

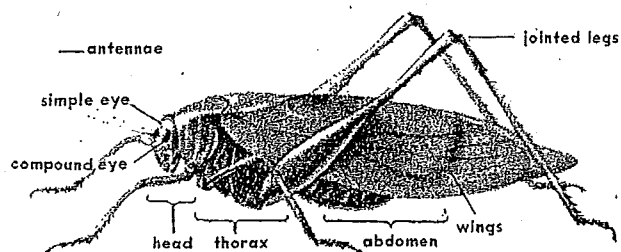
SEEING INSECTS

You can't help seeing insects, for they are found everywhere, even in the Antarctic. They have been on this earth some 200 million years, and seem here to stay. More insects and more kinds of insects are known than all other animals visible to the naked eye. Insects have been called man's worst enemy. They are. But some have economic value, and for other reasons we would be hard put to exist without them. Insects are gems of natural beauty, zoological mysteries, and a constant source of interest.

WHAT INSECTS ARE Insects are related to crabs and lobsters. Like these sea animals they possess a kind of skeleton on the *outside* of their bodies. The body itself is composed of three divisions: head, thorax, and abdomen. The thorax has three segments, each with a pair of jointed legs; so an insect normally has six legs. Most insects also have two pairs of wings attached to the thorax, but some have only one pair, and a few have none at all. Insects usually have two sets of jaws, two kinds of eyes—simple and compound—and one pair of antennae.

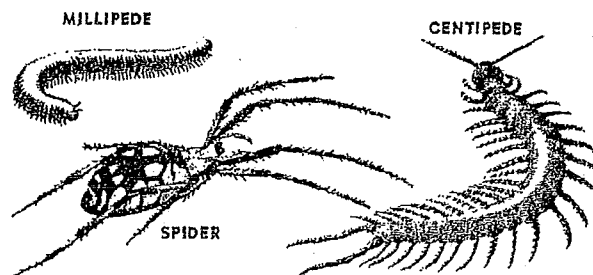
So much for the typical insects, but many common ones

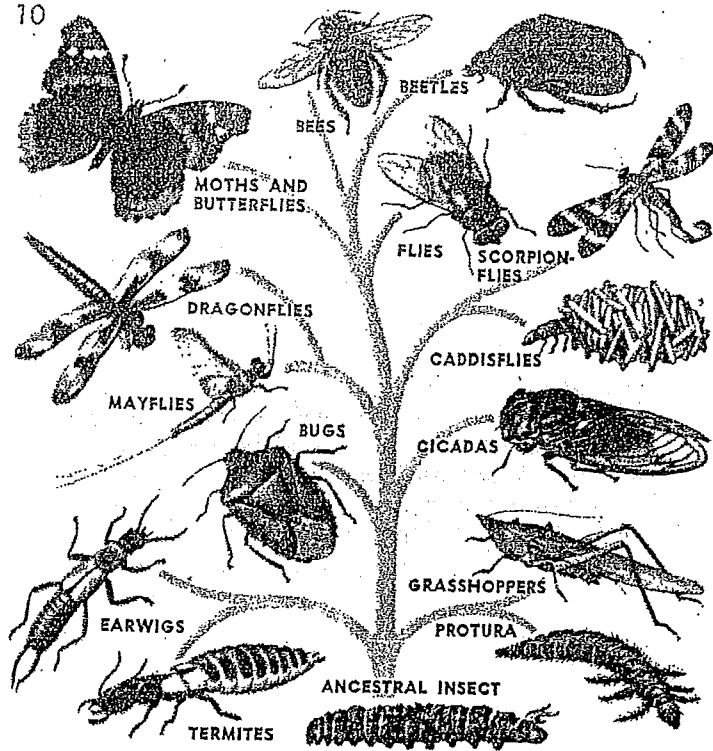
PARTS OF AN INSECT



are not typical. The thorax and abdomen may appear to run together. Immature stages (larvae) of many insects are worm-like, though their six true legs and perhaps some extra false ones may be counted. Immature insects are often difficult to identify. It is also hard to tell the sex of some insects. In some groups males are larger or have larger antennae or different markings. The female is sometimes marked by a spear-like ovipositor for laying eggs extending from the base of the abdomen.

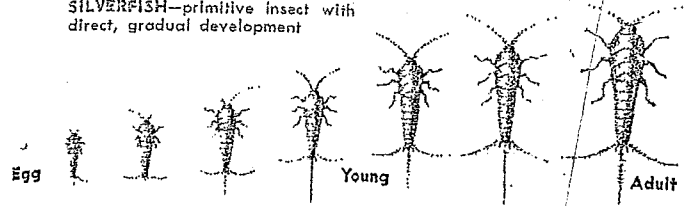
INSECT RELATIVES A number of insect-like animals are confused with insects. Spiders have only two body divisions and four pairs of legs. They have no antennae. Some spiders do not live in webs. Other insect-like animals have the head and thorax joined like the spiders. Crustaceans have at least five pairs of legs and two pairs of antennae. Most live in water (crab, lobster, shrimp), but the lowly sowbug is a land crustacean. Centipedes and millipedes have many segments to their bodies with one pair of legs (centipedes) or two pairs (millipedes) on each. Centipedes have a pair of long antennae; millipedes have a short pair. Millipedes often coil up when disturbed.



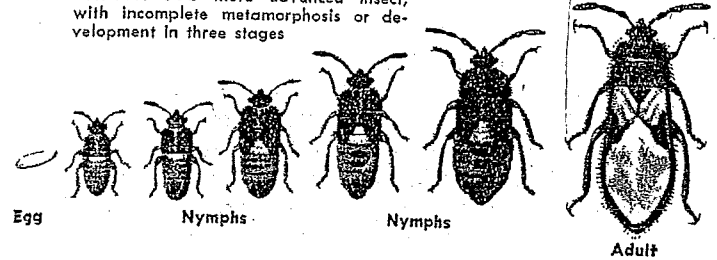


FAMILY TREE OF INSECTS The ancestor of all insects was probably a segmented worm-like creature much like primitive protura, silverfish, springtails, and kin. As long as 200 million years ago, roaches and other insects were common. Today there are 20 to 26 orders of insects (depending on the classification), including over 600,000 species. Most of the 12,000 kinds of fossil insects identified are similar to living species. For relationships of insects, see "family tree" above.

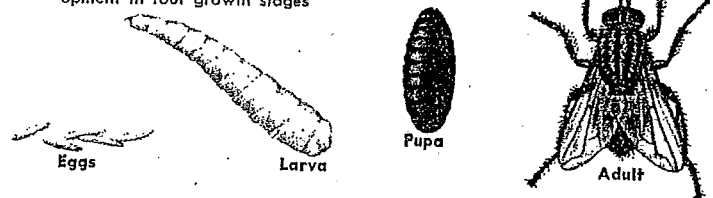
SILVERFISH—primitive insect with direct, gradual development



CHINCH BUG—more advanced insect, with incomplete metamorphosis or development in three stages



HOUSE FLY—advanced, modern insect, with complete metamorphosis or development in four growth stages



Insects follow different developmental patterns. In the simplest, the newly hatched insect is like a miniature adult. It grows and molts (sheds its skin) till it reaches adult size. In incomplete metamorphosis an immature nymph hatches, grows, develops wings, and by stages becomes an adult. Complete metamorphosis involves (1) egg, (2) larva, (3) pupa or resting stage, (4) adult.

KEY TO INSECT GROUPS



GRASSHOPPERS, ROACHES, AND THEIR KIN (Orthoptera), pages 17-28. Medium to large insects. Live on land. Forewings leathery. Hindwings folded fan-like (some have no wings). Development gradual. Chewing mouth-parts.



EARWIGS (Dermaptera), page 29. Small insects with typical pincer-like tail. Usually four small wings. Segmented antennae. Development gradual.



TERMITES (Isoptera), pages 30-31. Ant-like insects, small and soft-bodied. Some have four long wings. Live in colonies. Specialized "castes" for working, fighting. Chewing mouth-parts. Development gradual.



LICE (Anoplura), page 32. Small, wingless insects with piercing and sucking mouth-parts. Body flattened. Legs with claws for clinging to warm-blooded animals.



LEAFHOPPERS; APHIDS, AND SCALE INSECTS (Homoptera), pages 33-41. Small to medium insects, most with two pairs of similar wings held sloping at sides of body. Jointed beak for sucking attached to base of head. Land insects. Some scale-like.



TRUE BUGS (Hemiptera), pages 42-49. Range from small to large in size. Two pairs of wings, with forewings partly thickened. Jointed beak for sucking arises from front of head. Development is gradual.



DRAGONFLIES AND THEIR KIN (Odonata), pages 50-51. Fairly large insects with two pairs of long, equal-sized wings. Body long and slender. Antennae short. Immature insects are aquatic. Development in three stages.



MAYFLIES (Ephemeroidea) AND STONEFLIES (Plecoptera), page 52. Both with two pairs of transparent, veined wings. In mayflies, hind wings are smaller; in stoneflies they are larger. Mayflies have long, 2- or 3-pronged tails.



Zim + Cortam, 1963
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NERVE-WINGED INSECTS (Neuroptera), pages 53-55. The two pairs of wings, usually equal in size, are netted with veins. Four stages of development: egg, larva, pupa, and adult. Chewing mouth-parts. Long antennae.



SCORPIONFLIES (Mecoptera), page 56. Small insects with two pairs of slender, generally spotted wings. Legs long. Antennae long also. Beak-like, chewing mouth-parts. Larvae live in soil.



CADDISFLIES (Trichoptera), page 57. Most larvae live in fresh water. Some build ornamented case. Adults with two pairs of wings with long, silky hairs and with long antennae. Mouth-parts reduced.



MOTHS AND BUTTERFLIES (Lepidoptera), pages 58-101. Medium to large insects with two pairs of scaly wings. Sucking mouth-parts. Antennae knob-like or feathery. Development in four stages.



FLIES AND THEIR KIN (Diptera), pages 102-108. Two-winged, small to medium insects, with sucking mouth-parts. Antennae small, eyes large. Second pair of wings reduced to balancing organs. Development in four stages.



BETTERLES (Coleoptera), pages 109-135. Forewings modified to thickened covers. Hind wings thin, folded. Size from small to large. Chewing mouth-parts. Antennae usually short. All have four life stages. Some aquatic.



BEEES, WASPPS, AND ANTS (Hymenoptera), pages 136-149. Small to medium-size insects; many social or colonial. Two pairs of thin, transparent wings. Hindwings smaller. Mouth-parts for chewing or sucking. Only insects with "stingers." Development in four stages.



Where to Look for Insects

Adapted from *How to Know the Insects*, Roger G. Bland and H.E. Jaques
Compiled by Frederique Lavoipierre

Plants:

Collect from all sorts of plants in different habitats: flower and vegetable gardens, grasses in lawns and fields, weeds, bushes, aquatic plants, fruit and shade trees, forest trees.

Flowers: Look on the flower, between the petals and in the throat. Different flowers attract different insects. Don't forget flowers on trees, or catkins, such as willow and oak flowers, which are very attractive to insects.

Leaves: Look on both sides, as well as inside (leaf miners). The underside is often preferred. If leaves are chewed, but you see no insects, suspect nocturnal insects.

Stems: split stems for larvae where damage is found (holes, swellings, dead portions.)

Roots: insects that feed on roots are often near, attached to, or inside roots.

Fruits, nuts, vegetables: Cut inside these items for larvae if damage is apparent. Decaying fruits and vegetables on the ground yield many insects.

Mosses and lichens: These often harbor tiny insects.

Galls: Split open or place in closed containers until the insects emerge.

Sap: Fresh sap often attracts insects.

Tree holes: when filled with water, these attract mosquitoes and other insects.

Bark: many insects live under loose bark of live and dead trees.

Stumps: Inside rotting logs and stumps and on wood piles. Freshly cut wood is especially attractive to many insects.

Fungi:

Shelf fungi and mushrooms are often hosts to insects, both larvae and adults.

Air:

Sunny calm days are best for finding flying insects. Insects such as certain flies and winged ants and termites swarm in the spring and fall, especially on warm days after rain.

Water:

On top of, and beneath the surface of the water.

Scrape the mud along shorelines.

Insect rocks (especially the underside) above and beneath the water.

Inspect floating and rooted aquatic plants. Insects are sometimes inside the stems.

Inspect debris on the bottom of the water and on the shoreline.

The edges of mud puddles attract thirsty insects, especially butterflies.

Soil:

Rich humus-rich soil, compost piles, forest litter.

Digging a few inches into soil, especially around grasses may yield grubs.

Other Places:

Look under stones, logs, boards. Always return these to their original position.

At night, look at lights near natural habitats. Black lights attract many insects.

Roadside ditches, especially when vegetated, yield many insects.

Sweeping vegetation with a net during day or night yields different insects.

Place a sheet under bushes, and 'beat' the branches (not too hard!)

Sandy, wet shorelines of ponds and lakes.

Inside and beneath dead animals.

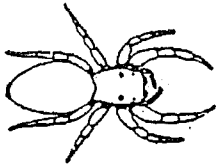
Sunny windows in buildings.

Stored grains.

Sunlit forest openings, hilltops (some butterflies).

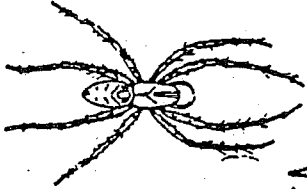
Surface of melting snow.

Hunters - pursue prey



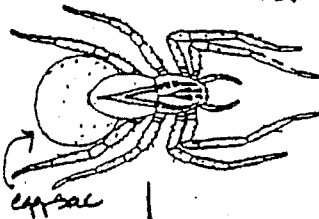
Salticidae

Jumping spiders. Four large eyes, short. Has best vision of spiders. Found on walls.



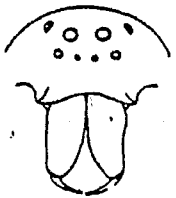
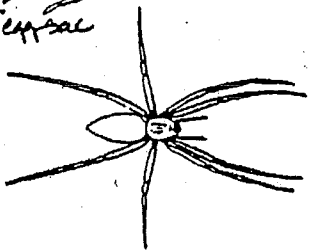
Oxyopidae

Lynx spiders. Very spiny legs. Found on vegetation.



Lycosidae

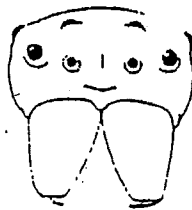
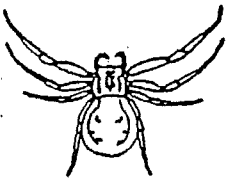
Wolf spiders. Mostly nocturnal - can see eyes glowing with flashlight at night. Female carries egg sac attached to spinnerets.



Plsauridae

Nursery web spiders. Resemble wolf spiders but builds nursery with leaves for herk. She carries egg sac under body in jaws & she makes the nursery.

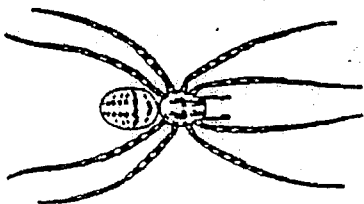
Sit-and-wait to embrace prey



Thomisidae

Crab spiders. Very long front legs to grab prey. Can change color to camouflage with background. Found on flowers. Will catch insects larger than itself.

Spitters

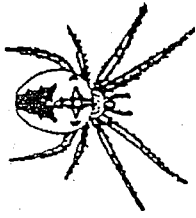


Scytodidae

Spitting spiders. Nocturnal hunters around buildings. Catches food by spit mucousy substance out of poison fan. Has 6 eyes. Distinctive pattern.

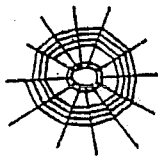
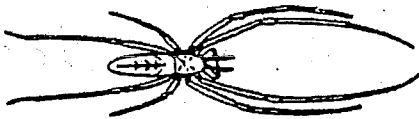
An Abbreviated Key to the "True" Spider Families

Weavers - ensnare prey
Orb Weavers



Araneidae

Typical orb weavers, hairy legs, hub of web closed, often has retreat away from web. "Charlotte."



Tetragnathidae

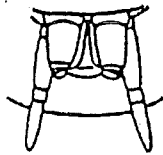
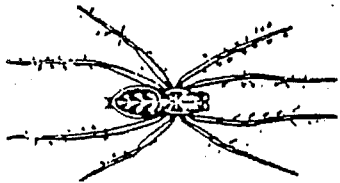
Elongated orb weavers, hub open, spirals widely set. Often near water.

Sheet Web Weavers



Linyphiidae

Hang inverted below sheet webs, bowl webs, bowl-and-daisy webs, hammock webs, dome webs. See pattern on abdomen. These are "money spiders" in Britain.

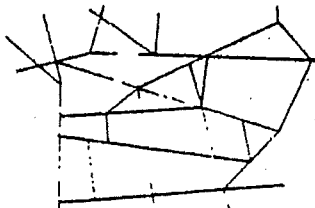


spinnerets from below

Agelenidae

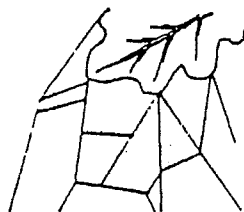
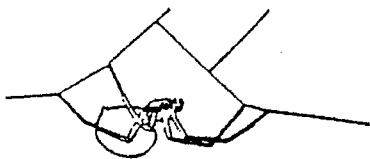
Grass spiders, flat sheets and funnel webs, long spinnerets, hairy legs.

Irregular Web Weavers



Pholcidae

Cellar spiders, often called daddy-long-legs. Common in closets, attics, cellars. Hides egg sac in north.



Theridiidae

Comb web weavers or comb-footed spiders. Globular abdomens. Web has retreat near top, often. Found in dark, damp corners. Black Widow in this group.

by Olga O'Brian
1997