

## Review of common terms used in insect classification

**Entognatha**- having internal mouthparts

**Ectognatha**- having exposed mouthparts

**Apterygota**- insects without wings

**Pterygota**- insects with wings

**Endopterygota**- wings develop within exoskeleton in the pupal stage

**Exopterygota**- wings develop on outside of body during nymphal stages

**Hemimetabola**- refers to a pattern of development. Immatures referred to as nymphs, gradually molt into adult form

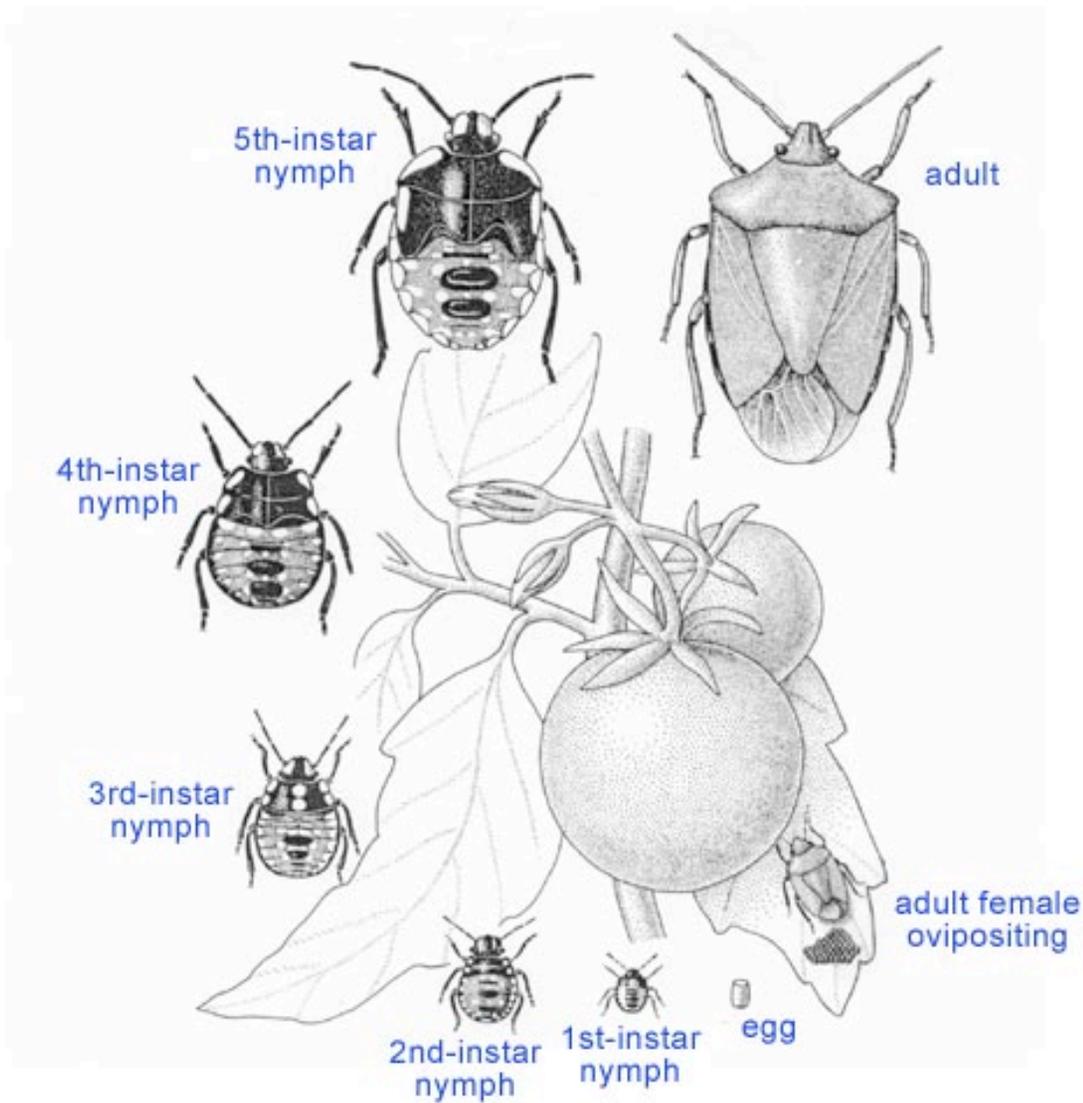
**Holometabola**- immatures referred to as larvae (or caterpillars for butterflies and moths), and go through pupal stage before adult form is reached. Immature and mature form very different in appearance

**Paleoptera**- “old” wing, insects that have wings which cannot be folded over their back

**Neoptera**- “new” wing, insects that can fold their wings over their back

There is also a glossary at the back of your book and many online (although you may want to be careful of some of these). This one has been helpful to me: <http://www.earthlife.net/insects/glossary.html>

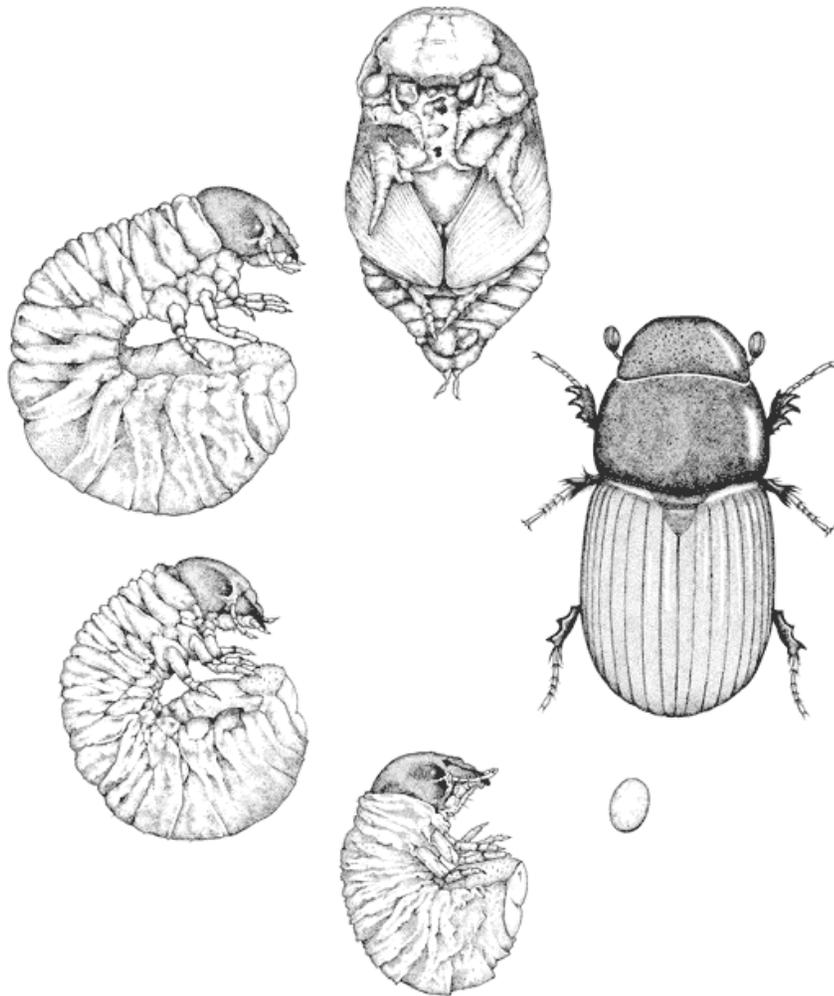
## Hemimetabolous Insect Development



The immature and adult forms of hemimetabolous insects are often found in the same habitat and feeding environment

Life cycle of a green vegetable bug (Hely *et al.* 1982)

## Holometabolous Insect Development



On the other hand, the immature form of holometabolous insects are found in different habitats and exploit very different food resources compared to the adult form.

What is a good example?

What benefits would this type of development have relative to the hemimetabolous development?

Illustrator: Sharyn Madder Source: Museum Victoria

## **Insect Habits**

- Insects live in almost all habitats excluding marine
- It is likely that different insect groups have acquired adaptations to exploit almost every available food resource
- Thus, insects exhibit a diversity of feeding structures and behavior

Examples of some of the extremes: insects that like it hot

- 1) Three ant genera in the deserts of North Africa, South Africa, and Australia scavenge when surface temps rise to 70 °C (ant body temp. ~ 50 °C)
- 2) Desert tenebrionids (beetles), cicadas, cicindellids, termites, and social bees and wasps came in second
- 3) Aquatic insects inhabiting hot springs (considered separately); one species of Chironomid larva were tolerant of water temps up to 49 °C





## Insects that like it cold

- Order Grylloblattodea: Family Grylloblattidae- The “rock crawlers” are an ancient group of insects (“living fossils”) with one extant family and 44 extinct families.
- Seek temperatures as low as 0 °C, and inhabit the mountainous regions of Siberia and the Ussuri River Basin in Eastern Russia. They can be found in the soil of rock crevices, caves, and underneath stones eating insect carrion

## **And they can eat almost anything....**

- Thousands of insects eat plants. Grubs (beetle larvae) eat the roots. Caterpillars, adult beetles, and leaf hoppers eat leaves. Cicadas and aphids suck plant juices. Moth larvae (caterpillars) and some weevil (curculionid beetles) larvae feed on fruits.
- Fungus specialists- fungus beetles
- Carnivores- mantids, carabid beetles
- Parasites and Parasitoids- mosquitoes and braconid wasps
- Dead wood/Live wood- termites, wood boring beetles
- Fabric and clothes- moth larvae
- Decaying matter

A glimpse of the diverse mouthparts that facilitate these varied eating habits

Chewing mouthparts (mandibulate)



Ant

Sucking mouthparts (haustellate)



Bee

Heteropteran



## **Insect Services**

- Pollination- orchard fruits, nuts, vegetables, and cotton.
- Provide honey, wax, silk, shelac
- Important member of the food chain
  - Aid in the recycling of nutrients by decomposing detritus
- Are extremely easy to work with for conducting scientific research

## Colony Collapse Disorder (honey bees)

- Rapid loss of hives due to bees failing to return
- Serious: Bee pollination responsible for approximately 1/3 of US diet
- Commercial value of honey bees estimated to be \$15 billion
- Potential causes:
  - Mites
  - Pathogens
  - Malnutrition
  - Stress
  - Reduced genetic variation
  - Pesticide: imidacloprid

## **And some insect disservices**

- Many insects are vectors of viruses and diseases that cause numerous human and animal deaths each year
- Many are pest species that defoliate crops, trees, and vegetation as well as stored clothing and grains

## Collecting Methods and Equipment

- Nets: Aerial and Sweep
- Aspirator
- Beating sheet
- Berlese Funnel
- UV/Mercury Light Traps
- Pit Fall Traps
- Kill Jar

## Dichotomous Keys

Using a dichotomous key is like reading a “choose your own adventure” novel except that the insects morphology has control over which way you choose to go

We will get some practice with this when we return from collecting and try to sort our insects specimens to order using the key starting on pg. 157 in your book