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

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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. associated with histoplasmosis, ornithosis and many other diseases. infest stored food.</td>
</tr>
<tr>
<td>Bird</td>
<td>sting; infest intestinal tract.</td>
</tr>
<tr>
<td>Book Louse, Psocid</td>
<td>venemous bite; infest nasal, intestinal, and urinary tracts.</td>
</tr>
<tr>
<td>Caterpillar</td>
<td>infest domestic birds and mammals.</td>
</tr>
<tr>
<td>Centipede</td>
<td>transmit enteric diseases.</td>
</tr>
<tr>
<td>Chewing Louse</td>
<td>infest stored food; used as indicator organisms for pesticide studies.</td>
</tr>
<tr>
<td>Cockroach</td>
<td>involved in transmission of broad fish tapeworm and guinea worm.</td>
</tr>
<tr>
<td>Collembola</td>
<td>infest houses; harmless.</td>
</tr>
<tr>
<td>Copra</td>
<td>cause dermatitis; transmit plague, murine typhus, tapeworms.</td>
</tr>
<tr>
<td>Daddy Long-leg Spider</td>
<td>some bite; larvae infest human flesh; transmit typhoid, paratyphoid, cholera, bacillary dysentery, infantile diarrhea, amebic dysentry, giardiasis, helminthes, trachoma, conjunctivitis, yaws, anthrax, tularemia, African sleeping sickness, eishianiasis, onchocerciasis, lolasis, bartonellosis, sandfly fever. occasionally bite man.</td>
</tr>
<tr>
<td>Earwig</td>
<td>transmit Chagas disease.</td>
</tr>
<tr>
<td>Flea</td>
<td>transmit tularemia and many other diseases.</td>
</tr>
<tr>
<td>Fly</td>
<td>involved in transmission of oriental lung fluke.</td>
</tr>
<tr>
<td>Ked or Louse Fly</td>
<td>produce vesicating venom; infest digestive and urinary tract; intermediate host of tapeworms.</td>
</tr>
<tr>
<td>Kissing Bug</td>
<td>cause dermatitis; infest human intestine; transmit scrub typhus, rice-ettisialpox, epidemic hemorrhagic fever.</td>
</tr>
<tr>
<td>Lagomorph</td>
<td>transmit malaria, encephalitis, yellow fever, dengue, filariasis.</td>
</tr>
<tr>
<td>Lobster, Crab, etc.</td>
<td>infest stored food; infest human intestine; some have stinging hairs.</td>
</tr>
<tr>
<td>Millipede</td>
<td>infest houses; harmless.</td>
</tr>
<tr>
<td>Mite</td>
<td>transmit leptospirosis, lymphocytic choriomeningitis, etc.</td>
</tr>
<tr>
<td>Mosquito</td>
<td>sting.</td>
</tr>
<tr>
<td>Moth or Butterfly</td>
<td>appearance causes fear; harmless.</td>
</tr>
<tr>
<td>Pseudoscorpion</td>
<td>infest stored food; transmit enteric diseases.</td>
</tr>
<tr>
<td>Rodent</td>
<td>venomous bite; secondary infection of bites.</td>
</tr>
<tr>
<td>Scorpion</td>
<td>household pests; harmless.</td>
</tr>
<tr>
<td>Sea Spider</td>
<td>venomous bite.</td>
</tr>
<tr>
<td>Silverfish, Firebrat</td>
<td>cause dermatitis; transmit epidemic typhus, trench fever, relapsing fever.</td>
</tr>
<tr>
<td>Snake</td>
<td>non-venomous bite.</td>
</tr>
<tr>
<td>Sowbug, Pillbug</td>
<td>destroy wood; housing deterioration.</td>
</tr>
<tr>
<td>Spider</td>
<td>bite man occasionally.</td>
</tr>
<tr>
<td>Sucking Louse</td>
<td>cause dermatitis, tick paralysis; transmit spotted fever, relapsing fever, tularemia, Colorado tick fever, Russian spring-summer encephalitis. appearance causes fear; harmless.</td>
</tr>
<tr>
<td>Sun Spider</td>
<td></td>
</tr>
<tr>
<td>Termite</td>
<td></td>
</tr>
<tr>
<td>Thrips</td>
<td></td>
</tr>
<tr>
<td>Tick</td>
<td></td>
</tr>
<tr>
<td>Whip Scorpion</td>
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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.
ARHTROPODS 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 & D) ......................................................... 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) ................................................................. 6

Wings absent or rudimentary (Fig. 3 B & C) ............................................................... 11

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

Fig. 5 A

Fig. 5 B

6. Mouthparts adapted for sucking, with elongate proboscis (Fig. 6 A) ...................................... 1

Mouthparts adapted for chewing, without elongate proboscis (Fig. 6 B) ................................. 9

Fig. 6 A

Fig. 6 B

7. Wings densely covered with scales; proboscis coiled (Fig. 7 A). ORDER LEPIDOPTERA ............ 7

Wings not covered with scales; proboscis not coiled (Fig. 7 B) .............................................. 8

Fig. 7 A

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

Fig. 8 A

Fig. 8 B
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

Fig. 10 A  
Fig. 10 B

Ind wing much smaller than front wing (Fig. 10 B). ORDER IMMENOPTERA........................

BEE, HORNET, WASP, YELLOW JACKET, OR ANT

11. Front wings horny or leathery, without distinct veins (Fig. 11 A).............................12

Fig. 11 A  
Fig. 11 B

Front wings leathery or paper-like, with distinct veins (Fig. 11 B). ORDER ORTHOPTERA........COCKROACH

12. Abdomen with prominent cerci; wings shorter than abdomen (Fig. 12 A). ORDER DERMAPtera.......EARDWIG

Fig. 12 A  
Fig. 12 B

Abdomen without prominent cerci; wings covering abdomen (Fig. 12 B). ORDER COLEOPTERA.......BEETLE
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 ....... EARWIG
    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 COLEMBOLA ..................... SPRINGTAIL

   Abdomen with more than 6 segments (Fig. 18 B). ORDER MALLOPHAGA ..................... CHEWING LICE

   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 LICE 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

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

Fig. 21 A

Fig. 21 B

22. Foot terminating in protractable bladder (Fig. 22 A). ORDER THYSANOPTERA.................................. THrips

Foot not terminating in protractable bladder (Fig. 22 B). ................................................. 23

Fig. 22 A

Fig. 22 B

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

Beak not jointed (Fig. 23 B). ................................................. 24

Fig. 23 A

Fig. 23 B

24. Mouthparts retracted into head (Fig. 24 A). ORDER ANOPLURA........................................ Sucking Lounge

Mouthparts not retracted into head (Fig. 24 B). ORDER DIPTERA............................... KED OR LOOSE FLY

Fig. 24 A

Fig. 24 B
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) ............................................................... 21

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
29. With large pincer-like claws (Fig. 29 A). ORDER PSEUDOSCOPIONIDA.
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.

Fig. 29 A
Fig. 29 B

Fig. 30 A
Fig. 30 B

Fig. 31 A
Fig. 31 B

Fig. 32 A
Fig. 32 B
33. Five to 7 pairs of walking legs (Fig. 33 A). CLASS CRUSTACEA

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

34. Abdomen without appendages (Fig. 34 A). ORDER CEPHALOCARIDA

Abdomen with appendages (Fig. 34 B).

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

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

ORDER ISOPODA

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

Two pairs of legs per body segment (Fig. 36 B). CLASS DIPLOPODA

CENTIPEDE

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

with 6 legs, head definite
flattened laterally flattened dorsoventrally

with 8 legs, head indefinite
under 4 mm, in length over 4 mm, in length
Haller's organ absent Haller's organ present

Plea

chewing mouthparts sucking mouthparts

Linognathus setosus
Dog Sucking Louse

Demodex canis
Demodectic Mange Mite

with 2 claws

with 1 claw

legs short, stubby
legs long, slender

Heterodexus spiniger
Kangaroo Louse

Trichodectes canis
Dog Biting Louse

Sarcoptes scabiei canis
Narcoptic Mange Mite

Otodexus cynotis
Ear Mite

genital comb present
spine 1 short

spine 1 long

genital comb absent
head squared
head rounded

Ctenocephalides canis
Dog Flea

Ctenocephalides felis
Cat Flea

Echidnophaga gallinacea
Sticktight Flea

Pulex simulans
False Human Flea

palpi long
ornately decorated

palpi short
basis capitulum produced

basis capitulum not produced

Amblyomma americanum
Lone Star Tick

Dermacentor variabilis
American Dog Tick

Rhipicephalus sanguineus
Brown Dog Tick

Ixodes scapularis
Black-Legged Tick

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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

*Otodius megnini* SPINOSE EAR TICK

*Rhipicephalus sanguineus* BROWN DOG TICK
CRUSTACEA: KEY TO SOME MAJOR ORDERS
Chester J. Stojanovich and Harold George Scott

1. With abdominal appendages (Fig. 1 A). ......................................................... 2
   Without abdominal appendages (Fig. 1 B). ...................................................... 7

Fig. 1 A

Fig. 1 B

2. Carapace present (Fig. 2 A). ............................................................................. 3
   Carapace absent (Fig. 2 B). .............................................................................. 6

Fig. 2 A

Fig. 2 B

3. With dorsal shield (Fig. 3 A). SHIELD SHRIMP. ............................................. Order NOTOSTRACA
   Without dorsal shield (Fig. 3 B). ....................................................................... 4

Fig. 3 A

Fig. 3 B

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4. With bivalve shell (Fig. 4 A). SHELL SHRIMP .......................................................... Order CONCHOSTRACA

Without bivalve shell (Fig. 4 B) .......................................................... 5

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

6. Body laterally compressed (Fig. 6 A). SAND FLEAS, ETC. ..................... Order AMPHIPODA

Body dorso-ventrally compressed (Fig. 6 B). SOWBUGS, PILLBUGS, ETC. .... Order ISOPODA
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

Fig. 7 A

Fig. 7 B

8. Body segmented (Fig. 8 A)................................................................. 9

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

Fig. 8 A

Fig. 8 B

9. Eyes stalked (Fig. 9 A). FAIRY SHRIMP........................................ Order ANOSTRACA

Eyes not stalked (Fig. 9 B). COPEPODS......................................... Order EUCOPEorida

Fig. 9 A

Fig. 9 B
CENTIPEDES: KEY TO SOME IMPORTANT UNITED STATES SPECIES
Harold George Scott

1. 8 dorsal plates: 15 pairs of long legs... EASTERN HOUSE CENTIPEDE, Scutigera coleoptrata

   More than 14 dorsal plates.......................................................... 2

   Scutigera coleoptrata

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

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PUBLIC HEALTH SERVICE. Communicable Disease Center, Training Branch, Atlanta, Georgia – 1964
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

   Fig. 1 A

   Fig. 1 B

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

   Fig. 2 A

   Fig. 2 B