

CHAPTER ONE

An Introduction To Wood Destroying Insects

When you complete this chapter, you will know how insects are classified, their relationships to other members of the animal world, and the types of metamorphosis they undergo.

Conducting a proper Wood Destroying Insect inspection implies that the inspector has a firm grasp of being able to correctly identify wood destroying insects [WDIs], including all their visible life stages, damage caused by WDIs, the signs of infestation by WDIs, and the conditions that are conducive to WDIs. Without this knowledge, the inspector would be unable to make the correct or proper recommendations for control of WDIs, if necessary, and could lead to significant legal consequences.

Animal Classification

There are over 1,000,000 described species of animals on earth. About 45,000 species are mites, 45,000 species are spiders, 8,600 species are birds, only 6,000 species are mammals and almost 1,000,000 species are insects!

To handle such a number of animals, a system of classification has been in use since the eighteenth century to facilitate separating animals into smaller units. Scientists have divided all members of the animal kingdom into the following basic units:

Phylum
 Class
 Order
 Family
 Genus
 Species

The Phylum is the largest group of animals that has a number of common characteristics. Some representative phyla [plural of “phylum”] are the Annelida (earthworms, leeches), the Platyhelminthes (flat worms, tapeworms, flukes), the Porifera (sponges), the Protozoa (single celled animals):(amoebas, paramecia), the Mollusca (clams, oysters, octopi, snails, slugs) the Nemathelminthes (roundworms) and the Arthropoda (shrimp, crabs, mites, spiders, millipedes, insects). Figure 1 – 1, on the following page, lists the major phyla.

Sometimes, wood is damaged by wood destroying fungi, which are members of the plant kingdom. Several species of fungi will be discussed in a Chapter 7.

PHYLUM	ARTHROPOD CLASSES	MAJOR INSECT ORDERS
*Arthropoda 856,828	*Insecta 739,828	*Coleoptera 300,000
Mollusca 100,000	*Arachnida 60,000	Lepidoptera 114,000
Chordata 45,000	Crustacea 50,000	*Hymenoptera 113,000
Protozoa 30,000	Diplopoda 7,500	*Diptera 90,000
Platyhelminthes 15,000	Chilopoda 3,000	Homoptera 33,000
Nematoda 10,000	Misc. 6,500	Hemiptera 25,000
Coelenterata 9,600		Orthoptera 30,000
Echinodermata 6,000		Misc. 34,828
Porifera 4,200		
Ectoprocta 4,000		
Misc. Invertebrates 4,000		

Figure 1-1

The phylum Arthropoda (arthro means joint and poda means foot or leg) has the largest number of species (about one million) and is characterized by having:

1. A skeleton on the outside of their body (an exoskeleton) — humans, on the other hand, have a skeleton inside their bodies (an endoskeleton).
2. The arthropod exoskeleton is shed periodically to allow the animals to grow.
3. A segmented body with paired jointed legs.
4. An open circulatory system — blood flows through a large dorsal blood vessel and then empties into a large body filled with blood (the hemocoel).
5. A double ventral nerve cord. This runs underneath the digestive tract. Our central nerve cord is single and runs dorsally (inside our vertebral column).

About 100,000 species of arthropods are found in the United States.

KEY TO THE COMMON ARTHROPOD CLASSES	
1. Antennae 2 pairs; 1 pair may be greatly reduced (Fig. 1)	CRUSTACEA
Antennae either absent or 1 pair	2
2. Antennae absent (Figs. 1, 8)	ARACHNIDA
One pair of antennae	3
3. Many pairs of legs; body divided into head and many-segmented trunk (Fig. 2)	4
Only 3 pairs of ambulatory legs present; body divided into head, thorax, abdomen; wings may be present	INSECTA
4. Most trunk segments with 2 pairs of legs (Figs. 1, 26)	DIPLOPODA
Each trunk segment with 1 pair of legs	5
5. First pair of legs modified into poison claws (Fig. 25); gills lacking; spiracles present	CHILOPODA
First pair of legs similar to others; gills may be present; spiracles absent	CRUSTACEA*

*If you arrived here, you failed to see the first pair of antennae and should return to couplet 1 to check your error.

Figure 1 - 2

The next category used to classify animals is the Class. Figure 1 – 2, on the previous page, provides a simple key for identifying the Classes found within the Phylum Arthropoda. Animals in a particular class have common characteristics.

Five common classes of Arthropods (there are more) are:

1. **Class Arachnida** (spiders, ticks, mites, scorpions). These animals all have four pairs of legs in the adult stage, lack antennae, usually have two body regions (cephalothorax and abdomen), never have wings and are without mandibles — therefore most arachnids cannot chew their food but must suck their prey's body fluids.
2. **Class Crustacea** (crabs, lobsters, shrimp, sowbugs). Members of this class have two pairs of antennae and at least five pairs of legs in the adult stage.
3. **Class Chilopoda** (centipedes). Centipedes are somewhat flattened from top to bottom, have 15 or more pairs of legs — one pair on each body segment. They have a single pair of antennae.
4. **Class Diplopoda** (millipedes). Millipedes are not flattened like centipedes. Most have at least 30 pairs of legs. Most of their body segments have two pairs of legs attached to them. They have a single pair of short antennae.
5. **Class Insecta** (insects). Adult insects have three body regions (head, thorax and abdomen). There are three pairs of legs attached to the thoracic region. Wings, if present, are also attached to the thorax. The head bears a single pair of antennae.

The “class” category is under the “phylum” and above the “order” category.

There are about 30 orders of insects. Examples of insect orders include

- | | |
|------------------|---------------------------------------|
| 1. Protura | [telsontails] |
| 2. Thysanura | [bristletails: silverfish, firebrats] |
| 3. Collembola | [springtails] |
| 4. Ephemeroptera | [mayflies] |
| 5. Odonata | [dragonflies] |
| 6. Orthoptera | [grasshoppers, roaches] |
| 7. Dermaptera | [earwigs] |
| 8. Isoptera | [termites] |
| 9. Embioptera | [embiids] |
| 10. Plecoptera | [stoneflies] |
| 11. Zoraptera | [zorapterans] |
| 12. Corrodentia | [book lice, bark lice] |
| 13. Mallophaga | [chewing lice] |
| 14. Anoplura | [blood sucking lice] |
| 15. Thysanoptera | [thrips] |
| 16. Homoptera | [aphids, scales, leaf hoppers] |
| 17. Hemiptera | [true bugs] |
| 18. Strepsiptera | [twisted winged parasites] |
| 19. Neuroptera | [lacewings] |
| 20. Mecoptera | [scorpionflies] |
| 21. Tricoptera | [caddisflies] |

- | | |
|------------------|--------------------------|
| 22. Lepidoptera | [butterflies and moths], |
| 23. Hymenoptera | [wasps, bees and ants] |
| 24. Diptera | [flies and mosquitoes] |
| 25. Siphonaptera | [fleas] |
| 26. Coleoptera | [beetles] |

Beneath the “order” category is the “family”. Family names always end in “-idae.”
For example,

1. Lyctidae (powder post Beetles),
2. Bostrichidae (false powderpost beetles)
3. Anobiidae (furniture and death watch beetles)
4. Formicidae (ants).

Below the family come the “genus” category and then the “species” category. Generic names are always under lined or written in italics. The name for the species is always given as a double name or binomial. The first name is the generic name and the second name is the specific part of the name. Both of these names are underlined or italicized and both must be used as a species name. The genus name always begins with a capital letter, and the second half of the binomial begins with a lower case letter

If we were to classify the old house borer according to the system described above we would have the following:

Phylum:	Arthropoda	joint footed animals
Class:	Insecta	three distinct body regions with three pr of legs and two pr of wings attached to the thorax
Order:	Coleoptera	the forewing of the adult is fully schlerotized
Family:	Cerambycidae	long-horned beetles, possessing long antennae that sweep back along the sides of the body, often longer than the adult’s body
Genus:	<u>Hylotrupes</u>	
Species:	<u>Hylotrupes bajulus</u>	

Insect Life Cycles

Insects undergo a process of metamorphosis in their development. Metamorphosis (which means a change in form) refers to the changes insects go through from the time they hatch from an egg until they become adults.

Four types of metamorphosis are recognized:

- § No metamorphosis, ametabolous, or gradual development — In this particular process the immature or juvenile insect looks like the adult. They feed on the same type of food as the adult. Their only difference is size and the fact that the adult stage is sexually mature. Insects that undergo this type of development include the silverfish (Order Thysanura) the springtails (Order Collembola), grasshoppers, crickets, cockroaches (Order Orthoptera), lice (Order Anoplura), and termites (Order Isoptera). See the first column of figure 1 – 3 below.
- § Incomplete metamorphosis — Insects with this type of development have immatures called naiads. Naiads are aquatic, feeding and developing in water. They normally do not resemble the adult structurally. The adult stage has wings and lives out of the water into which it will deposit its eggs. Adults feed on different foods than do their naiads. Insects with Incomplete metamorphosis are Mayflies (Order Ephemeroptera), Stoneflies (Order Plecoptera), dragon and damselflies (Order Odonata). See the second column of figure 1 – 3 below.

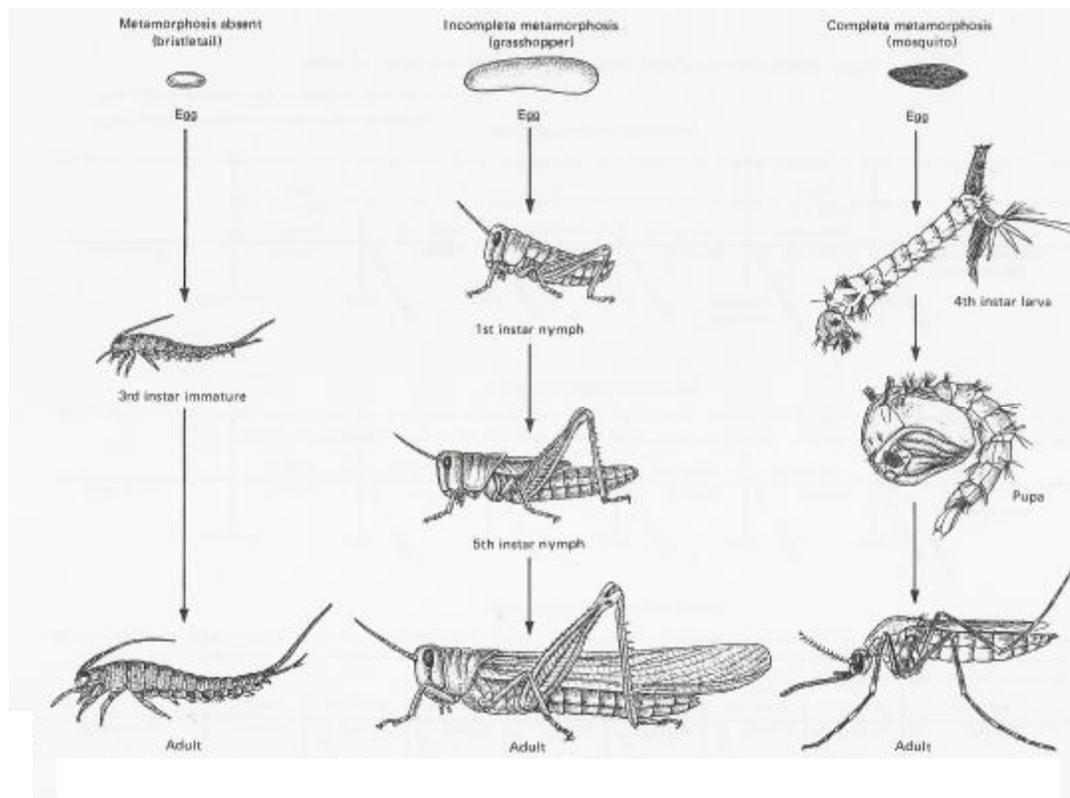


Figure 1 - 3

§ Complete metamorphosis — Insects with this type of development undergo four stages: the egg, larva, pupa and adult. The larval stage is very different from the adult. Their habitat, food and behavior as well as their structure are very different from the adults. The pupal stage that follows the larval stage usually is in active and non-feeding. It is during this stage that the adult features are formed (legs, wings and sexual organs). Examples of insects with complete metamorphosis are: butterflies and moths (Order Lepidoptera), fleas (Order Siphonaptera), wasps, bees and ants (Order Hymenoptera) and beetles (Order Coleoptera). See the third column of figure 1 – 3 on the previous page.

The Structure of Insects

Insect bodies are characterized by having three distinct regions:

Head

The head of the insect is where all the sensory organs are located, as well as the the mouth. Insects may have two distinct types of eyes: simple and compound. Compound eyes are typically mounted on the sides of the head, toward the front, are composed of many ocelli that perceive images. Single ocelli may be present in combination with compound eyes, or alone, and are used to observe changes in light intensity. Figure 1 – 4, on the following page, shows the head of a termite.

Antennae, which typically occur in pairs, are loaded with sensory receptors, and are usually located on the front of the head. There are many types of antennae, and they are often used in distinguishing one species from another.

Thorax

The middle section of an insect is the thorax. Legs and wings, if present, are attached to the thorax. Many insects have wings, some do not. Among those that do, most of them have two pair. Some winged adult insects only have one pair of wings, but a vestigial remnant of the second pair is present in the form of halteres [balancing organs] as on the diptera.

The suffix “-ptera” is Greek for wing, and is a part of the “order” names for many insects. Insect wings vary greatly in texture, size, function, vein patterns, and number, and afe often used to identify adult insects. Figure 1 – 4 shows the thorax region.

Abdomen

The abdomen is the rear-most body region, and is attached to the rear of the thorax. The abdomen contains the organs of digestion, excretion, and reproduction. Figure 1 – 4 shows the abdomen of the subterranean termite.

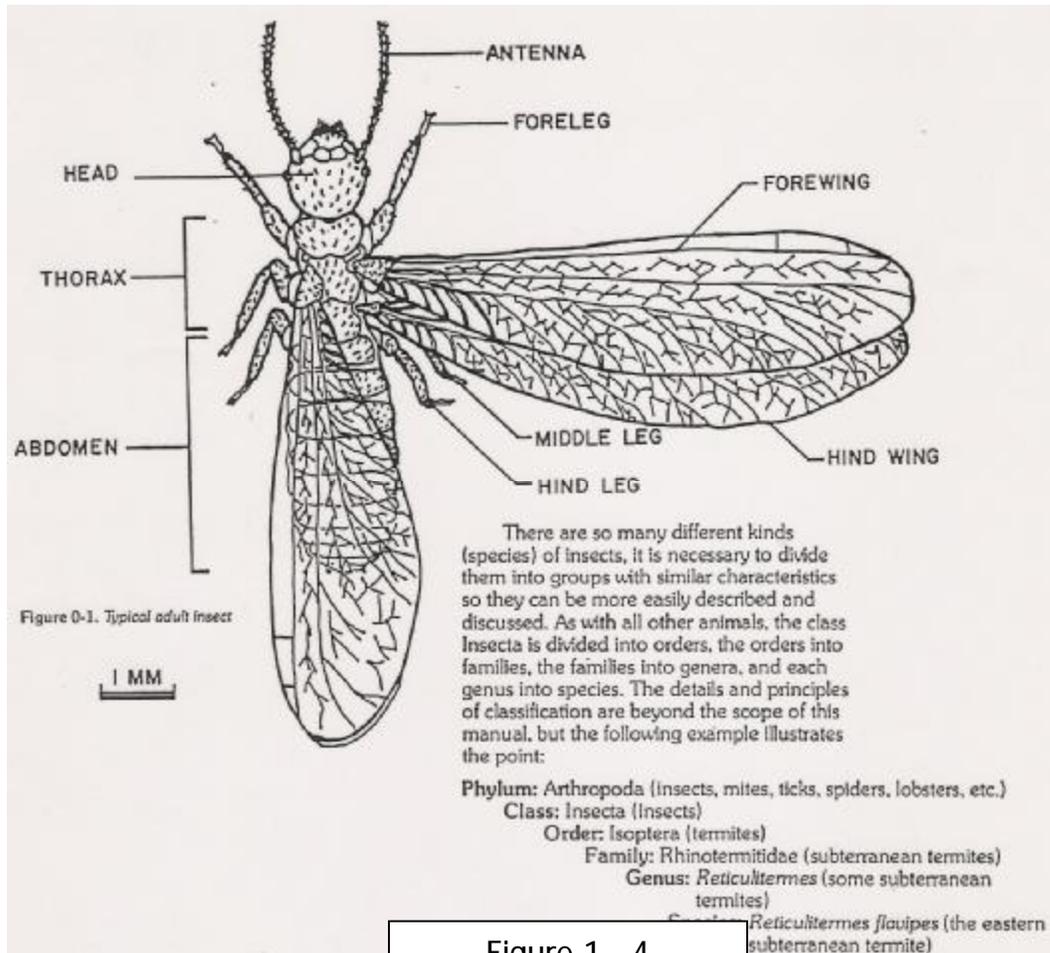


Figure 1 - 4