ISOPTERA

These are the termites. The order name means equal winged and refers to the fact that the front and hind wings are nearly of the same size and shape. There are about 2300 described species worldwide.

They are generally small to medium-sized (less than 10 mm) social insects. They winged forms are frequently dark brown or black in color while the non-winged forms are usually pale white in color. They are somewhat soft-bodied (lightly sclerotized). The head is prognathous, with some of the castes having the head capsule highly modified. The compound eyes are present in all winged forms; they may be present or absent in non-winged forms. The antennae are relatively short, moniliform or filiform, usually 10-30 segmented. Only the primary reproductives are winged; the wings are membranous with the front and hind wings of about the same size and shape; they have only a few thickened or heavy longitudinal veins along the costal margin with relatively few cross veins. The wings are held flat over the back at rest. Even the winged forms lose their wings after mating - they break off along a weakened fracture line; the remaining stubs are called scales. The legs are relatively short with well-developed coxae; the tarsi are 4 or 5-segmented, and there is usually a pair of claws. The genitalia are lacking or weakly developed; they have relatively short cerci.

Sometimes these insects are called white ants. They are not ants and are not really even related to the ants. They have the joint between the abdomen and the thorax relatively broad and the antennae are moniliform or filiform, but not elbowed. The ants are more heavily sclerotized, the joint between the abdomen and the thorax is narrow (pedicel), and the antennae are distinctly elbowed.

This order is more common in the tropics. It is a relatively primitive order most closely related to the Blattaria. There is an Australian species, *Mastotermes darwinensis*, which has some cockroach-like characters (hind wing has an anal lobe, eggs are laid in oothecae, the internal digestive symbionts are similar to those found in wood roaches).

Termites utilize cellulose for food, but require bacteria or flagellated protozoans to digest the cellulose. This is an example of **mutualism** - an association between 2 different species of organisms for the benefit of both. **Trophallaxis** - anal liquid exchange to pass along symbionts.

They are social insects, and have evolved a fairly highly evolved social system, although it is one that is different from the bees and ants. In the Isoptera, the males are equally important in raising the colony along with the females. The males do not help in the Hymenoptera. One definition of a social insect is: "True social insects are ones in which the female tends or helps to construct a brood-chamber for an egg laid by another female." With this definition, only ants, bees, wasps, and termites are true social insects. Among the social insects, individuals frequently exhibit morphological differences in the adults for specialized work. These differences are the basis for what we term **castes** (a type of polymorphism).

We all are aware of termites for the damage they can do to houses, etc. But they actually do much more good for the environment than bad. They get rid of decaying wood, etc. in nature.

Castes of termites:

1. Reproductive caste - consists of primary and secondary reproductives. The reproductives are the ancestral types from which other castes have evolved.

    a. Primary reproductives are characterized by fully developed wings, a well-sclerotized body which is usually dark in color, the presence of compound eyes, the brain and sexual organs are large and well-developed. The primary function of the primary reproductives is to found new colonies. Primary reproductives include the kings and queens which swarm. Some queen termites can lay as many as 7000 eggs per day, and can live from 15 to 30 years. After the colony is going strong, the queen becomes somewhat sedentary, her

abdomen can become quite huge in relation to rest of body (called physogastry) and is full of eggs.

b. Secondary (or supplementary) reproductives have no aerial life (their wings are short). They appear in new colonies sometimes after the loss of the primary reproductives. There is no set number of them and they include both males and females.

2. Sterile castes:

a. workers: include nymphs and sterile adults. Here is another advantage the termites have over the Hymenoptera. The immatures are capable of working too, and it is both sexes that work. Workers are wingless. Often workers are dimorphic, being recognizable major and minor forms. Workers care for the young and feed members of the other castes, some of which are incapable of feeding themselves. Workers are the destructive forms of termites.

b. soldiers: structurally soldiers are the most highly specialized of the termite castes. Practically all genera of termites have a soldier caste. They are recognized by their larger size, and the strong sclerotization of the head. The mandibles are usually large. Mechanical vs. chemical defense = mechanical have large strong mandibles; chemical don't have the big strong mandibles, but they have a **nasus** (a snout like spout on the head where the defensive chemical is discharged - a soldier that has a nasus is called a **nasutae**) to release a chemical for defense. The family Termitidae have nasutae.

Termitophiles are common with termites. Termitophiles are any animal other than a termite normally found in a termite nest. They include many other arthropods such as isopods, spiders, mites, and insects. Of the insects, the Coleoptera are the most common, and of these the Staphylinidae have particular adaptations involving special mimicry. The staphylinids fold their abdomens up over their bodies. Those that are mimics have the tip of the abdomen looking much like the head of a termite.

Your text lists 4 North American families; we will cover only 3 of these.

A. Family Rhinotermitidae: These include some dampwood termites and the subterranean termites. Nine U.S. species. The **fontanelle** (a pore on the frons of the head used to secrete a substance used to mix with dirt to construct the earthen tubes the termites use as runways) is usually present. In the winged forms, the wings usually have only 2 thickened or heavy longitudinal veins along costal margin, with the radial vein usually lacking any anterior branches. Cerci 2-segmented. Scale of front wing longer than pronotum; pronotum flat. This family includes several major pests such as the subterranean termite, *Reticulitermes flavipes*, and the formosan termite, *Coptotermes formosanus* (this is the major pest species in the French Quarter in New Orleans). Species in this family usually need to keep some contact between their nest and the ground. This is one way to look for an infestation - to check the foundation of the home for any small earthen tubes built between the ground and the wooden parts of the home. The subterranean termites do occur in western North Dakota.

B. Family Termitidae: Fifteen U.S. species. These also usually have a fontanelle, and in the winged forms, the wings usually have only 2 thickened or heavy longitudinal veins along the costal marge, and the radial vein is usually lacking any anterior branches. Cerci 1- or 2-segmented. Scale of front wing shorter than pronotum; pronotum saddle shaped. If the soldier caste is present, it will have a large **nasute** on the anterior part of the head - defensive secretions.

C. Family Kalotermitidae: These include some drywood, dampwood, and powderpost termites, which can damage buildings and furniture. Seventeen species in the U.S. All castes lack a **fontanelle** (do not contruct earthen tubes). In the winged forms, the wings will have 3 or more thickened or heavy longitudinal veins along the

costal margin with 1 or more anterior branches to the radial vein. Ocelli present; shaft of tibiae without spines; antennae usually with fewer than 21 segments; cerci short, 2-segmented. The soldiers have the head length subequal to the head width (in other families the head is longer than the width). These usually do not have to keep a contact between the nest and the ground. These apparently do not occur in North Dakota (we have some in collection).

D. Family Termopsidae: (This used to be called the Hodotermidae). These are called dampwood termites. Three species which occur along the Pacific coast. All castes lack a **fontanelle**. In the winged forms, the wings will have 3 or more thickened or heavy longitudinal veins along the costal margin with 1 or more anterior branches to the radial vein. Ocelli absent; shaft of tibiae with spines; antennae usually with more than 21 segments; cerci long, 4-segmented. There is no worker caste.