29 B

30. Opening toward button narrow (Fig. 30 A)...........(Hypoderma bovis) NORTHERN CATTLE GRUB

Opening toward button wide (Fig. 30 B) ...................(Hypoderma lineatum) CATTLE GRUB

Fig. 30 A  Fig. 30 B
MOSQUITOES: CHARACTERISTICS OF ANOPHELINE AND CULICINE MOSQUITOS

Kent S. Littig and Chester J. Stojanovich

ANOPHELES

AEDES

Egg

Larva

Pupa

Adult

CULEX

PALP LONG

FEMALE

MALE

PALP SHORT

FEMALE

MALE

Resting Position

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1962
MOSQUITOES: PICTORIAL KEY TO U.S. GENERA OF LARVAE
Harry D. Pratt

Air tube present
Abdomen without palmitate hairs.

Air tube absent
Abdomen with palmitate hairs on middle segments.

ANDOPELES

Air tube absent
Abdomen without palmite hairs.

Air tube with a basal pair of hair tufts.
Row of tufts or straight hairs present in some species.

CULICETI

Air tube without a basal pair of hair tufts.
Air tube with one to many pairs of tufts or hairs beyond base.

MOSQUITA

Air tube with several pairs of tufts or hairs.

CULEX

Air tube with only one pair of tufts or hairs on ventral side.

GRINORITIS

Eighth abdominal segment with a plate bearing a row of teeth on posterior side. Head longer than wide; the common species with four stout spines.

URANOTAENIA

Eighth abdominal segment without a plate. Head wider than long; hairs not spine-like.

HEMOCRITIS

Anal segment completely ringed by the plate which is pierced on the midventral line by tufts of the ventral brush.

PSOROPHORA

Anal segment not completely ringed by the plate, or if ringed by the plate, not pierced on the midventral line by tufts of the ventral brush.

AEDES

Eighth abdominal segment with comb scales.
If a lateral plate is present, it does not bear hairs.

ORTHOPODOMYIA

Eighth abdominal segment without comb scales, but with lateral plate bearing two spinulose hairs.

TOXORRHYNCHITES

Formerly MEGARHYNCHITIS

Anal segment with median ventral brush. Eighth abdominal segment with two rows of comb scales.

WYEOHYAEN

Anal segment without median ventral brush. Eighth abdominal segment with only one row of comb scales.

KIECOMYIA

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1959
MOSQUITOES: PICTORIAL KEY TO SOME COMMON LARVAE OF WESTERN UNITED STATES

Harry D. Pratt

Air tube present at tip of abdomen; palmate hairs absent on middle abdominal segments.

Air tube absent at tip of abdomen; palmate hairs present on middle abdominal segments.

CULICINE MOSQUITOES

Air tube with several tufts on each side

GENUS Culx

Air tube with a tuft at base on each side

GENUS Culicopa

Air tube with a tuft beyond base on each side

GENUS Aedes

Air tube with 5 or more tufts on each side

Air tube with 4 tufts on each side

HOUSE MOSQUITO

Culx pipiens

Air tube with 5-14 comb scales on 8th abdominal segment; last tooth of pecten on air tube widely spaced.

20-50 comb scales on 8th abdominal segment; last tooth of pecten on air tube evenly spaced.

Lateral hair of anal segment as long as, or longer than, anal segment, stout.

Culx maculatus

Culx micans

Pecten teeth extend to about middle of air tube

Pecten teeth extend much beyond middle of air tube

Anal gills shorter than anal segment

Anal gills longer than anal segment

ENCEPHALITIS MOSQUITO

Culx tarsalis

Culx perus

Aedes vexans

Aedes nigromaculalis

Aedes dorsalis

Aedes sticticus

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia—1960
MOSQUITOES: PICTORIAL KEY TO SOME LARVAE COMMONLY FOUND IN ARTIFICIAL CONTAINERS

Harry B. Pratt and Chester J. Slojanovich

Orthopodomyia aequipes Orthopodomyia alba Aedes taeniorhynchus Aedes atropalpus Culex quinquefasciatus Culex salinarius
MOSQUITOES: PICTORIAL KEY TO ANOPHELINE LARVAE OF THE UNITED STATES

Stanley B. Freeborn and Eugene J. Gerberg

Outer clypeal hairs simple; feathered, or sparsely branched

Inner clypeal hairs simple; anterior hair single or double

Outer and inner clypeal hairs equidistant; slightly feathered; leaflets of palmate hairs with smooth margins

Posterior margin of spiracular plate with tails

PSEUPOUNCTIPENNIS
(South Central U.S. west to Texas)

FRANCISCANUS
(Southwestern U.S.)

Hair "O" on 4th segment transverse and multiple

BARBERI
(Tree holes of eastern half of U.S.)

ATROPOS
(Lower Rio Grande Valley, Texas and South Florida)

Hair "O" on 4th segment usualy triple

ALBIMANUS
(Southwestern U.S.)

Hair "O" on 4th segment usualy single

Hair 2 on 4th seg. usually simple

Hair 2 on 4th seg. with two or more branches

Inner clypeal hairs slightly feathered at tips

WALKERI
(Eastern U.S.)

INNER CYPHEAL HAIRS DENSELY BRANCHED

Hair 2 on 4th seg. usually simple

Occipital hairs with 6 or more branches; fresh water breeder

OCCIDENTALIS
(Northern United States and Northeastern U.S.)

PIRUS/VUROUS/PENN/S
(All U.S.)

Hair 2 on 4th seg. usually double

Occipital hairs with 2 or fewer branches; brackish water breeder

FREEBORN
(Western U.S.)

Earlei
(Northern Central and Northeastern U.S.)

Quadrivagilatus
(Eastern half of U.S.)

Hair 2 on 4th seg. usually simple

Hair 2 on 4th seg. usually simple

Hair 2 on 4th seg. with two or more branches

Inner clypeal hairs densey branched

Hair 2 on 4th seg. usually double

PUNCTIPENNIS
(All U.S.)

Hair 2 on 4th seg. usually simple
MOSQUITOES: PICTORIAL KEY TO SOME LARVAE OF FLORIDA COMMONLY FOUND IN CONTAINERS
Chester J. Stojanovich and Harry D. Pratt

 PART I

air tube absent; abdomen with palmate hairs

air tube present; abdomen without palmate hairs

palmate hair

hairs 0 and 2 on abdominal segments 4 and 5 multiple

hair 0 rudimentary or absent, hair 2 single or double

Anopheles crucians

inner clypeal hairs separated by less than width of a basal tubercle

inner clypeal hairs separated by at least width of a basal tubercle

Anopheles punctipennis

Anopheles quadrimaculatus

comb scales present on 8th abdominal segment

comb scales absent on 8th abdominal segment

Orthopodomyia signifera

Toxorhynchites rutilus
Part II

Air tube with one hair or tuft on each side

Comb scales with a strong median spine, thorax with prominent lateral spines

Aedes aegypti

Air tube at least 6 times as long as wide

Comb scales in a single row, air tube with a basal tuft

Culiseta melanura

Thorax with spicules, lateral hair of saddle single

Culex nigripalpus

Culex salinarius

Culex restuans

Culex quinquefasciatus

Comb scales in a patch, thorax with less prominent lateral spines

Aedes triseriatus

Air tube 3.5 times as long as wide

Comb scales in a patch, air tube without a basal tuft

Antenna with tuft inserted at middle

Air tube with 3 pairs of long single hairs

Antenna with tuft inserted beyond middle

Air tube with 4 pairs of multiple tufts

Thorax without spicules, lateral hair of saddle double
MOSQUITOES: PICTORIAL KEY TO SOME COMMON LARVAE OF PUERTO RICO FOUND IN CONTAINERS
Harry D. Pratt and Chester J. Stojanovich

- **Anopheles albimanus**
  - outer elytral hair not densely branched
  - inner elytral hairs separated by at least width of basal tubercle
- **Anopheles grabhamii**
  - outer elytral hair densely branched
  - inner elytral hairs separated by less than width of basal tubercle
- **Orthopodomyia signifera**
  - comb scales present on 8th abdominal segment
  - thorax without stellate hairs
  - saddle with posterior spines
- **Toxorhynchites portoricensis**
  - comb scales absent on 8th abdominal segment
  - thorax with stellate hairs
  - saddle without posterior spines
- **Aedes quinquefasciatus**
  - air tube absent, abdomen with palmate hairs
- **Aedes nigripalpus**
  - air tube present, abdomen without palmate hairs
  - thorax without prominent lateral spines
  - saddle with posterior spines
- **Aedes mediovittatus**
  - air tube with one tuft on each side
  - thorax without stellate hairs
  - saddle without posterior spines
- **Aedes aegypti**
  - air tube 3–5 times as long as wide
  - thorax without spicules
  - saddle with posterior spines
MOSQUITO DIAGRAM – ADULT FEMALE Aedes
Chester J. Stojanovich and Harold George Scott

PROBOSCIS
ANTENNA
PALPUS
EYE
Mesorotum
OCCIPUT
FEMUR
WING
SCUTELLMUM
TIBIA
ABDOMEN
tarsus
MOSQUITO DIAGRAM – LATERAL ASPECT OF MOSQUITO THORAX
Chester J. Stojanovich

SPIRACULAR BRISTLES
POSTERIOR PRONOTAL BRISTLES
EYE
ANTERIOR PRONOTAL BRISTLES
POSTSPIRACULAR BRISTLES
PROPLEURAL BRISTLES
STERNOPLEURAL BRISTLES
STERNOPLEURON
PREALAR BRISTLES
UPPER MESEPIMERAL BRISTLES
HALTER
MESEPIMERON
LOWER MESEPIMERAL BRISTLES

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1960
MOSQUITOES: PICTORIAL KEY TO SOME COMMON ADULTS (FEMALE) OF THE UNITED STATES

Harry D. Pratt and Chester J. Stojanovitch

[Circuit diagram with labeled parts]
MOSQUITOES: PICTORIAL KEY TO SOME ADULTS (FEMALE) IN EASTERN UNITED STATES
Harry D. Pratt and Chester J. Stojanovich
MOSQUITOES: PICTORIAL KEY TO SOME COMMON ADULTS (FEMALE) OF WESTERN UNITED STATES
Harry D. Pratt and Chester J. Stojanovich

Anopheles punctipennis
- proboscis with pale band

Anopheles freeborni
- proboscis without pale band

Culex tarsalis
- wing spotted

Culex peus
- wing not spotted

Culiseta incidens
- abdomen without definite bands

Culiseta inornata

Culex pipiens

Aedes sticticus
- hind tarsus with pale bands at both ends of some segments

Aedes melanimon
- middle abdominal bands B-shaped

Aedes vexans

Aedes dorsalis
- abdomen with pale median stripe

Aedes nigromaculis
MOSQUITOES: PICTORIAL KEY TO SOME ADULTS COMMONLY ASSOCIATED WITH Aedes aegypti
Harry D. Pratt and Chester J. Stojanovich

**Probase Curved, Large Mosquitoes with Brilliant Greenish to Purplish Color**

**Probase Straight, Smaller Mosquito Usually with Blackish or Brownish Color**

**Taxarchymus rutilus**

**M. lutei-shape**

**M. denticulatus**

**M. atropalpus**

**Orthopodomyia species**

**SCUTELLUM SADDLE-SHAPED, ABDOMEN WITHOUT SCALES OR PALE BANDS**

**SCUTELLUM TRI-COLORED, ABDOMEN WITH SCALES AND USUALLY WITH PALE BANDS**

**Mesonotum with Broad Dark Median Stripe, Abdomen Pointed**

**Mesonotum with Two Pale Spots and Fine Coppery Scales, Abdomen Blunt with Basal Pale Bands Almost Straight**

**Mesonotum Almost Uniform, Scales Coarse and Beassy, Abdomen Blunt with Pale Basal Bands Narrow**

**Mesonotum Almost Uniform, Scales Fine and Coppery, Abdomen Blunt with Apical Pale Bands**

**Aedes aegypti**

**Aedes atropalpus**

**Anopheles (Triaresus**

**Culex restuans**

**Culex quinquefasciatus**

**Culex salinarius**

**Culex terrestris**

**Wing Uniformly Dark**

**Wing Dark with Four Well-Defined Dark Spots**

**Wing with Patches of Dark and Pale Scales**

**Anopheles barbatus**

**Anopheles quadrimaculatus**

**Anopheles punctipennis**

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1962
MOSQUITOES: PICTORIAL KEY TO ADULT FEMALE ANOPHELINES OF UNITED STATES

Richard H. Daggy

Wings with tufts of white or yellow scales

Two pale areas on front margin of wing

CRUCIANUS

BRADLEY

These three species are indistinguishable as adults. See "Pictorial Key to Anopheline Larvae" for separation in that stage.

Hind tarsus entirely dark-scaled

pale banded

ALBIMANUS

(Lower Rio Grande valley of Texas)

Thoracic bristles long—about one-third the width of thorax

pale unbanded

pale banded

WALKERI

(Eastern U.S.)

PUNCTIPENNIS

(Alf of J.S.)

Thoracic bristles not at all—shorter than one-half the width of thorax

pale unbanded

coppery-colored fringe spot at tip of wing

OCCIDENTALIS

(Pacific Coast)

EARLEI

(Northern U.S.

West of the Rockies

End of the Rockies

PSEUDOPUNCTIPENNIS

(Southwestern U.S.)

Terminal segment of pale entirely white

FRANCISCANUS

(Eastern, central, and western J.S.)

Terminal segment of pale tipped with black

U.S. DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

Communicable Disease Center

Training Branch

Atlanta, Georgia — 1945

Revised Sept. 1951, May 1953
MOSQUITOES: PICTORIAL KEY TO UNITED STATES GENERA
BASED ON MALE GENITALIA
PART I
Chester J. Stojanovich

basistyle about equal in length to dististyle
and with 1-2 stout setae near base

basistyle usually much shorter than dististyle,
without 1-2 stout setae near base

Anopheles

claspettes present 'absent only in Aedes aegypti as shown below'

Aedes aegypti

distal lobe of basistyle with leaf-like scales

distal lobe when present without leaf-like scales

Haemogogus

SEE PART II SECTION I

SEE PART II SECTION II

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PART II

PART II SECTION I

dististyle not slender but variously shaped as shown below

Aedes cinereus with dististyle furcate at base and
Aedes vexans with claw of dististyle not inserted at tip

PART II SECTION II

Psorophora

tenth sternite crowned with teeth or tuft of spines

distal lobe of basistyle with leaf-like scales or rods
lobe of ninth tergite short

Aedes

tenth sternite simple or with few teeth

distal lobe of basistyle without leaf-like scales or rods
lobe of ninth tergite half as long as basistyle

SEE PART III

Culex

Deinocerites
PART III

- Dististyle greatly modified at apex
- Dististyle not greatly modified at apex

- Wyemyia
  - Claw of dististyle comb-like
- Orthopodomyia
  - Claw of dististyle not comb-like

SEE PART IV
PART IV

claw of dist-style elongated

claw of dist-style short

Toxorhynchites

dist-style slender and tapering towards tip
dist-style stout

Culiseta

basal lobe long and slender, if not long bearing a rod-like seta
basal lobe not long and slender and without rod-like seta

Mansonina

Uranotaenia
PART II

- Psorophora ciliata
  - Wing scales mixed dark and white
  - Hind legs without long erect scales

- Psorophora cyanescens
  - Wing scales mostly dark
  - Hind legs without long erect scales

- Psorophora canina
  - Fringe of wing uniform in color
  - Hind legs with long erect scales

- Psorophora discolor
  - Wing scales mixed dark and white
  - Hind legs without long erect scales

- Psorophora signipes
  - Wing scales mostly dark
  - Hind legs without long erect scales

- Aedes pullatus
  - Hind tarsi with pale bands at both ends of some segments

- Aedes spenceri
  - Prohairs without pale band

- Psorophora taeniorhynchus
  - Abdomen with a pale median stripe

- Aedes resting
  - Abdomen without a pale median stripe

- Aedes marginata
  - Abdomen with pale medium stripe

- Aedes atlanticus
  - Abdomen without pale medium stripe

- Aedes nitens
  - Abdomen with pale medium stripe

- Aedes nigromaculatus
  - Hind half of hind femur entirely pale scaled

- Aedes atropalpus
  - Base of costa with white scales

- Aedes canadensis
  - Base of costa with dark scales

- Aedes zozophus
  - Hind half of hind tibia with long erect scales

- Aedes incriminus
  - Hind tibia without long erect scales

- Aedes sollicitans
  - Mesonotum with 2 broad white stripes at middle

- Aedes trivittatus
  - Mesonotum without 2 broad white stripes at middle

- Aedes trivittatus
PART III

dorsal segments of abdomen with pale scales apically

wing scales mostly dark
hind tarsus with white ring at apex

Haemagogus equinus

See Part IV, Section I

hind tarsus with pale bands

See Part IV, Section II

wing scales mostly dark
hind tarsus with pale bands

Psorophora confinis

Psorophora discolor

Psorophora signipennis

Psorophora cyanescens

Psorophora ciliata

Psorophora hawardii

Psorophora varipes

Psorophora mexicana

Psorophora harrida

Psorophora longipalpus
PART IV

abdominal segments without dorsal white bands or median triangular spots

PART IV SECTION I

abdomen with basal triangular patches

mesonotum with one or two stripes of white scales near or at the middle

mesonotum without stripes of white scales near middle

mesonotum with 2 broad white stripes at middle

mesonotum without 2 broad white stripes at middle

Aedes triseriatus

mesonotum with median stripe and extending in scutellum

mesonotum with median stripe extending in scutellum

Aedes scapularis

Aedes infirmatus

mesonotum with median stripe narrower

mesonotum with median stripe broader

Aedes tormentor

Aedes atlanticus

Aedes theleter

hypostigial area without scales

hypostigial area with scales

Aedes sticticus

Aedes muellergi

mesonotum with medium stripe margined with white or silver white scales

mesonotum with medium stripe margined with golden scales

Aedes thibaulti

mesonotum with dark median stripe reaching anterior margin

mesonotum with dark median stripe not reaching anterior margin

Aedes triseriatus

Aedes kundersoni

prohovers without pale band

PART IV SECTION II

prohovers with pale band

mesonotum yellow with 2 broad postero-lateral spots

mesonotum without 2 postero-lateral spots

abdominal segments almost entirely yellow streaked

abdominal segments not entirely yellow streaked

Aedes bimaculatus

Aedes fulvescens pallens

mesonotum with V-shaped marking

mesonotum without V-shaped marking

Aedes aegypti

Aedes vexans

middle abdominal bands B-shaped

middle abdominal bands not B-shaped

Aedes nigromaculis

Aedes sollicitans

Aedes nigromaculis
MOSQUITOES: PICTORIAL KEY TO SOME COMMON ADULTS (FEMALE) OF UTAH

PART I

Chester J. Stojanovich

Abdomen blunt

Abdomen pointed

Anopheles franciscanus

Anopheles freeborni

Aedes species

SEE PART II

Base of subcosta with row of bristles on under side

Base of subcosta without row of bristles on under side

Wing spotted

Wing not spotted

Proboscis without pale band

Proboscis with pale band

Culiseta incidunt

Culex tarsalis

Culiseta inornata

Culex pipiens

Culiseta impatiens

Culex erythrothorax

Culex salinarius

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1964
FLEAS: PICTORIAL KEY TO SOME COMMON SPECIES IN THE UNITED STATES

Harry D. Pratt

MOUSE FLEA
Leproplexus simulex

GROUND SQUIRREL FLEA
Diamanus montanus

STICKTIGHT FLEA
Echinnophaga gallinacea

MOUSE FLEA
Leproplexus simulex

GROUND SQUIRREL FLEA
Diamanus montanus

STICKTIGHT FLEA
Echinnophaga gallinacea

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FLEAS: PICTORIAL KEY TO SPECIES FOUND ON DOMESTIC RATS IN SOUTHERN UNITED STATES

STENOPONIA AMERICANA

Genal, pronotal and abdominal combs present

Genal and pronotal combs present

Genal and pronotal combs present

Pronotal comb present

No combs present

1 row of bristles on typical abdominal segment

2 rows of bristles on typical abdominal segment

Thorax normal

Front margin of head rounded

Thorax contracted

Front margin of head angular

Slightly revised April 1947
By Roy F. Fritz and Harry D. Pratt

Genal comb of five or more spines. Eye present.

Genal comb of two to four spines. Eye absent or reduced.

Labial palps not extending beyond trochanter of first pair of legs

Labial palps extending beyond trochanter of first pair of legs

Thorax contracted by vertical sclerotization

Thorax normal

Ocular bristle inserted in front of eye

Ocular bristle inserted below eye

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia
ILLUSTRATED KEY TO SPECIES FOUND DURING PLAGUE INVESTIGATIONS
Harry D. Pratt and Chester J. Stojanovich

1. Pronotal and genal combs absent (Fig. 1 A).........................2

Pronotal combs present; genal comb present or absent (Fig. 1 B & G)........5

2. Front margin of head with two angles; three thoracic tergites together
shorter than the first abdominal tergite (Fig. 2 A). (Echidnophaga
gallinacea)..........................................................STICKTIGHT FLEA

Front margin of head rounded; three thoracic tergites together longer
than the first abdominal tergite (Fig. 2 B)........................................3

3. Ocular bristle in front of eye; mesopleuron divided by internal sclero-
tization; female with spermatheca partially pigmented (Fig. 3 A & B)......
...................................................(Genus Xenopsylla)...........4

Ocular bristle beneath eye; mesopleuron without internal sclerotization;
female with spermatheca entirely without pigment (Fig. 3 C & D).........
(Pulex irritans)..........................................................HUMAN FLEA
4. Genus *Xenopsylla*

*X. brasiliensis*

*X. cheopis*

*X. astia*

*X. vexabilis hawaiiensis*

*Xenopsylla cheopis*, male terminal segments.

spermatheca

*Xenopsylla cheopis*, female terminal segments

*X. vexabilis hawaiiensis*
5. Genal comb absent (Fig. 5 A) ........................................ 6
Genal comb present (Fig. 5 B) ......................................... 8

Fig. 5 A

Fig. 5 B

6. Pronotal comb with about 12 teeth on each side (Fig. 6 A). India .........
Pronotal comb with 5 to 10 teeth on each side (Fig. 6 B) .................. 7

Fig. 6 A

Fig. 6 B

7. Labial palpus long, extending beyond trochanter of first leg (Fig. 7 A).
Diamanus montanus ....................................................... ROCK SQUIRREL FLEA
Labial palpus short, not extending to tip of coxa of first leg (Fig. 7 B).
Nosopsyllus fasciatus ..................................................... NORTHERN RAT FLEA

Fig. 7 A

Fig. 7 B

labial palpus

labial palpus

trochanter

trochanter
3. Genal comb with two teeth (Fig. 8 A) ..................... (Genus Neopsylla) Neopsylla setosa important in U. S. S. R., Mongolia and Manchuria.

Genal comb with three teeth (Fig. 8 B) .............. (Genus Ctenophthalmus) Ctenophthalmus breviatus and pollex potential vectors in U. S. S. R.

Genal comb with four teeth (Fig. 8 C) .................. (Genus Leptopsylla) Leptopsylla segnis is cosmopolitan.

![Genal comb with two teeth](Fig. 8 A)
![Genal comb with three teeth](Fig. 8 B)
![Genal comb with four teeth](Fig. 8 C)

Genal comb with more than five teeth ............ (Genus Ctenocephalides). 9

9. Head strongly rounded anteriorly; first spine of genal comb about half as long as second; hind tibia with the spiniform setae A and B (Fig. 9 A & B). Ctenocephalides canis ................................................................. DOG FLEA

Head not strongly convex anteriorly; first spine of genal comb almost as long as second spine; hind tibia with spiniform seta B, spiniform seta A replaced by a minute seta which may be absent in some specimens (Fig. 9 C & D). Ctenocephalides felis ................................................................. CAT FLEA

![Head strongly rounded](Fig. 9 A)
![Head not strongly convex](Fig. 9 B)
![Ctenocephalides canis](Fig. 9 C)
![Ctenocephalides felis](Fig. 9 D)
SNAKES: PICTORIAL KEY TO VENOMOUS SPECIES IN UNITED STATES
PART I
Chester J. Stojanovich and Margaret A. Parsons

loreal pit absent, if ringed red and yellow
rings always separated by black

loreal pit present, if absent
red and yellow rings touch

yellow  black  red

yellow  red  yellow

NON-VENOMOUS SNAKES

loreal pit present

loreal pit absent

neck ring black

neck ring red

Micrurus fulvius
TRUE CORAL SNAKE
M. f. fulvius
Southeastern
M. f. barbouri
Florida
M. f. tenere
Arkansas, Texas

Micruroides euryxanthus
ARIZONA CORAL SNAKE
tail blunt or with rattle

Agkistrodon contortrix
COPPERHEAD
A. c. contortrix
Southeastern
A. c. latincinctus
Texas, Oklahoma, Kansas
A. c. mohasen
Eastern
A. c. pictigaster
Texas

Agkistrodon piscivorus
WATER MOCCASIN
A. p. piscivorus
Southeastern
A. p. leucostoma
Southeastern

SEE PART II

loreal scale present

loreal scale absent
PART II

head with large scales medially

head with small scales medially

upper preocular usually touching postnasal

upper preocular and postnasal separated

Sistrurus catenatus
Massachusetts Rattlesnake

S. c. catenatus
Great Lakes & Central U.S.

S. c. edwardsii
Arizona, Colorado, New Mexico, Texas

S. c. tergeminus
Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas

Sistrurus miliarius
PIGMY RATTLESNAKE

S. m. miliarius
Southeastern

S. m. barburi
Southeastern

S. m. streckeri
Southeastern

supraocular scale modified into a hornlike ridge

supraocular scale not modified into a hornlike ridge

Crotalus cerastes
SjDEWINDER Rattlesnake

C. c. cerastes
Arizona, California, Nevada, Utah

C. c. cerbomalous
C. c. laterorepens
Arizona

internasal ridge present

internasal ridge absent

Crotalus willardi
RIDGE-NOSED Rattlesnake

C. w. willardi
New Mexico

C. w. willardi
Arizona

dorsal blotches on body divided into 2 parallel rows
first supralabial scale broadly attached to postnasal scale

Crotalus pricei
TWIN-SPIOTTED Rattlesnake

Arizona

dorsal blotches on body not divided into 2 parallel rows
first supralabial scale not broadly attached to postnasal scale, sometimes completely separated

SEE PART III
PART III

**Prenasal and rostral usually separated**

- Crotalus mitchelli pyrrhus
  - SOUTHWESTERN SPECKLED RATTLE SNAKE
  - Arizona, California, Nevada, Utah

- Upper preocular usually separated vertically, anterior portion raised above posterior portion

**Prenasal and rostral attached**

- Upper preocular usually not separated, if separated anterior portion not raised above posterior portion

**Crotalus lepidus**
- ROCK RATTLE SNAKE

**Crotalus adamanteus**
- EASTERN DIAMONDBACK RATTLE SNAKE
  - Southeastern

**Crotalus viridis**
- WESTERN RATTLE SNAKE
  - C. v. viridis: West Central U.S.
  - C. v. abyssus: Arizona
  - C. v. cerberus: Arizona
  - C. v. concolor: Colorado, Utah
  - C. v. helleri: California
  - C. v. latouesi: Nevada & adjoining states
  - C. v. nuntius: Arizona
  - C. v. oreganus: California, Idaho, Oregon, Washington

- Supraocular scale divided, pitted or margins uneven

**Crotalus mitchelli stephensi**
- PANAMINT RATTLE SNAKE
  - California, Nevada

SEE PART IV
PART IV

**Tail without distinct rings**

**Tail with distinct rings**

**Anterior frontal area with large scales**

**Anterior frontal area with scales not much larger than posterior scales**

*Crotalus molossus*
BLACK-TAILED RATTLE SNAKE Southwestern

*Crotalus horridus*
CANE BRAKE OR TIMBER RATTLE SNAKE

*Crotalus scutulatus*
MOHAVE RATTLE SNAKE Arizona, California, Nevada, New Mexico, Texas

**Crotalus tigris**
TIGER RATTLE SNAKE Arizona

**Crotalus atrox**
WESTERN DIAMONDBACK RATTLE SNAKE Southwestern

**Crotalus ruber**
RED DIAMONDBACK RATTLE SNAKE California
BIRDS: PICTORIAL KEY TO SOME COMMON PEST SPECIES OF PUBLIC HEALTH IMPORTANCE
Margaret A. Parsons and Chester J. Stojanovich

COMMON PIGEON
- Male, black body, head brown
- Female, overall dull grey color

COMMON COWBIRD
- Male, wing with red 'epaulets'
- Female, breast heavily striped, light eye stripe

RED-WINGED BLACKBIRD
- Male, plain bronze or dull purple back, tail long
- Female: less iridescent, smaller size

CRACKLES
- Winter, bill dark, body heavily speckled with light dots
- Spring, bill yellow, color purple and green

STARLING
- Male and female, very large size, coal black color, tail flat

CROWS
PIGEON, COLUMBA LIVIA – EXTERNAL MORPHOLOGY
Harold George Scott and Walter S. Dougherty

Crown
Eyelid fringe
Skull back
Iris
Orbital cere
Auricular feathers
Nape
Neck blend

Shoulder
Scapular feathers
Back region
Tertial feathers
Second wing bar
Rump
First wing bar
Secondary remiges
Primary remiges
Dorsal tail coverts

Rectrices

Crest
Belly
Vent region
Ventral tail coverts
Hock
Tarsus
Milk toe

Crop region
Lesser wing coverts
Wing butt
Median wing coverts
Secondary wing coverts

Leg
Outer toe
Middle toe
Claw
Inner toe
RODENTS: PICTORIAL KEY TO SOME COMMON UNITED STATES GENERA

Harold George Scott and Margery R. Borum

RATS
- Domestic
- Tail almost naked, scaly
  - Large (9-17" long)
  - Small (5-7" long)

MICE
- House
- Tail long
- Tail short
- Hair short
- Hair long

WOOD RATS
- Peromyscus

PENNSYLVANIA WHITET-FOOTED MICE
- Tail bones longer than 1/2 body
  - Large (about 16" long)
  - Small (7-9" long)

GEORGIA EAST POCKET Gophers
- Tail bones shorter than 1/2 body
  - Front feet enlarged
  - Front feet not enlarged

SCiURUS
- Tree Squirrels
- Tail bushy

Dipodomys
- Kangaroo Rats
- Tail not bushy

Citellus
- Ground Squirrels

Tamias EAST
- Chipmunks

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1962
DOMESTIC RODENTS AND COCKROACHES: PICTORIAL KEY TO DROPPINGS
Harold George Scott and Margery R. Borom

length over 1/3-inch*

- rectangular, blunt
  - Rattus norvegicus
    - NORWAY RAT

- elongate, pointed
  - Rattus rattus
    - ROOF RAT

length under 1/4-inch*

- without ridges
  - length about 1/4-inch
    - Mus musculus
      - HOUSE MOUSE

- with ridges
  - length about 1/16-inch
    - Blattella germanica
      - GERMAN COCKROACH

- with ridges
  - length about 1/32-inch
    - Periplaneta americana
      - AMERICAN COCKROACH

    - Blatta orientalis — ORIENTAL COCKROACH

    - Periplaneta fuliginosa — SMOKY BROWN COCKROACH

- with ridges
  - length about 1/32-inch
    - Periplaneta australasiae
      - AUSTRALIAN COCKROACH

    - Periplaneta brunnea
      - BROWN COCKROACH

    - Supella lateralis
      - BROWN-BANDED COCKROACH

*All characteristics for average, dry, adult droppings. Study groups, not individual droppings.
PRAIRIE DOGS: PICTORIAL KEY TO COMMON NORTH AMERICAN SPECIES
(Cynomys)
Harry Weinburgh and Margery R. Boron

- Tail white-tipped, long, more than 1.5 times total length
- Tail white-tipped, short, less than 1.5 times total length

- Black on tail, covering most of dorsal tail
  - HEAD ONLY
  - Black on tail confined to dorsal shunt
    - TEXAS TO SASKATCHEWAN

- Terminal half tail white without dark center
- Terminal half tail with dark center (gray)

- Summer color in light cinnamon or clay
  color mixed with buff, darker on rump
  CENTRAL VALLEYS OF UTAH
- Summer color grayish (pinkish buff mixed with black);
  dark patch on cheek and above eye
  WYOMING, COLORADO, AND EASTERN UTAH

- UTAH PRAIRIE DOG
- WHITE-TAILED PRAIRIE DOG

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia – 1964
**RABBITS AND HARES: PICTORIAL KEY TO COMMON UNITED STATES SPECIES**

Harold George Scott and Margery R. Borom

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**Note:** Rabbits and hares are lagomorphs, not rodents. The incisor teeth are used to differentiate these two groups of mammals.

**Genus Sylvilagus**

**RABBITS**

- **Western U.S.**
  - Total length under 11-1/2 inches

- **Sylvilagus idahoensis**
  - Pygmy Rabbit
  - Total length 6.2 to 7.5 times ear length

- **Sylvilagus palustris**
  - Marsh Rabbit
  - Total length about 6.2 times ear length

- **Sylvilagus audubonii**
  - Desert Cottontail
  - Total length about 6.7 times ear length

- **Sylvilagus nuttalli**
  - Nuttall Cottontail
  - Total length about 5.9 times ear length

- **Sylvilagus floridanus**
  - Eastern Cottontail
  - Total length about 7.4 times ear length

- **Sylvilagus transitionalis**
  - New England Cottontail
  - Total length about 4.8 times ear length

- **Sylvilagus bachmani**
  - Brush Rabbit
  - Total length about 7.2 times ear length

- **Sylvilagus aquaticus**
  - Swamp Rabbit
  - Total length 6.2 to 18-1/4 inches

**HARES**

- **Southeastern U.S.**
  - Total length over 20 inches

- **Sylvilagus townsendii**
  - White-Tail Jack
  - Total length about 7.2 times ear length under tail white

- **Sylvilagus americana**
  - Varying Hare
  - Total length about 6-7 times ear length tail dark

- **Lepus americanus**
  - Black-Tail Jack
  - Total length 11-3/4 to 18-1/4 inches

- **Lepus townsendi**
  - White-Tail Jack
  - Hind foot about over 4-1/8 inches long

- **Lepus californicus**
  - Black-Tail Jack
  - Hind foot about over 4-1/8 inches long

**Lepus**

- **Lepus californicus**
  - Black-Tail Jack
  - Total length under 11-1/2 inches

**Genus Lepus**

- **Lepus townsendi**
  - White-Tail Jack
  - Total length over 20 inches

- **Lepus eurasiensis**
  - European Hare
  - Total length less than 6 times ear length

- **Lepus americanus**
  - Varying Hare
  - Total length about 6-7 times ear length tail dark

- **Lepus townsendi**
  - White-Tail Jack
  - Total length about 7.2 times ear length under tail white

- **Lepus californicus**
  - Black-Tail Jack
  - Total length 11-3/4 to 18-1/4 inches

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*All measurements for adults.

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia — 1962
BATS: PICTORIAL KEY TO UNITED STATES GENERA

Harold George Scott and Chester J. Stajanovich

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia — 1960 — Revised 1962
SELECTED REFERENCES

GENERAL


CRUSTACEA


CENTIPEDES


MILLIPEDES


SPIDERS


SCORPIONS


TICKS


MITES


SILVERFISH


COLLEMBOLA


COCKROACHES


TERMITES


EARWIGS


PSOCIDS


LICE (Anoplura)


LICE (Mallophaga)

**LICE (Mallophaga) (continued)**


**BUGS**


**LEPIDOPTERA**


**BEETLES**


**HYMENOPTERA**


FLIES


MOSQUITOES


Stojanovich, C.J. 1960-61. Illustrated key to common mosquitoes of (I) Southeastern United States, (II) Northeastern North America. Publ. by Author, P.O. Box 727, Emory University Branch, Atlanta, Georgia, 36 + 49 pp.

FLEAS


SNakes


BIRDS


RODENTS, RABBITS, AND HARES


BATS
