

PARASITOLOGY
LABORATORY ONLY

CDC

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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
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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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PUBLIC HEALTH SIGNIFICANCE OF GROUPS INCLUDED IN THE KEY

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

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 4 pairs of walking legs (Fig. 1 A & B).....2
- Five or more pairs of walking legs (Fig. 1 C & D).....33

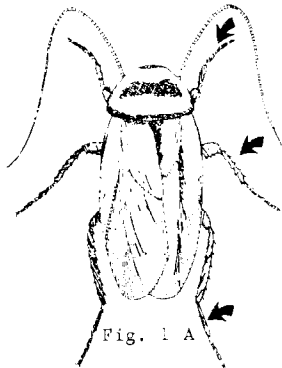


Fig. 1 A

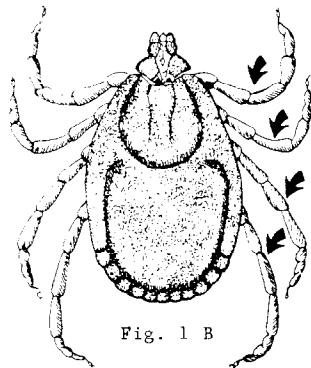


Fig. 1 B

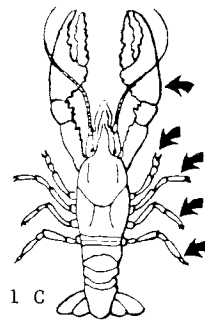


Fig. 1 C

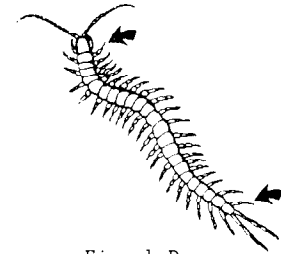


Fig. 1 D

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

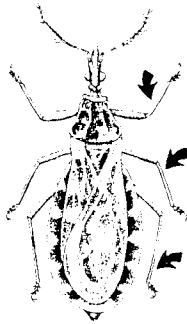


Fig. 2 A

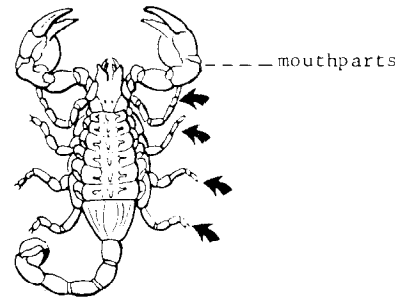


Fig. 2 B

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

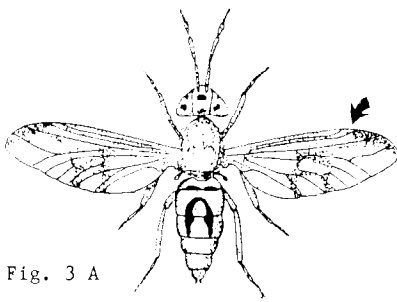


Fig. 3 A

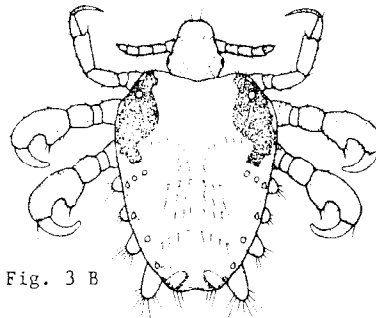


Fig. 3 B

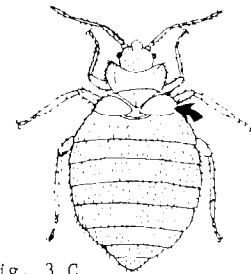


Fig. 3 C

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

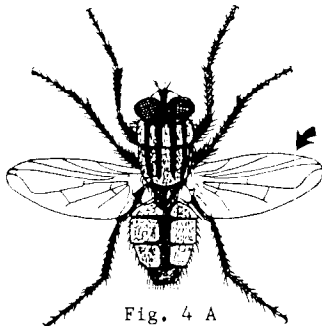


Fig. 4 A

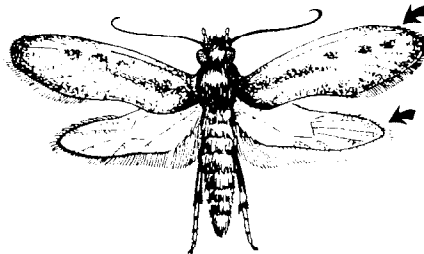


Fig. 4 B

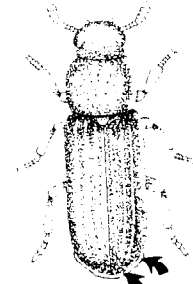


Fig. 4 C

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

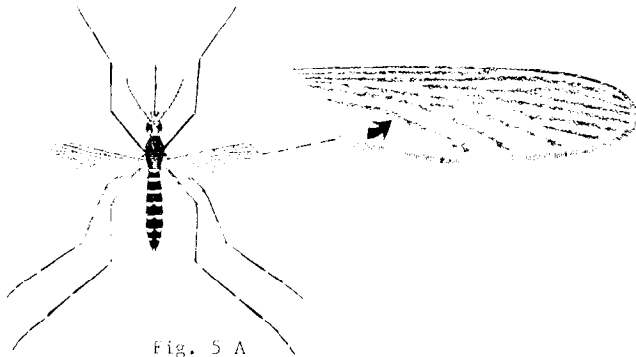


Fig. 5 A

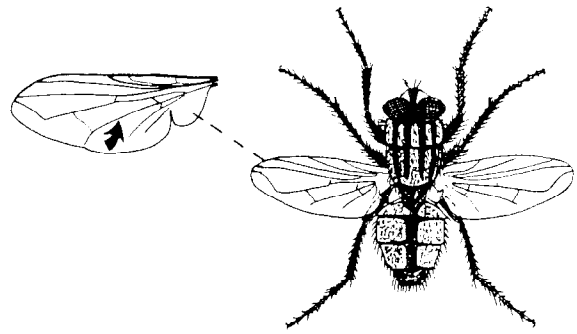


Fig. 5 B

6. Mouthparts adapted for sucking, with elongate proboscis (Fig. 6 A).....7
 Mouthparts adapted for chewing, without elongate proboscis (Fig. 6 B).....9

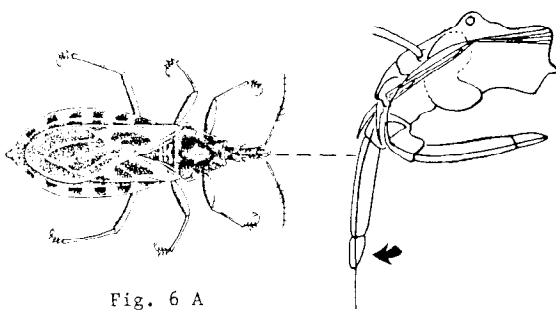


Fig. 6 A

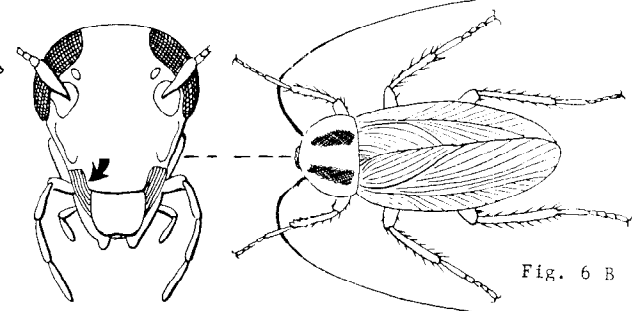


Fig. 6 B

7. Wings densely covered with scales; proboscis coiled (Fig. 7 A). ORDER LEPIDOPTERA.....
MOTH OR BUTTERFLY
 Wings not covered with scales; proboscis not coiled (Fig. 7 B).....8

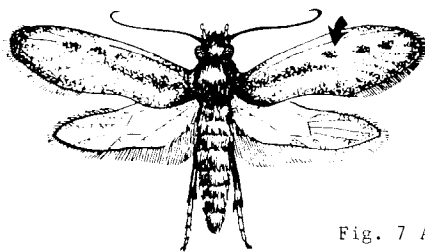


Fig. 7 A

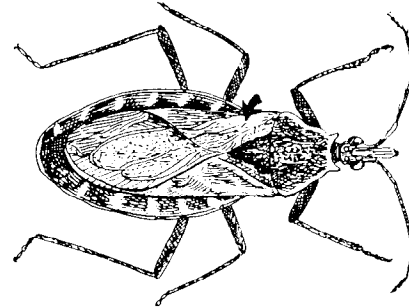


Fig. 7 B

8. Wing with fringe of long hair (Fig. 8 A). ORDER THYSANOPTERA.....THRIPS
 Wing without long hair (Fig. 8 B). ORDER HEMIPTERA.....KISSING BUG

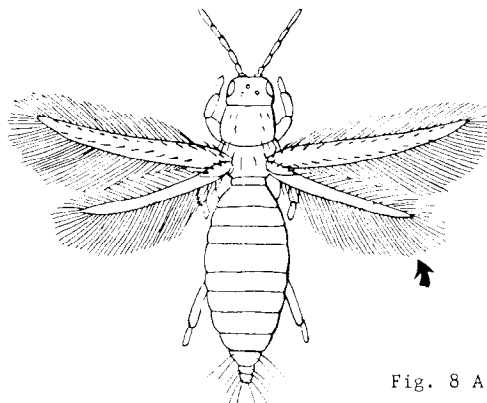


Fig. 8 A

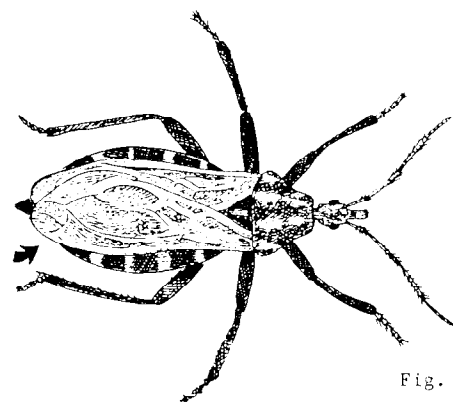


Fig. 8 B

- 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

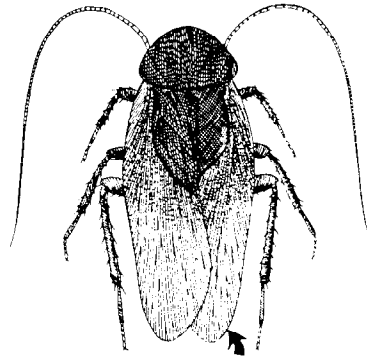


Fig. 9 B

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

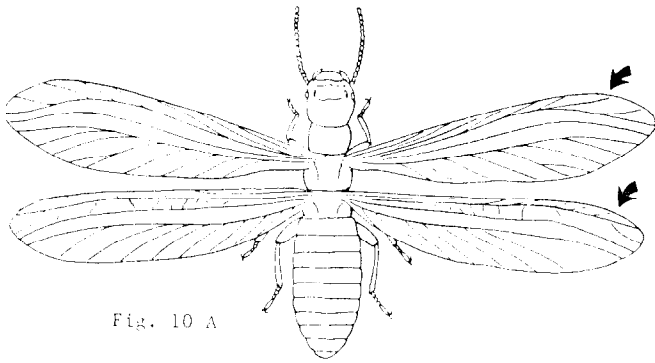


Fig. 10 A



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

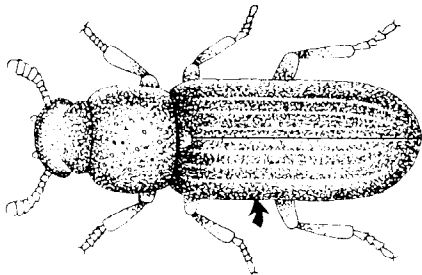


Fig. 11 A

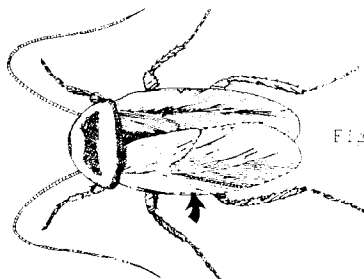


Fig. 11 B

- 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

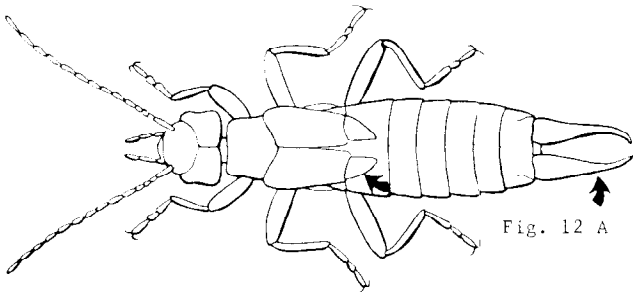


Fig. 12 A

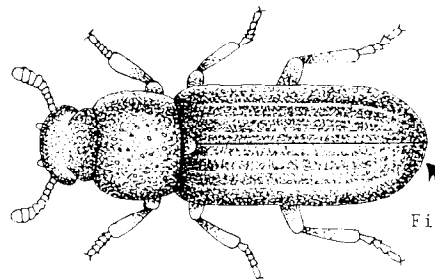


Fig. 12 B

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

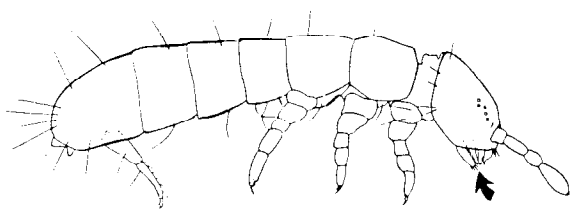


Fig. 13 A

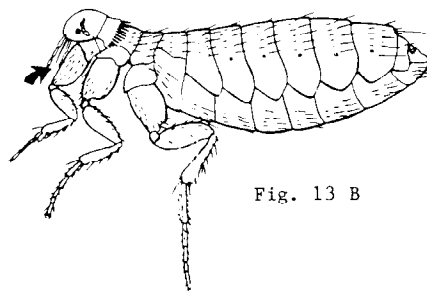


Fig. 13 B

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

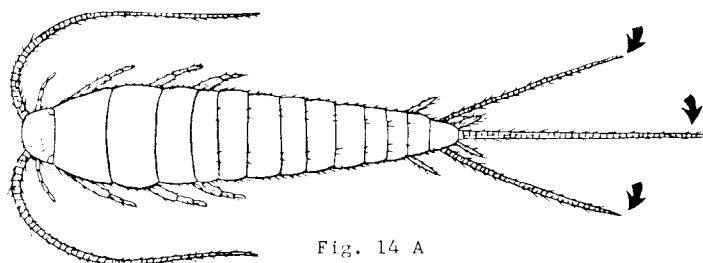


Fig. 14 A

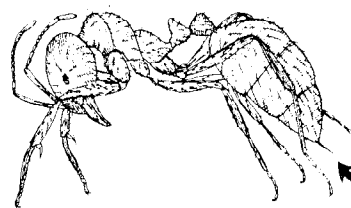


Fig. 14 B

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

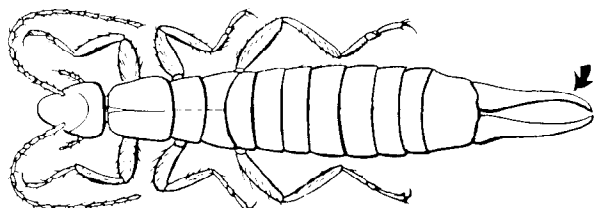


Fig. 15 A



Fig. 15 B

16. With narrow waist (Fig. 16 A). ORDER HYMENOPTERA.....ANT
 Without narrow waist (Fig. 16 B).....17

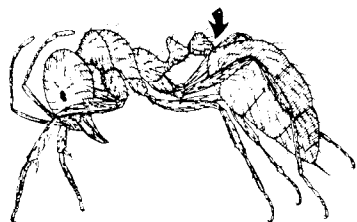


Fig. 16 A

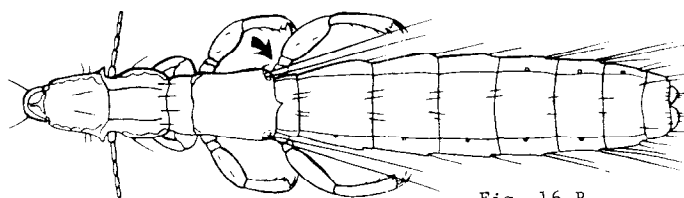


Fig. 16 B

17. Antenna with fewer than 8 segments (Fig. 17 A).....18
 Antenna with more than 8 segments (Fig. 17 B).....19

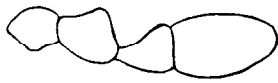


Fig. 17 A

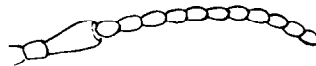


Fig. 17 B

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

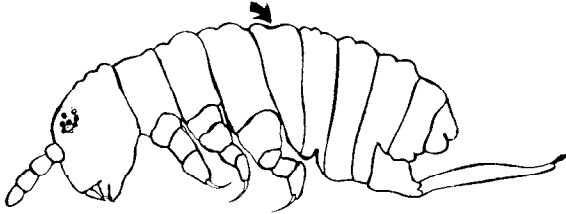


Fig. 18 A

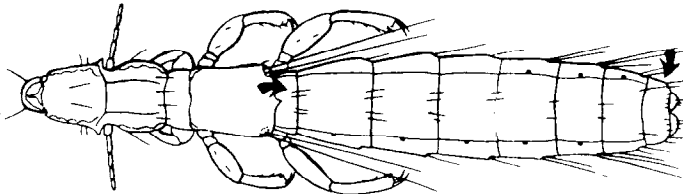


Fig. 18 B

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

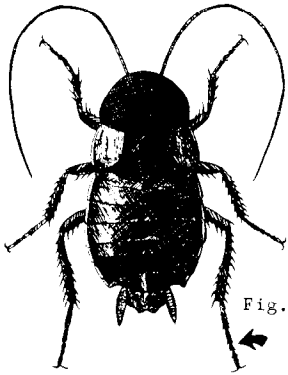


Fig. 19 A

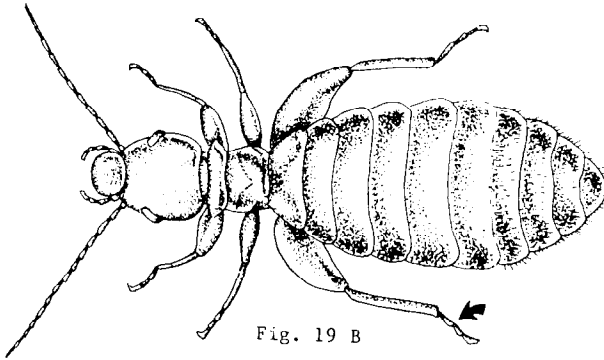


Fig. 19 B

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

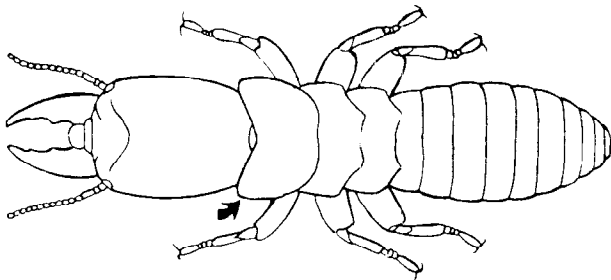


Fig. 20 A

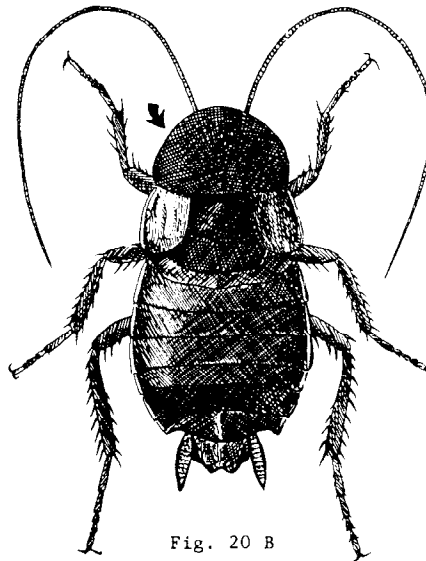


Fig. 20 B

- 21. Flattened laterally (Fig. 21 A). ORDER SIPHONATERA.....FLEA
- Flattened dorso-ventrally (Fig. 21 B).....22

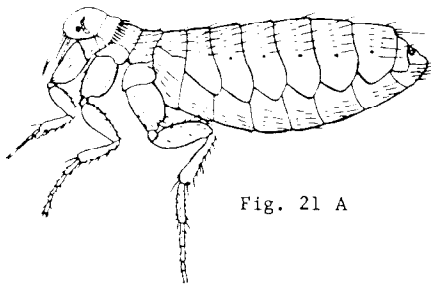


Fig. 21 A

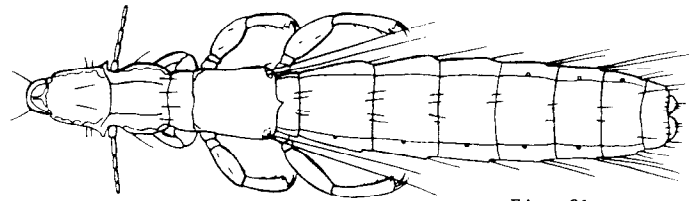


Fig. 21 B

- 22. Foot terminating in protrusible bladder (Fig. 22 A). ORDER THYSANOPTERA.....THRIPS
- Foot not terminating in protrusible bladder (Fig. 22 B).....23

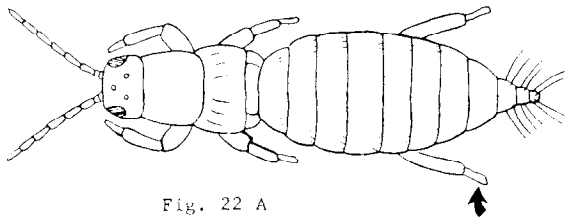


Fig. 22 A

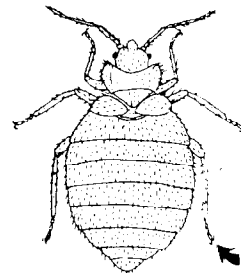


Fig. 22 B

- 23. Beak jointed (Fig. 23 A). ORDER HEMIPTERA.....BEDBUG
- Beak not jointed (Fig. 23 B).....24

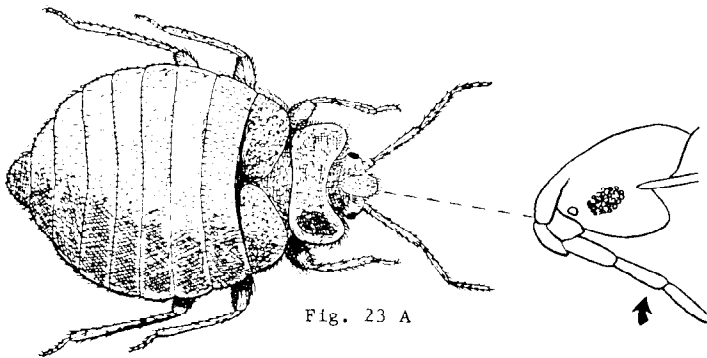


Fig. 23 A

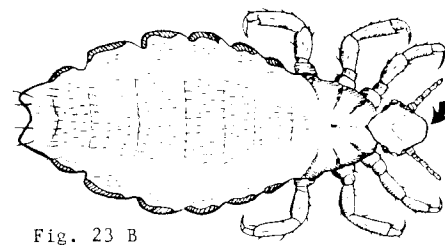


Fig. 23 B

- 24. Mouthparts retracted into head (Fig. 24 A). ORDER ANOPLIURA.....SUCKING LOUSE
- Mouthparts not retracted into head (Fig. 24 B). ORDER DIPTERA.....KED OR LOUSE FLY

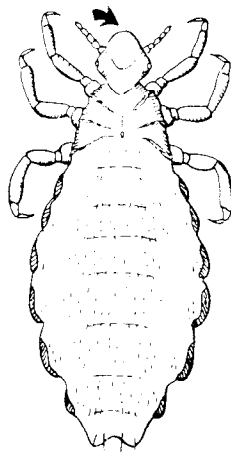


Fig. 24 A

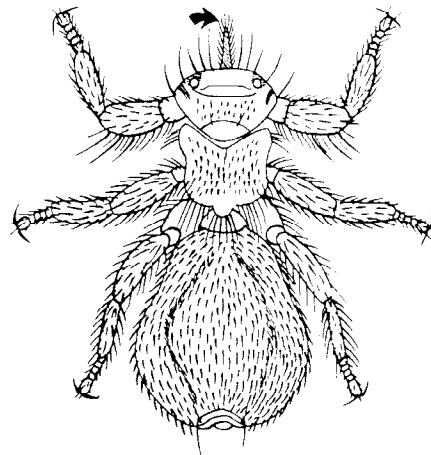


Fig. 24 B

- 25. Abdomen well-developed (Fig. 25 A). CLASS ARACHNIDA.....26
- Abdomen peg-like (Fig. 25 B). CLASS PYCNOGONIDA.....SEA SPIDER

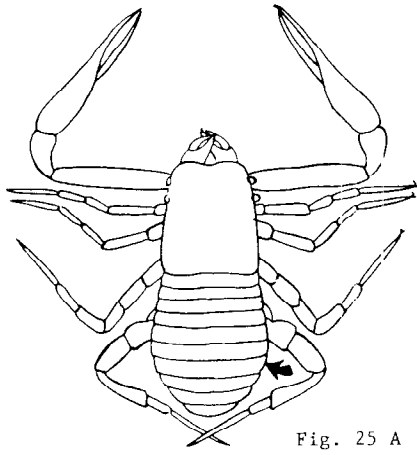


Fig. 25 A

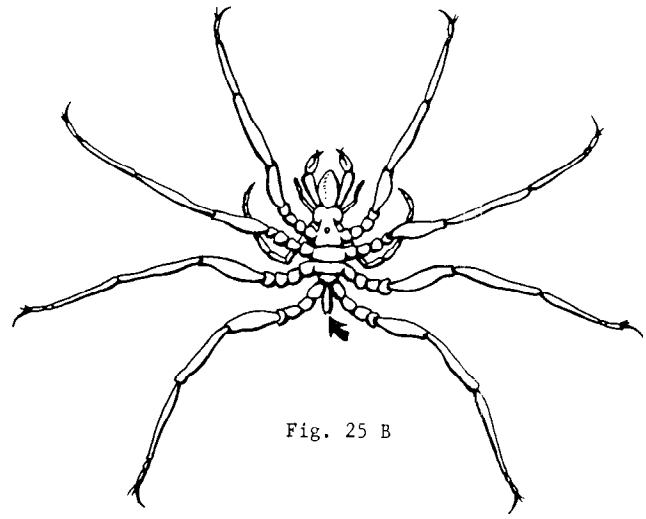


Fig. 25 B

- 26. Abdomen distinctly segmented (Fig. 26 A).....27
- Abdomen not distinctly segmented (Fig. 26 B).....31

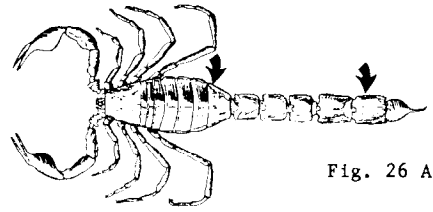


Fig. 26 A

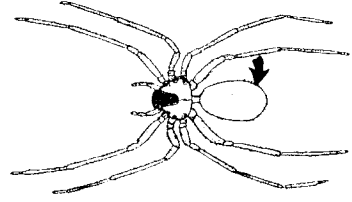


Fig. 26 B

- 27. Abdomen lengthened to form a long tail (Fig. 27 A).....28
- Abdomen not lengthened to form a long tail (Fig. 27 B).....29

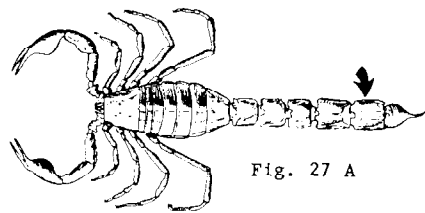


Fig. 27 A

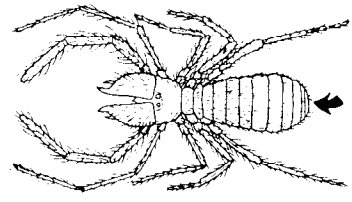


Fig. 27 B

- 28. Tail with stinger (Fig. 28 A). ORDER SCORPIONIDA.....SCORPION
- Tail without stinger (Fig. 28 B). ORDER PEDIPALPIDA.....WHIP SCORPION

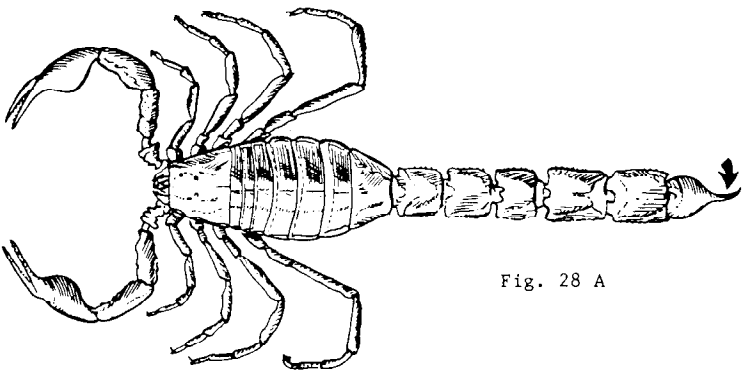


Fig. 28 A

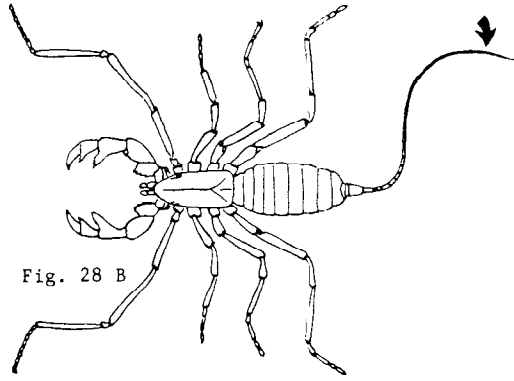


Fig. 28 B

29. With large pincer-like claws (Fig. 29 A). ORDER PSEUDOSCORPIONIDA.....PSEUDOSCORPION
 Without large pincer-like claws (Fig. 29 B).....30

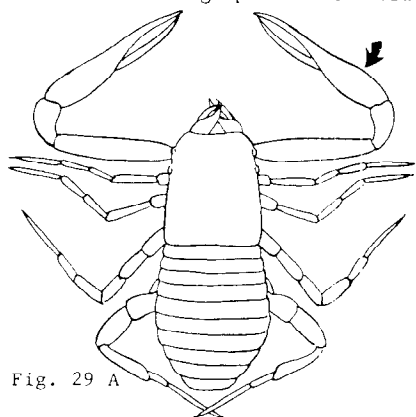


Fig. 29 A

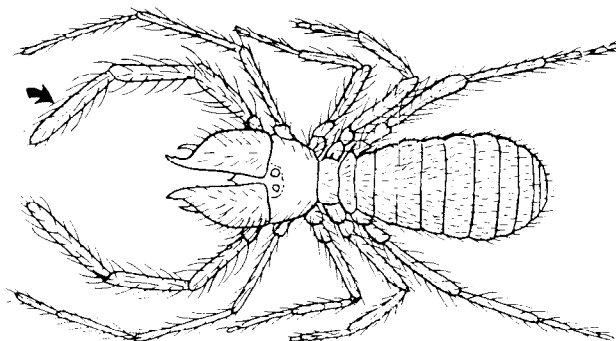


Fig. 29 B

30. Legs not longer than body (Fig. 30 A). ORDER SOLPUGIDA.....SUN SPIDER
 Legs much longer than body (Fig. 30 B). ORDER PHALANGIDA.....LADY LONG-LEG SPIDER

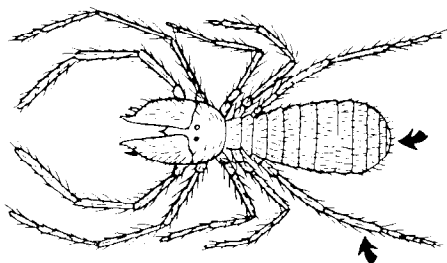


Fig. 30 A

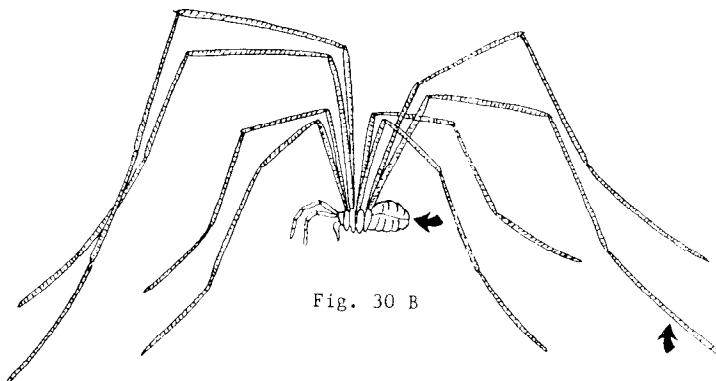


Fig. 30 B

31. Abdomen constricted to form a narrow waist (Fig. 31 A). ORDER ARANEIDA.....SPIDER
 Abdomen not constricted (Fig. 31 B).....32

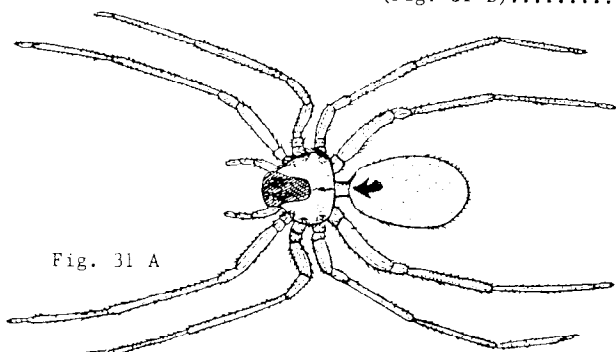


Fig. 31 A

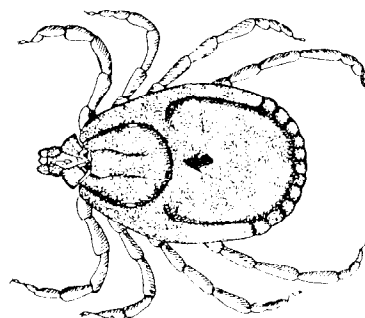


Fig. 31 B

32. Body with long hair; Haller's organ absent (Fig. 32 A). ORDER ACARINA.....MITE
 Body without hair or short hair; Haller's organ present (Fig. 32 B). ORDER ACARINA.....TICK

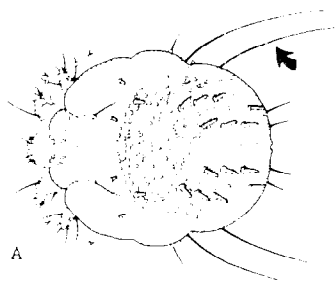


Fig. 32 A

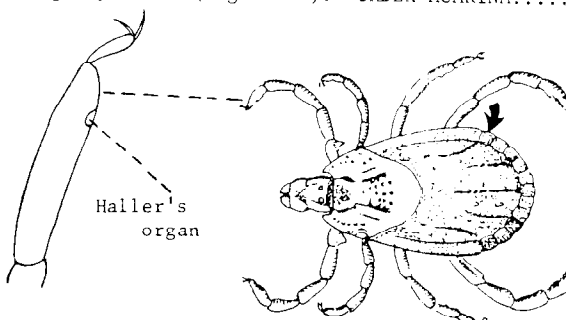


Fig. 32 B

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

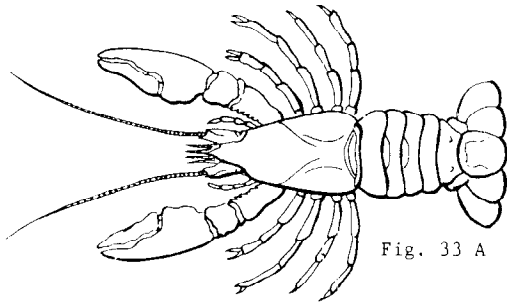


Fig. 33 A

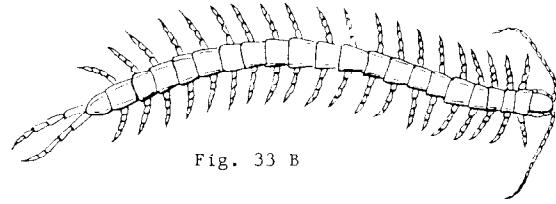


Fig. 33 B

34. Abdomen without appendages (Fig. 34 A). ORDER COPEPODA.....COPEPOD
 Abdomen with appendages (Fig. 34 B).....35

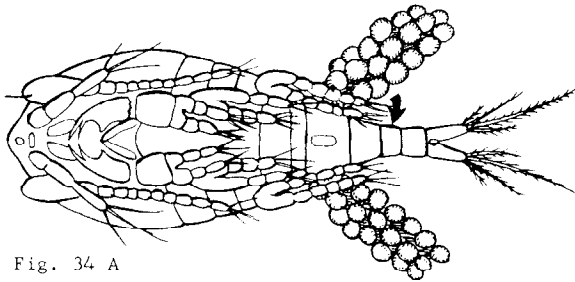


Fig. 34 A

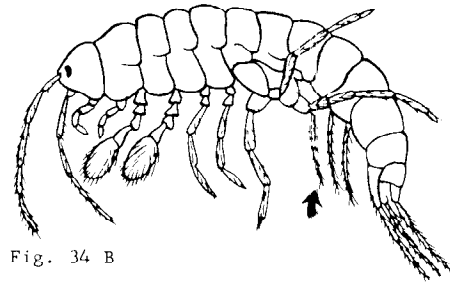


Fig. 34 B

35. Thorax covered with a fused plate; eyes, when present, on movable stalks (Fig. 35 A & B).....
 ORDER DECAPODA.....LOBSTER, CRAB, CRAYFISH, SHRIMP, ETC.
 Thorax not covered with a fused plate; eyes, when present, not on movable stalks (Fig. 35 C & D)...
 ORDER ISOPODA.....SOWBUG, PILLBUG

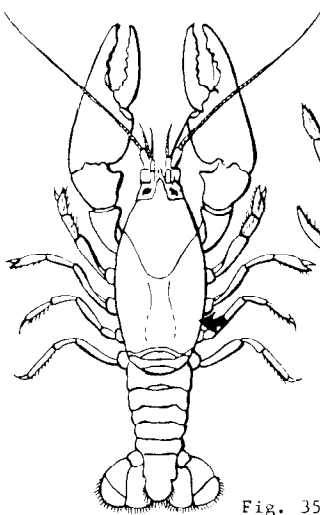


Fig. 35 A

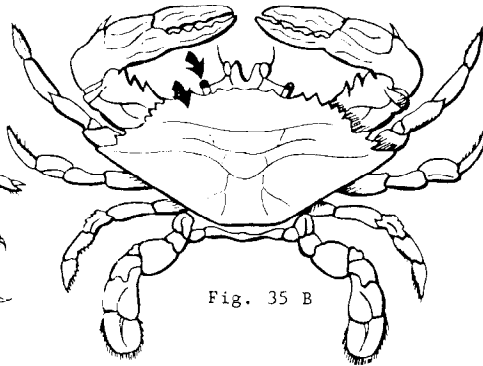


Fig. 35 B

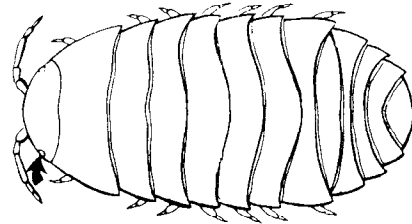


Fig. 35 C

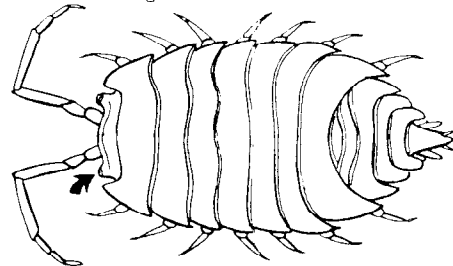


Fig. 35 D

36. One pair of legs per body segment (Fig. 36 A). CLASS CHILOPODA.....CENTIPEDE
 Two pairs of legs per body segment (Fig. 36 B). CLASS DIPLOPODA.....MILLIPEDE

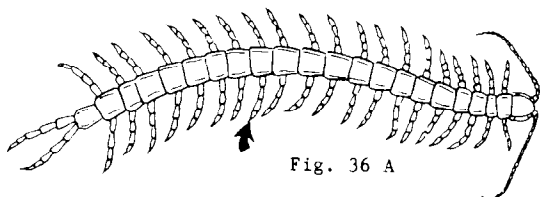


Fig. 36 A

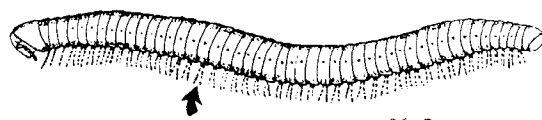
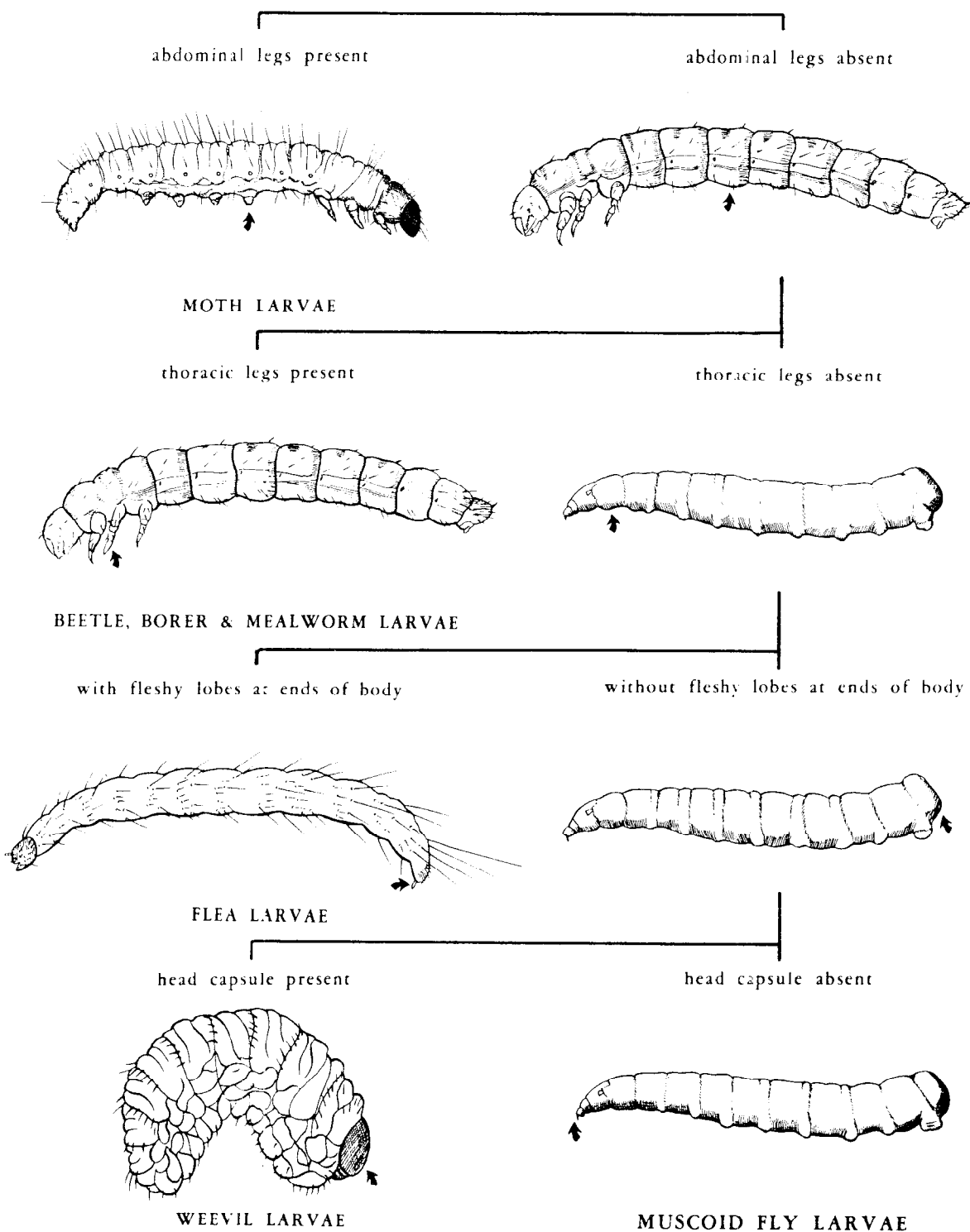


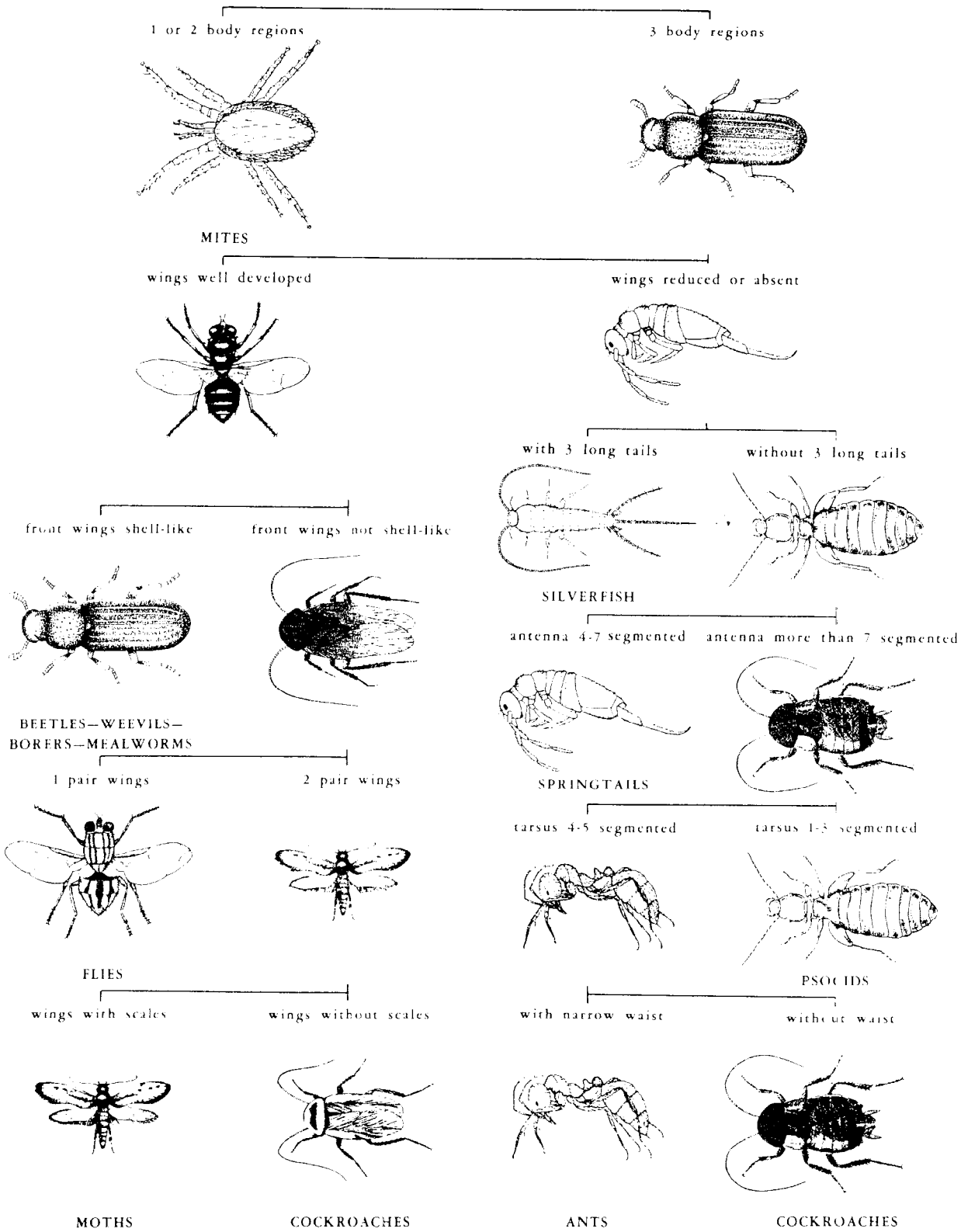
Fig. 36 B

HOUSEHOLD AND STORED-FOOD PESTS: PICTORIAL KEY TO COMMON LARVAE

Chester J. Stojanovich & Harold George Scott

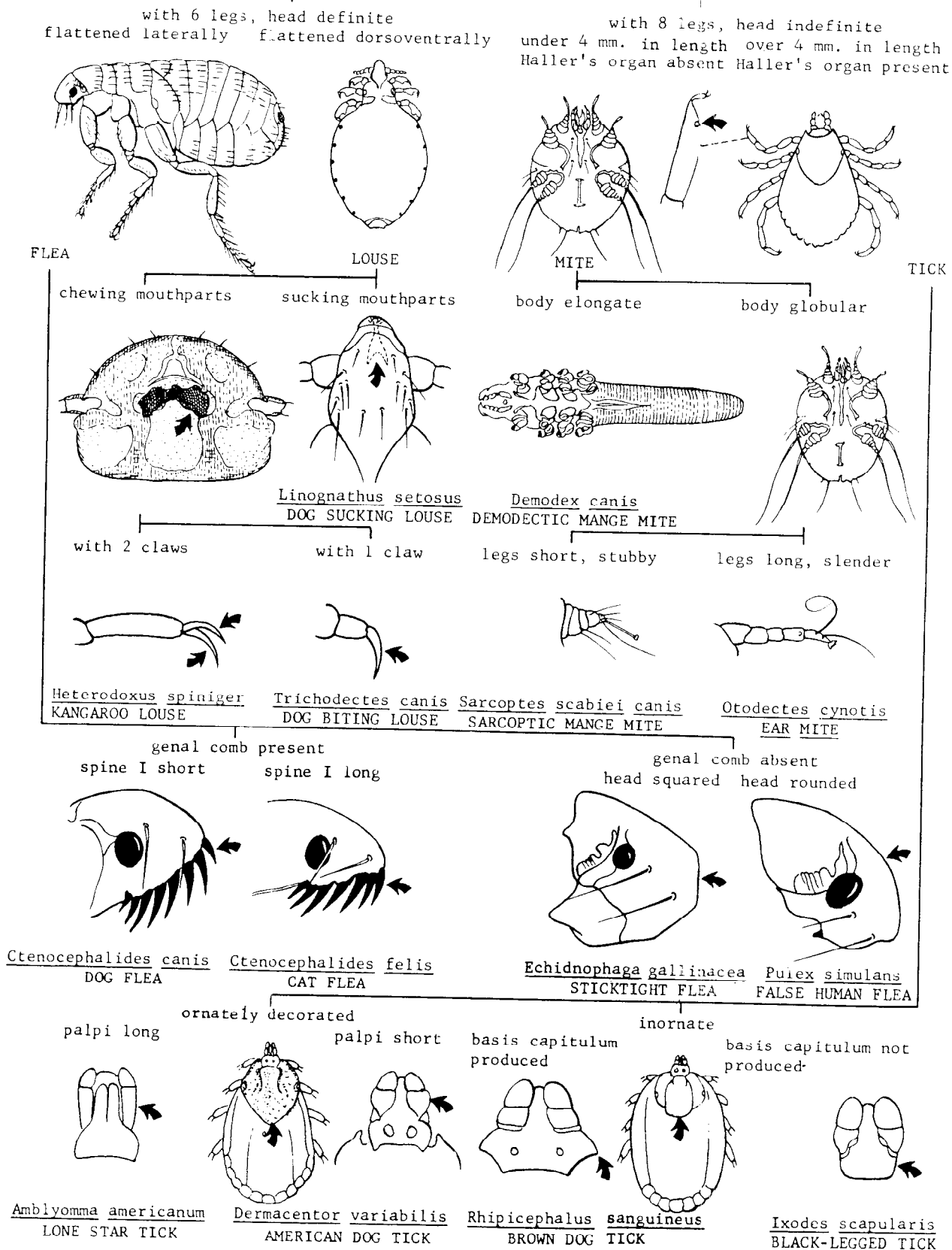


HOUSEHOLD AND STORED-FOOD PESTS: KEY TO COMMON ADULTS
Harold George Scott & Chester J. Stojanovich



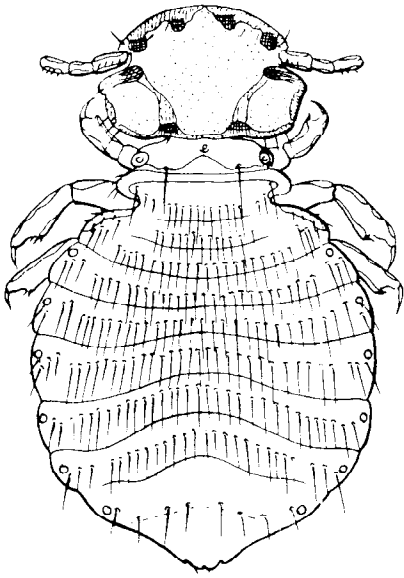
ECTOPARASITES OF THE DOG: PICTORIAL KEY TO COMMON SPECIES

Harold George Scott & Chester J. Stojanovich

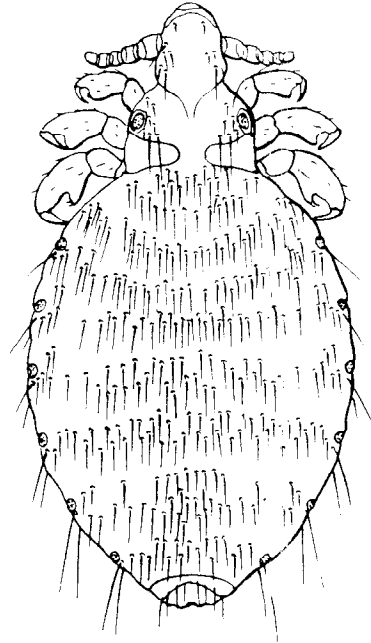


REPRESENTATIVE ECTOPARASITES OF THE DOG

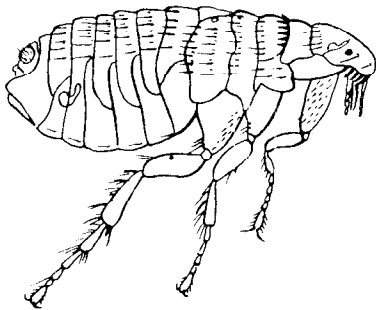
Chester J. Stojanovich



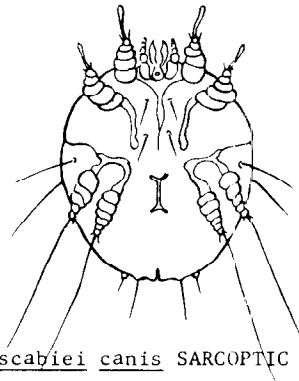
Trichodectes canis DOG BITING LOUSE



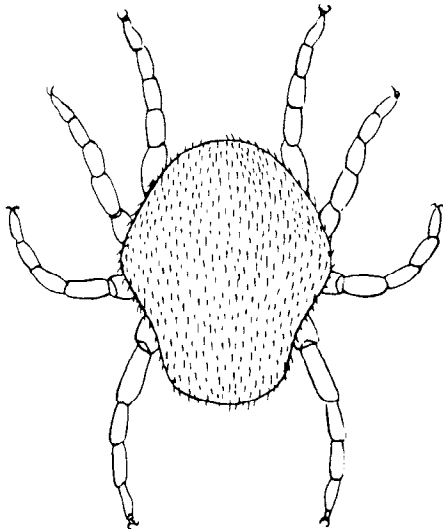
Linognathus setosus DOG SUCKING LOUSE



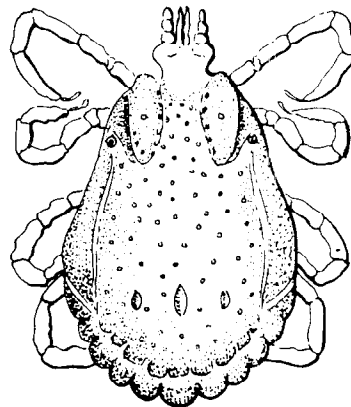
Ctenocephalides felis CAT FLEA



Sarcoptes scabiei canis SARCOPTIC MANGE MITE

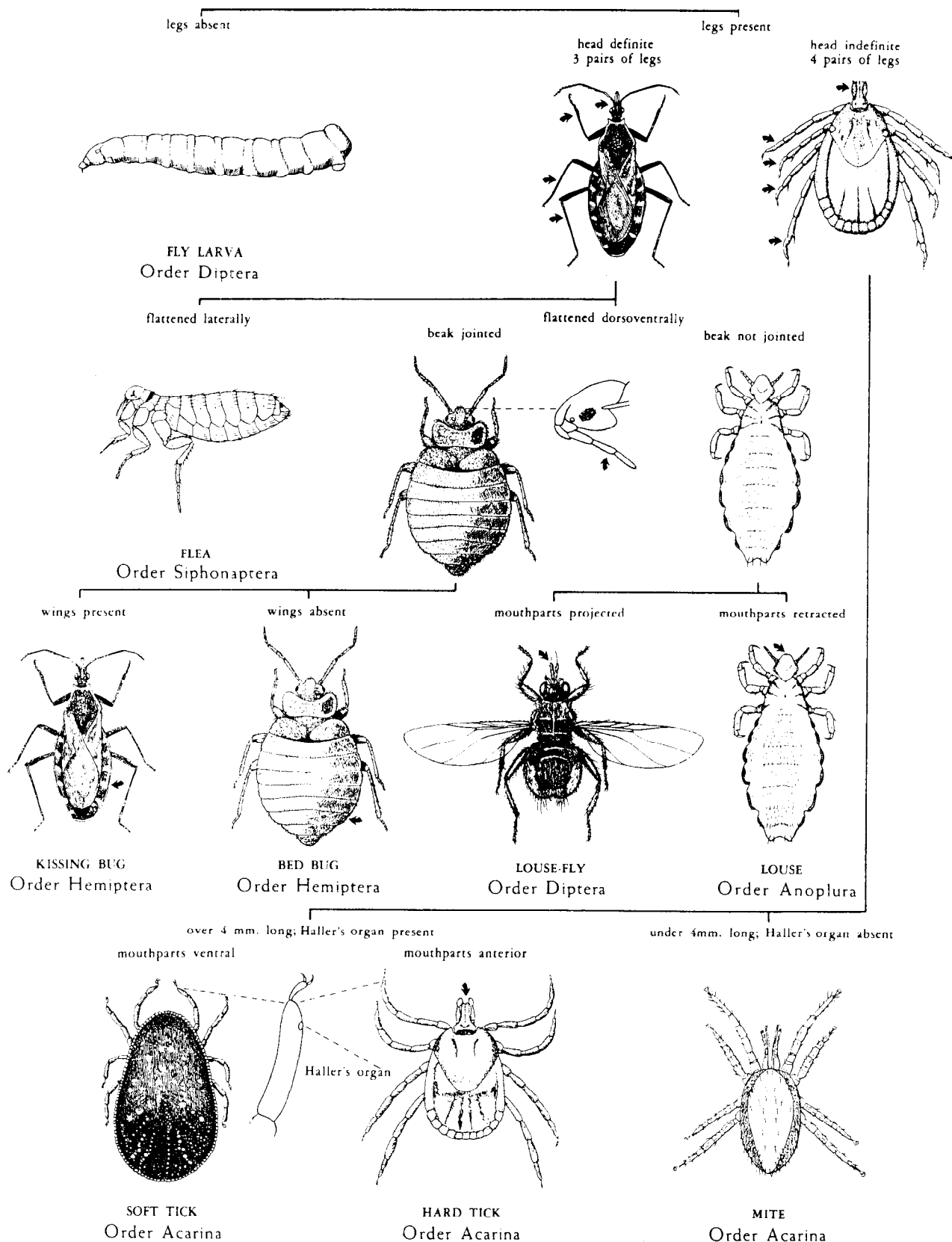


Otobius megnini SPINOSE EAR TICK



Rhipicephalus sanguineus BROWN DOG TICK

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



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

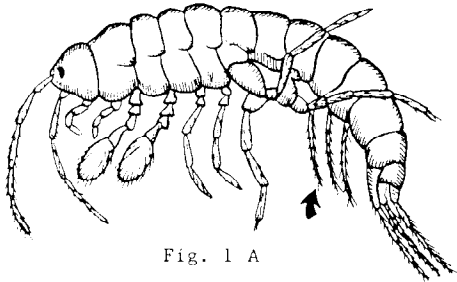


Fig. 1 A

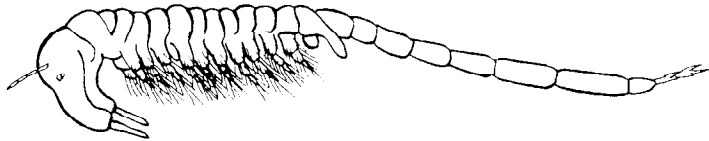


Fig. 1 B

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

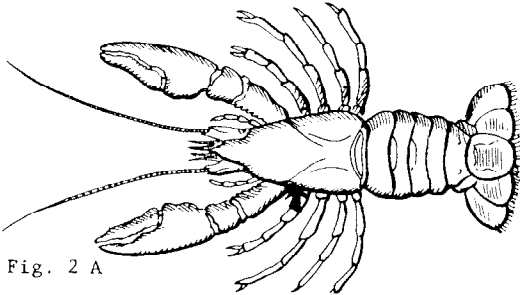


Fig. 2 A

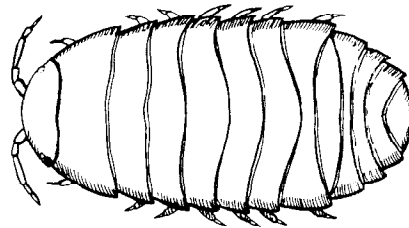


Fig. 2 B

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

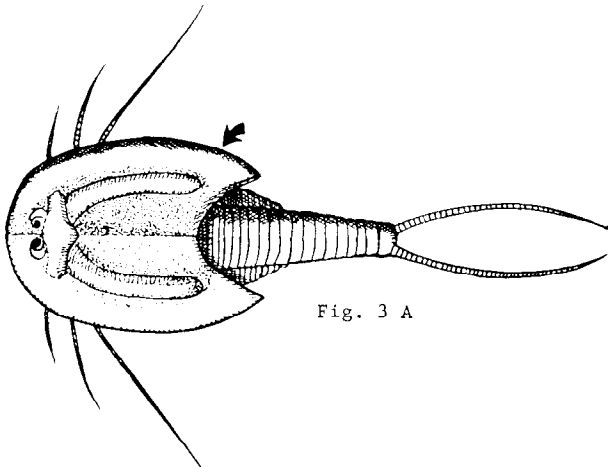


Fig. 3 A

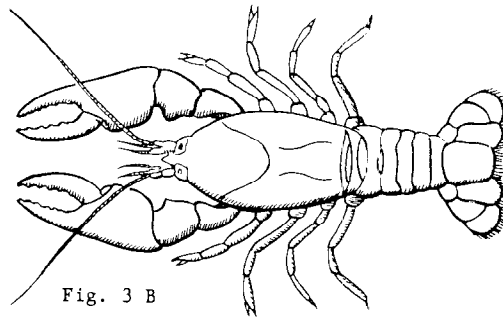


Fig. 3 B

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

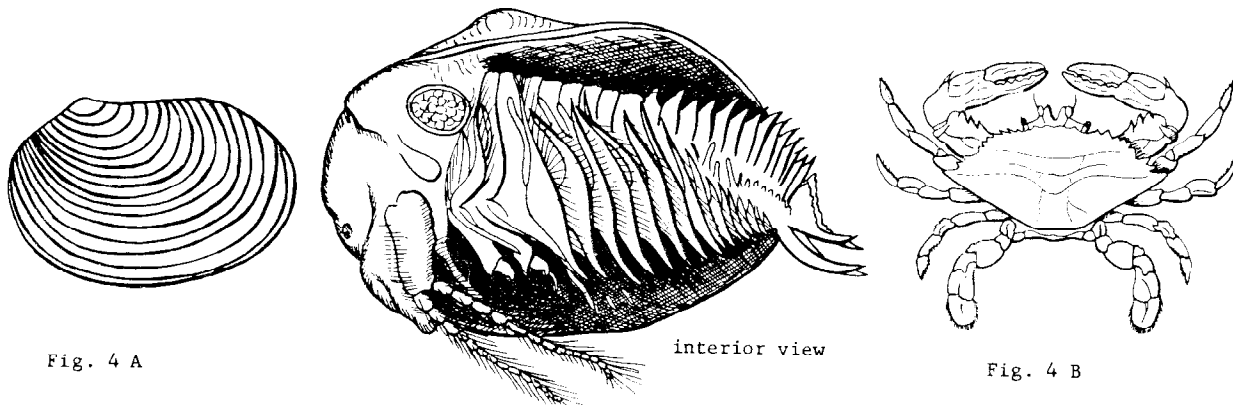


Fig. 4 A

interior view

Fig. 4 B

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

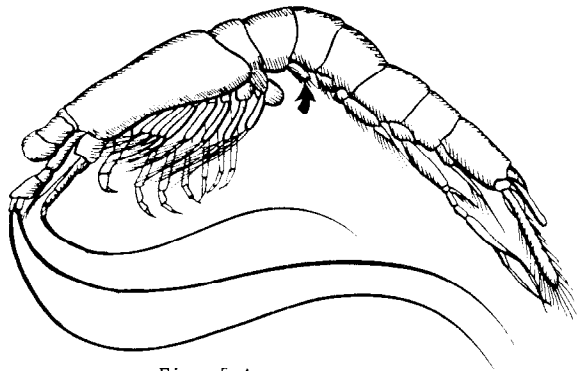


Fig. 5 A

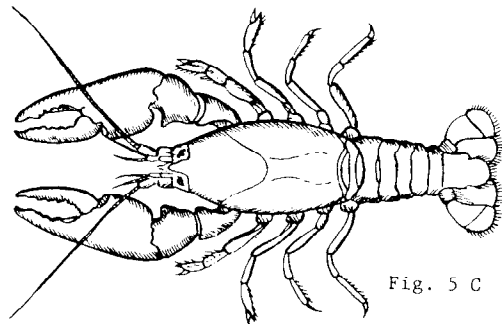


Fig. 5 C

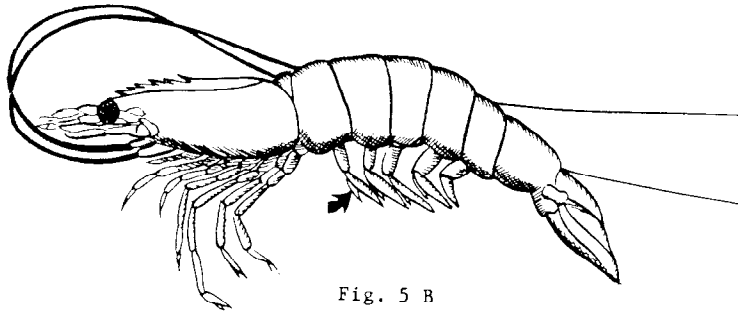


Fig. 5 B

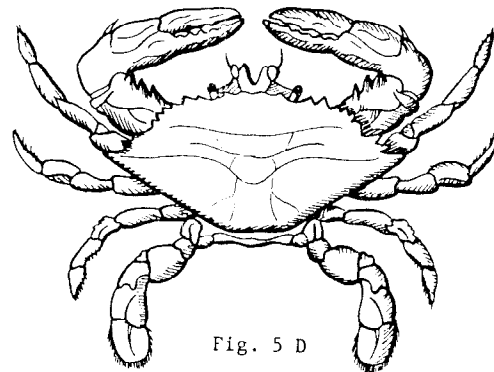


Fig. 5 D

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

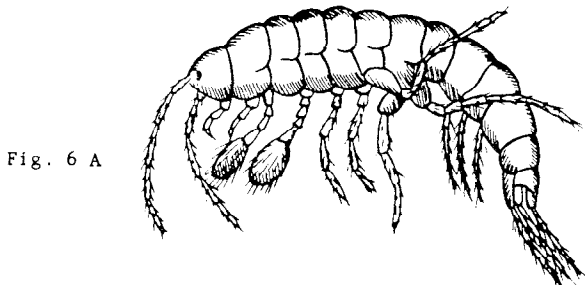
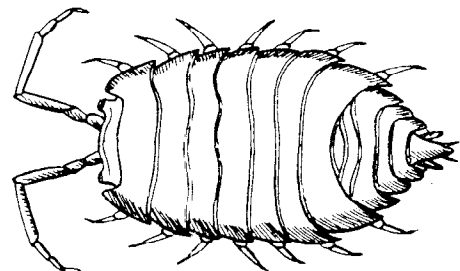


Fig. 6 A

Fig. 6 A



- 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

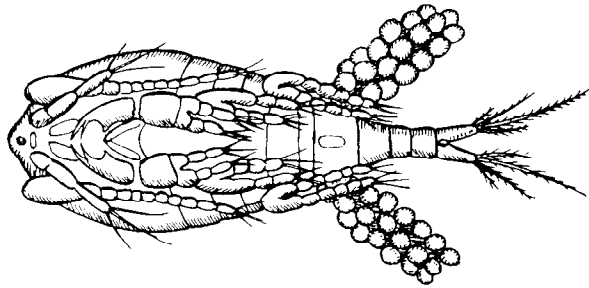


Fig. 7 A

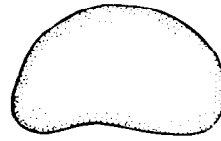
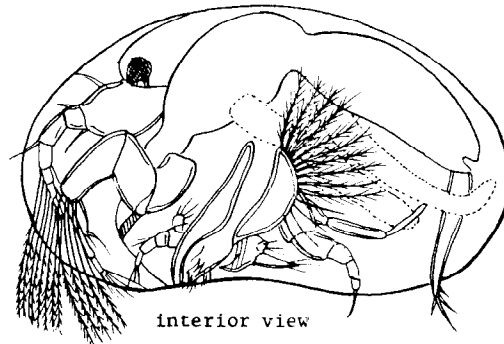


Fig. 7 B



interior view

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

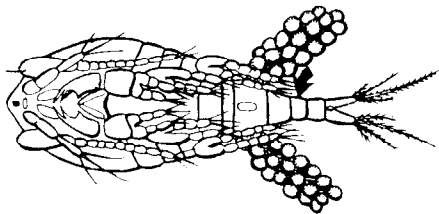


Fig. 8 A

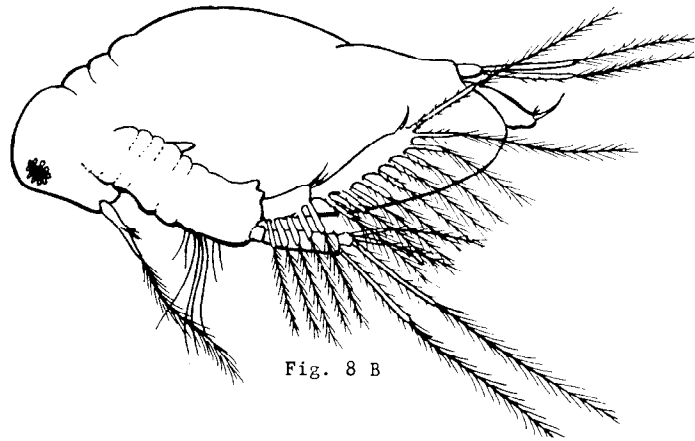


Fig. 8 B

- 9. Eyes stalked (Fig. 9 A). FAIRY SHRIMP..... Order ANOSTRACA
- Eyes not stalked (Fig. 9 B). COPEPODS..... Order EUCOPEPODA

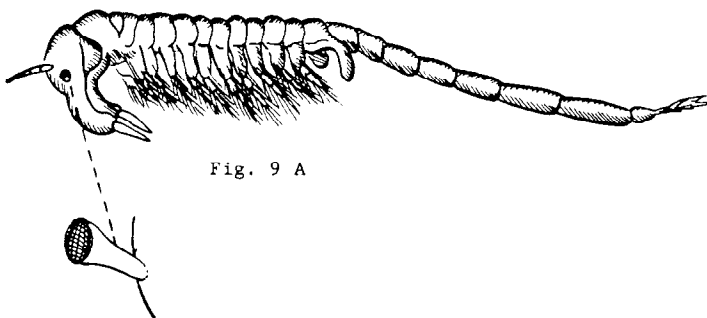


Fig. 9 A

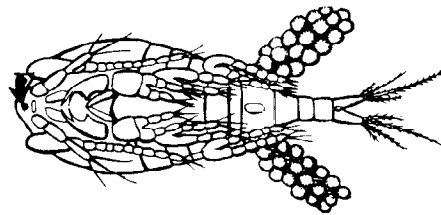
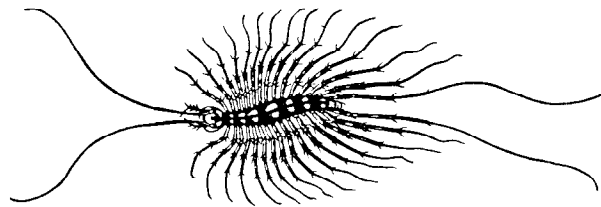


Fig. 9 B

CENTIPEDES: KEY TO SOME IMPORTANT UNITED STATES SPECIES

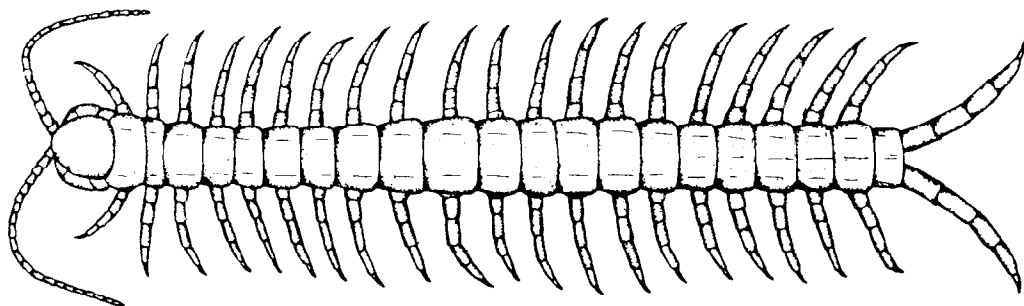
Harold George Scott

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

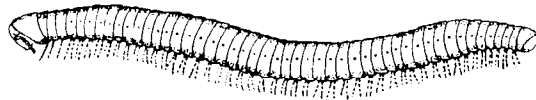


Scolopendra heros

- 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 *Pleurolomia butleri* (= *Fontaria virginiensis*)
- Legs without basal spines *Pseudopclydesmus serratus*



Narceus americanus

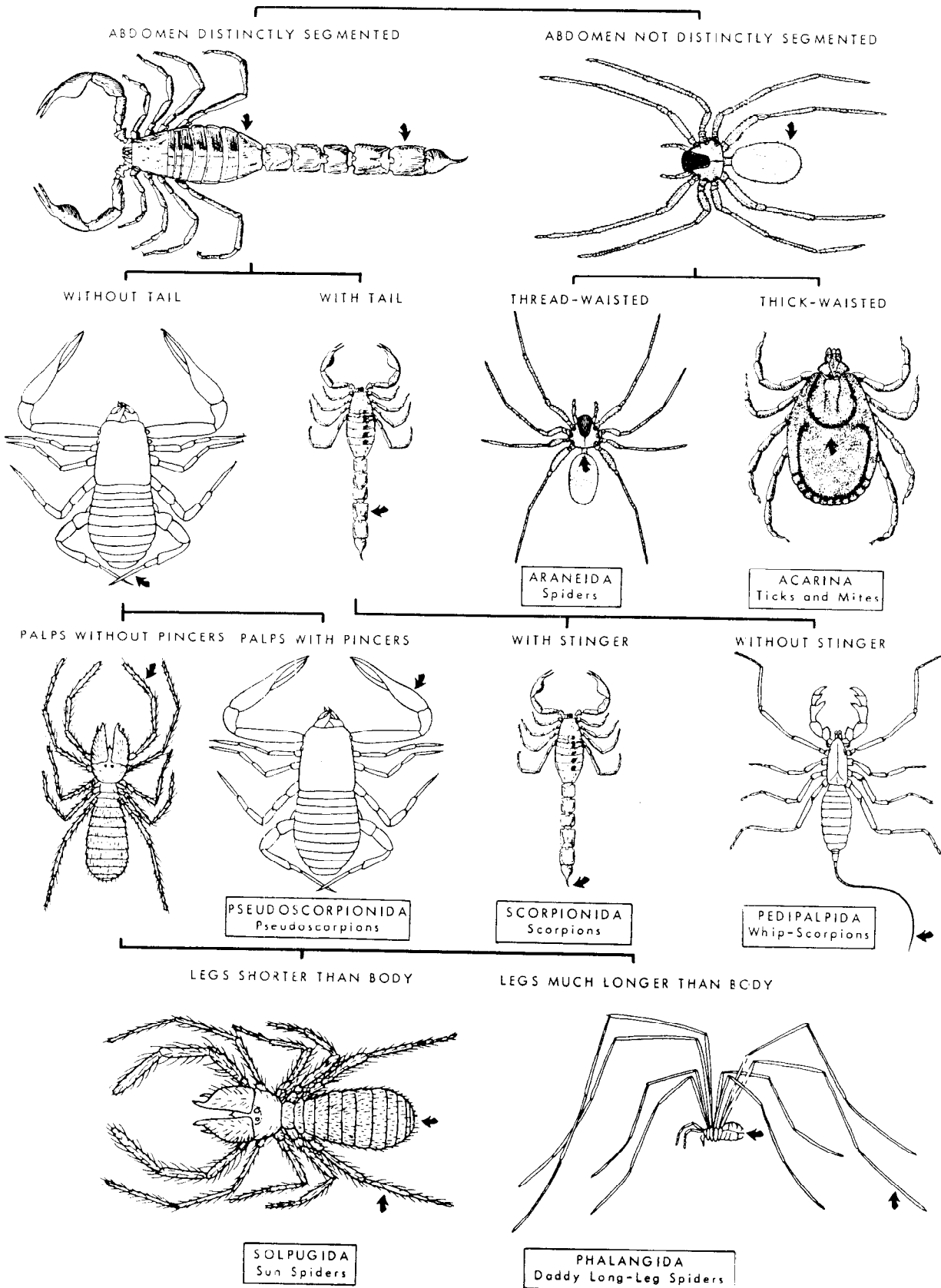
- 3. Body segment 3 with legs *Narceus americanus* (= *Spirobolus marginatus*)
- Body segment 3 without legs *Brachyiulus pusillus* (= *Julus virgatus*)

Brachyiulus pusillus



ARACHNIDA: KEY TO COMMON ORDERS OF PUBLIC HEALTH IMPORTANCE

Harold George Scott & Chester J. Stojanovich



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

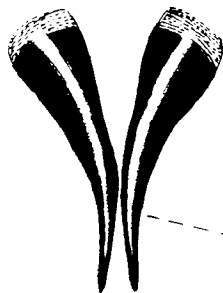


Fig. 1 A

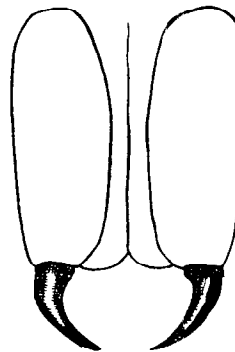
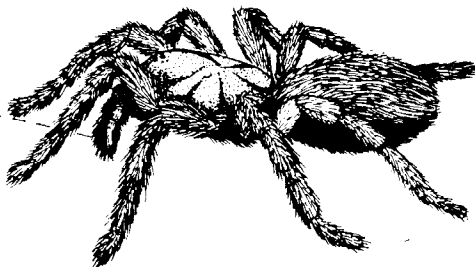


Fig. 1 B

- 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

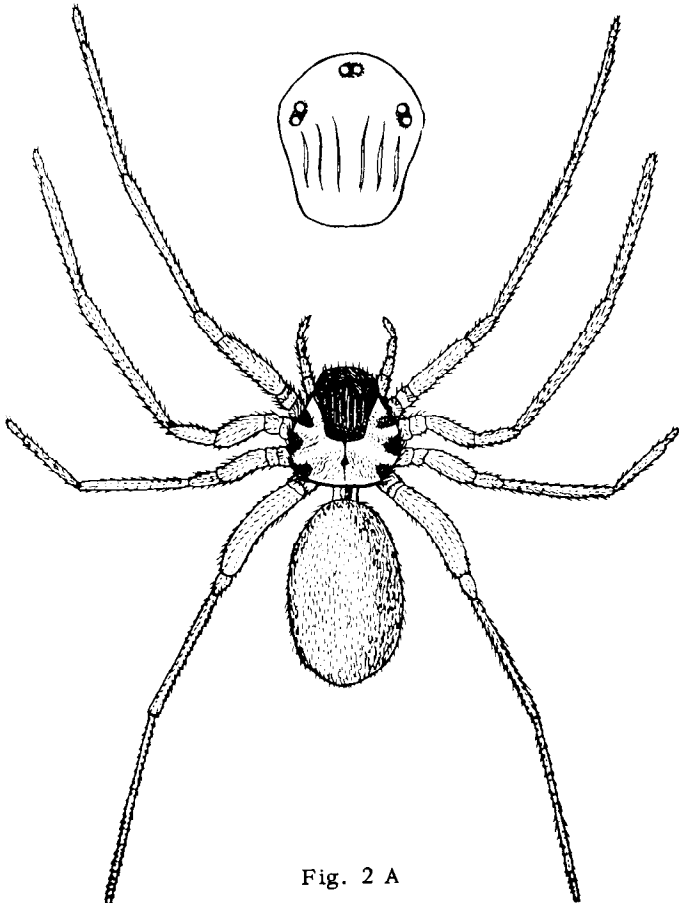


Fig. 2 A

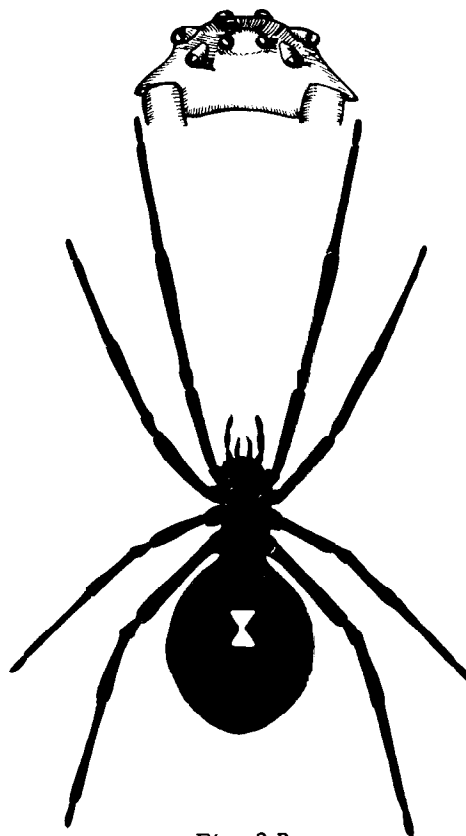


Fig. 2 B

SCORPION DIAGRAM: DORSAL VIEW OF CENTRUROIDES VITTATUS,
Chester J. Stojanovich

