# (تصنيف الحشرات)

## ٣٠٣ش

## (الجزء النظري)

## الفصل الدراسي الأول

إعداد

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كلية العلوم

قسم علم الحيوان

٢٠٢٢-٢٠٢٣

# بيانات الكتاب

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**الكلية: العلوم**

**الفرقة: الثالثة**

**التخصص: كيمياء والحشرات**

**تاريخ النشر: الفصل الدراسي الأول**

**٢٠٢٢-٢٠٢٣**

## رؤية كلية العلوم

التميز في تعليم العلوم الاساسية والبحث العلمي للمساهمة في التنمية المستدامة

## رسالة كلية العلوم

تقديم تعليم مميز في مجالات العلوم الاساسية وانتاج بحوث تعليمية تطبيقية للمساهمة في التنمية المستدامة من خلال اعداد خريجين متميزين طبقاً للمعاير الاكاديمية القومية وتطوير مهارات وقدرات الموارد البشرية وتوفير خدمات مجتمعية وبيئية تلبي طموحات مجتمع جنوب الوادي وبناء الشراكات المجتمعية الفاعلة .

## رؤية القسم

خريجون وباحثون متميزون علمياً وبحثياً في دراسة ضرر ونفع الكائنات الحيوانية خدمة للمجتمع وتنمية للبيئة

## رسالة القسم

يسعى قسم علم الحيوان والحشرات بكلية العلوم جامعة جنوب الوادي من خلال ما يقدمة من برامج تعليمية باستخدام الوسائل العلمية والتعليمية المتطورة والتي تكشف عن المزيد من ضرر ونفع الكائنات الحية وباحثين وخريجون متميزين علمياً وبحثياً ينتفع بهم المجتمع وترتقي بهم الامة .

# INSECT TAXONOMY

# WHAT IS TAXONOMY ?

Taxonomy is a greek word derived from 2 words :

Taxis : means arrangment

Nomos : means law

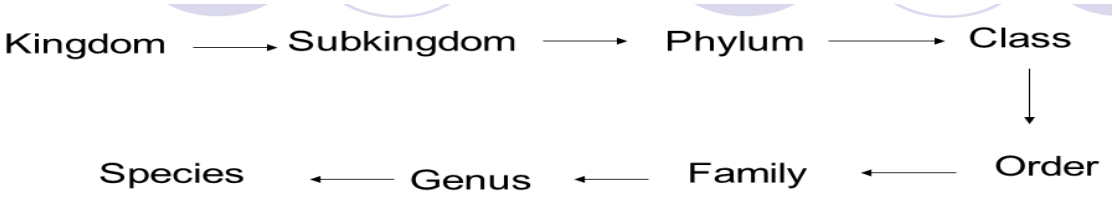
Taxonomy can also defined:

1- The science, laws, or principles of classification

2- The classification of organisms in an ordered system that indicates natural relationships

3- Division into ordered groups

**Carl linneous the first one put a system of taxonomy according to physical features :**




He also put the system of bionomial nomencluture of each organism

Recently Organisms are classified into 4 kingdoms :

Protista , Fungi , Plantae , Animalia

# Kingdom : Animalia

**Phylum : Arthropoda**

**Class : Insecta**

**( Hexapoda )**

Insects are the biggest class of Arthropods

They are the most diverse group of animals on the earth

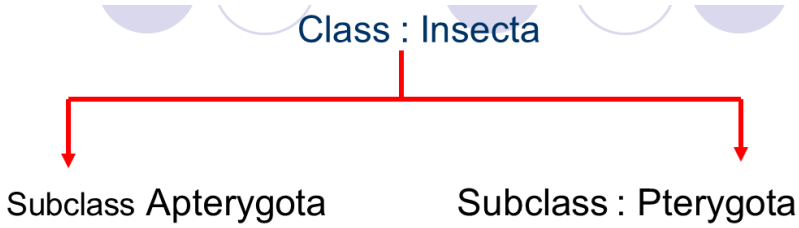
Have approximately million described species

Represent more than half of all known living organisms

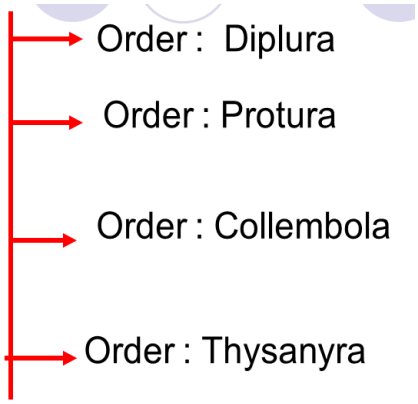
Insects found in nearly all environments on the plant

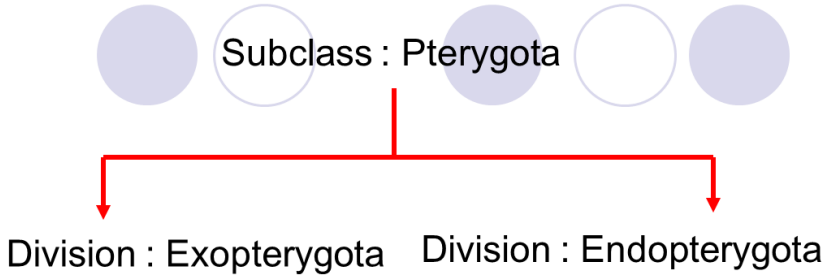
Have economical harmful and beneficial species for human

**General Classification of Class : Insecta**




**Subclass : Apterygota**






Exopterygota : Incomplete metamorphosis wings develop externally

Endopterygota : Complete metamorphosis wings rudiments develop internally

**Exopterygota**

Ephemeroptera , Odonata , Isoptera , Dermaptera , Blattodea (Dictyoptera) , Orthoptera, Plecoptera , Embioptera , Hemiptera , Psocoptera , Thysanoptera , Siphunculata, Zoraptera ,Mallophaga

**Endopterygota**

Diptera , Lepidoptera , Siphonaptera, Mecoptera , Trichoptera , Hymenoptera , Coleoptera

, Neuroptera , Strepsiptera

## Subclass : Apterygota

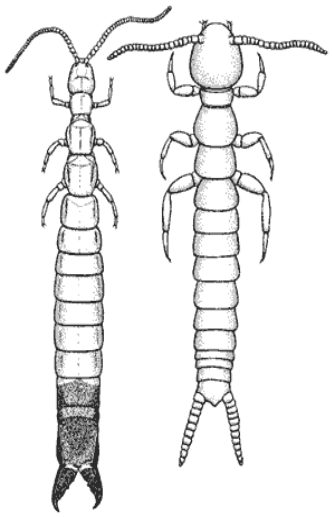
Order :Diplura

The Diplura are a group of primitive arthropods usually included in the class Insecta

The Diplura are world wide distribution with about 1000 described species a signed to 8 families

The name Diplura is derived from the presence of paired caudal appendages

## General Chracters of order diplura



1- Shape : Slender elongated body

2- Size : Small ( Less than 5mm )

3- Body is divided into :

a) Head : eyes : absent

antenna : many segmented

mouth parts : chewing (inside head)

b) Thorax : wingless

legs : well developed

2 pairs of spiracles on the thorax

c) Abdomen : 10 segments

has a pair of caudal cerci which

may be segmented (Campodeidae)

or one segmented (Japygidae)

4- Metamorphosis : not marked

the young and adult differ chiefly in size and sexual maturity

5- Habitat : under leaves , stones or in soil

6- Feeding : many species may be predators

food is other Diplura , mites , Collembola fly and beetle larvae ,roots of living plants

7- Biology :

- Male deposit sperm bundles in the soil

- Female pick up these sperm bundles and become fertilized

- Eggs may be deposit randomly and in clusters or at end of a filamentous stalk

- The prelarva hatch in 7-16 days ( donot feed and move little )

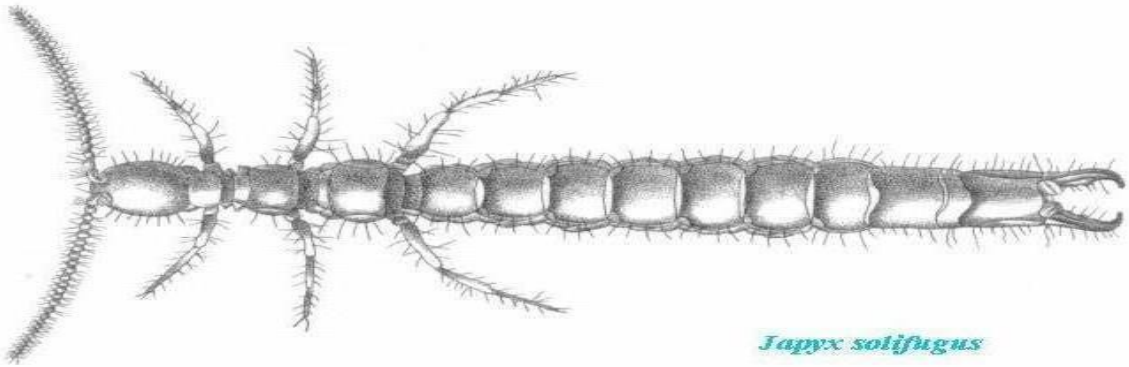
- The prelarva molts in about 2 days to immature fully mobile and feed on whatever food source available

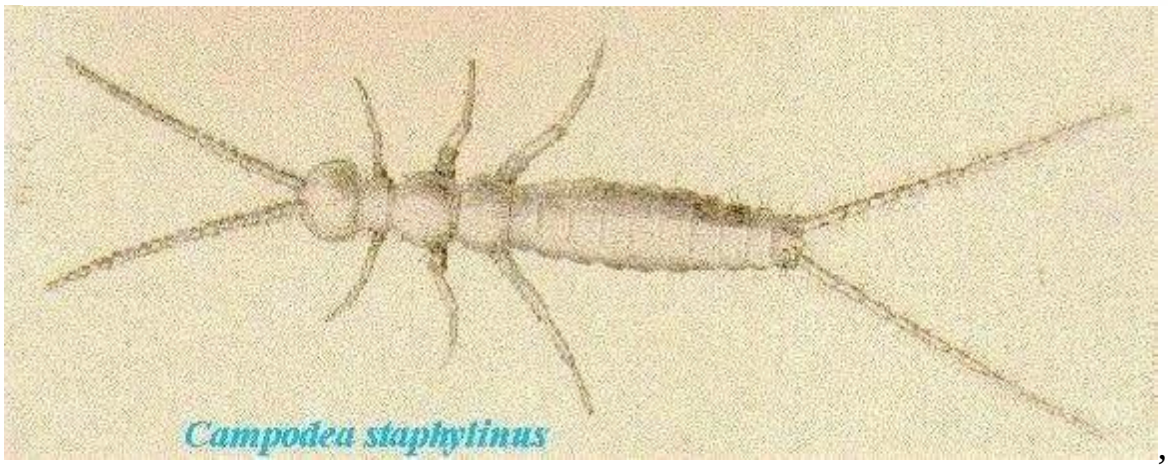
- After $2^{nd}$ molt the immature form possesses the major setae

- During $4^{th} – 5^{th}$ molt the individual becomes sexually mature

- Diplura continue to molt during their lives adding and regenerating damaged appendages

8- Examples :


Japyx solifugus


Campodea staphylinus

,,,

## Order : Protura

## ( Proturans )

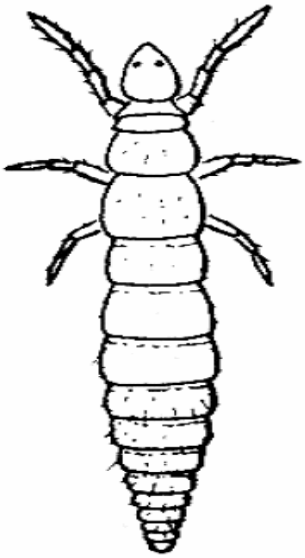
600 speices have been described asigned to 8 families

Members of order Protura are pale to white arthropods that live in the soil and ground litter debris, because of these characteristics , the group was not discovered and recognized until 1907 , long after almost all the other insect orders had been described and classified by F.Silvestri and A. Berlese

General Characters of Order : Protura

1- Shape : Slender

3- Body is divided into :



a) Head : cone shaped

eyes : absent

antenna : absent

mouthparts ; chewing , well developed

Inside head

b) Thorax : wingless

3 similar pairs of thoracic legs

the 1st pair serve as tactile organs

c) Abdomen : 12 segments

1st 3 abdominal segments with paired styli

2- Size : Small ( 1.5 mm )

4- Metamorphosis :

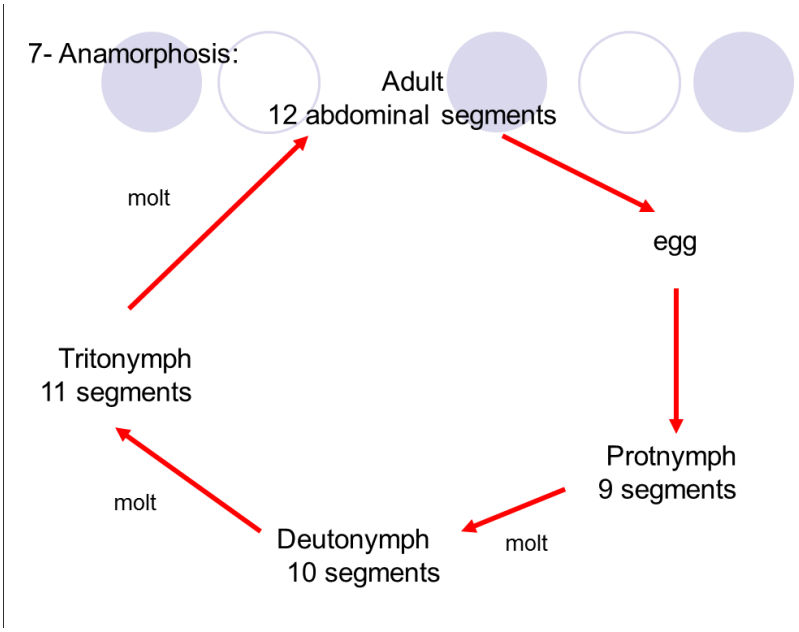
Nymphs are similar to adults in general appearance -

In development they exhibit anamorphosis , that is adding segments to the body at each molt

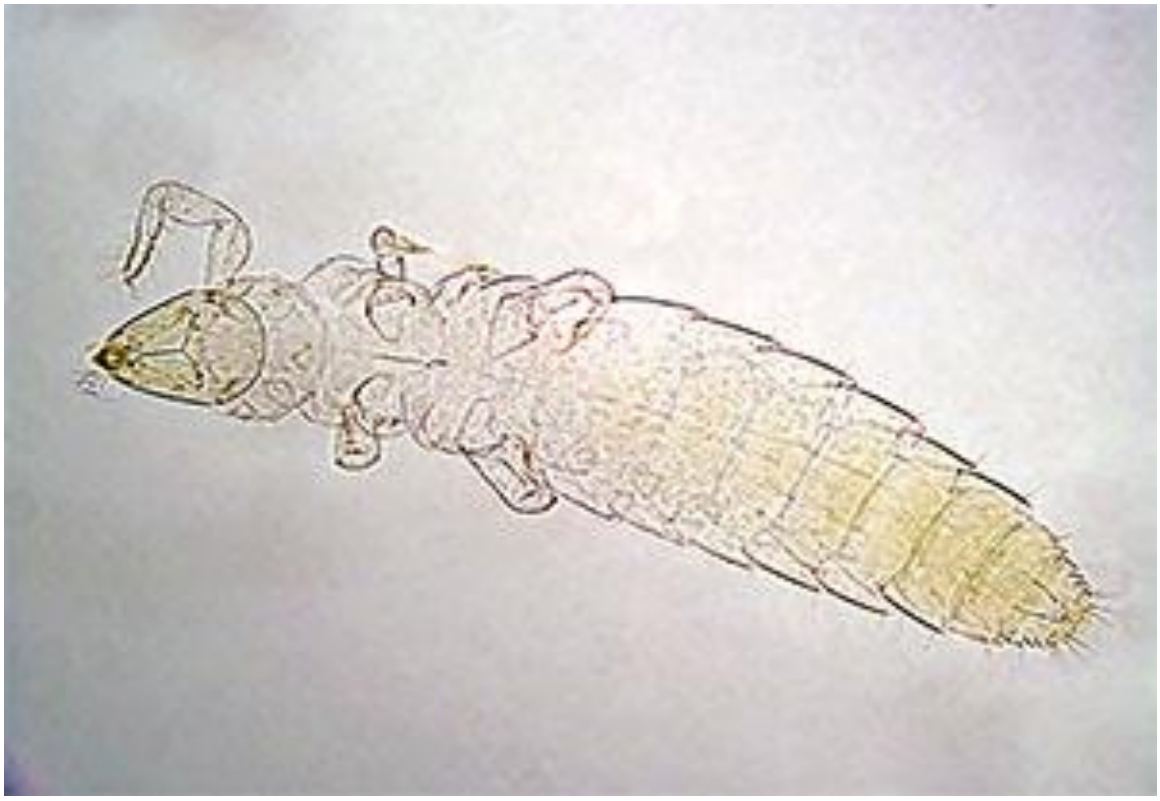
5- Habitat : humus , soil damp situation , old leaf mold along wood edges

6- Feeding : both nymphs and adults feed on decayed organic matter

7- Anamorphosis:



8 – Examples :



Acerantomon doderoi

## Order : Collembola

## ( Springtails , Snow fleas )

Collembola comprise one of the most wide spread terrestrial arthropods

They are found everywhere in all habitats except the open oceans and deep areas of large lakes

**General characters of Order : Collembola**

1- Size : minute to medium small ( 0.5 -10 mm )

2- Body is divided into :

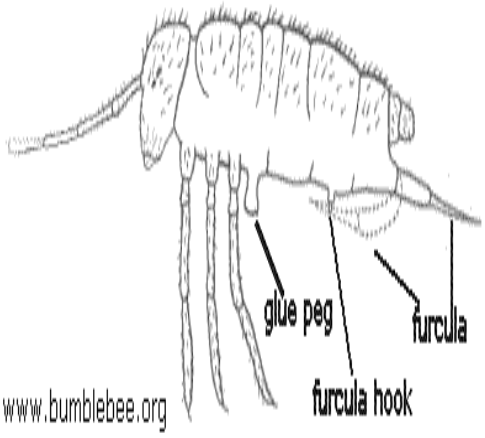
Head : eyes : present or absent

antenna : present

mouthparts : chewing

can retract

may have stylet-like




Thorax : wingless

legs : well developed

Abdomen : 6 or fewer abdominal segments

1st seg.has tubular structure(collophore)

4th seg has a ventral jumping organ or furcula

button or tenaculum when not in use

Furcula move down and back abliing insect for jumping

3 – Metamorphosis : absent

both sexes usually similar and without

definite genitalia

4 – habitat : found abundantly in many types of moist situations , including deep leaf mold , damp soil , rotten wood , edges of ponds , fleshy fungi

5- Feeding : feed on fungi (mushrooms ) , bacteria and decaying vegetation, some are carnivores , others are herbivores

a number are fluid feeders

6- Biology :

Fertilization is internal

The sperm is produced in a packet

These packets are produced randomly and fertilization

occurs by accidental contact of the female with the packet of sperm

Both male and female occur in most species but parthenogenesis is common

Collembola continue to molt after reaching sexual maturity reach 52 time

7- Examples :

Class : Insecta

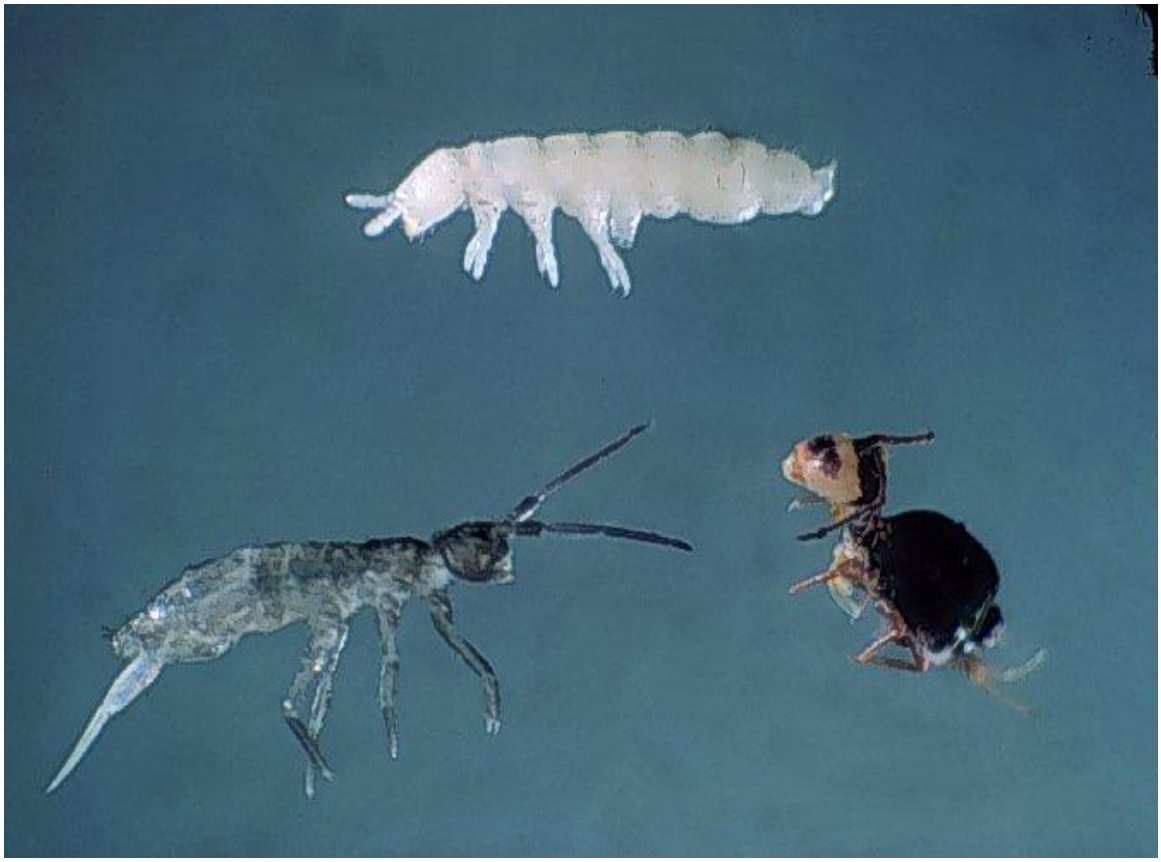
Subclass :Apterygota

Order : Collembola

Suborder : Arthropleona

Family : Onychiuridae

e.g. : *Tetrotodophora bielanensis*



## Order : Thysanura

## ( Silverfish , Firebrats )

General characters of Order : Thysanura

1- Shape : Flattened wider body

styliform appendages

2- Size : Small to medium size (5-30 mm )

3- Body is divided into :

Head : eyes : absent or small

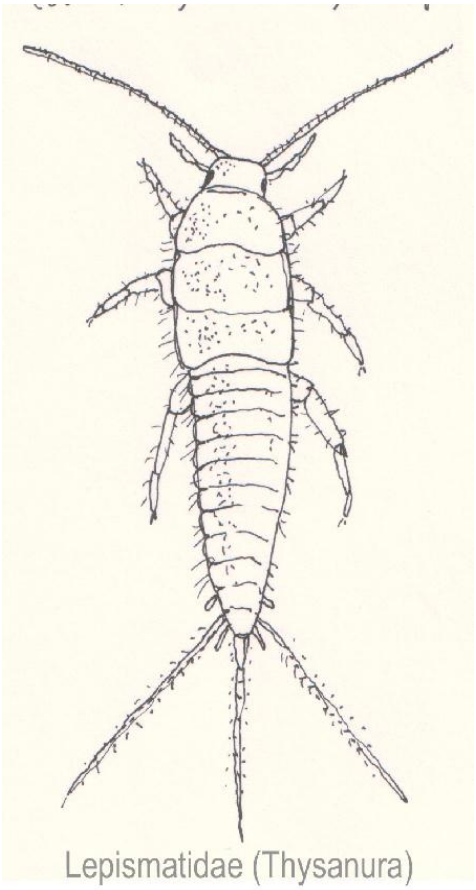
antenna : multisegmented

Thorax : wingless

legs : well developed

Abdomen :11 segments

has long cerci and along caudal filament



Lepismatidae (Thysanura)

4- Economic status :

Silverfish *Lepisma saccharina* ,

firebrats *Thermobia domestica* feed commonly on starch.

They cause considerable damage to books and clothing by chewing off the starch or glue

5- Biology :

-Eggs are laid singly in cracks

-The young grow slowly , maturing in 3-24 months , and

have a large and indefinite number of molts

-Molting continue after adulthood is reached

6- Examples :

*Thermobia domestica*

*Lepisma saccharina*


*Thermobia domestica*

# Subclass: Pterygota

## Division : Exopterygota

## Order : *Ephemeroptera*

## (Mayflies; Cadisflies )

Classification of Order: Ephemeroptera
Order : Ephemeroptera (mayflies)

Suborder : Furcatergalia
Infraorder : Scapphodonta
Family : Ephemeridae
Genus : Ephemera
Genus : Hexagenia
Genus : Litobrancha
Genus : Pentagenia

(Ephemeroptera from Greek, *ephemeros* = short-lived; *pteron* = wing)
General Chracters of order:Ephemeroptera

1-shape : Slender insects with soft body.
2-size : small to medium sized insects with an average wingspan up to 15 mm
3-Body is divided into :
a) Head : Short, fine antennae.
Compound eyes large, usually Covering most of the head.
Vestigial mouthparts.

b)Thorax : 2 pair of membranous wings, Hindwings much smaller than the forewings.

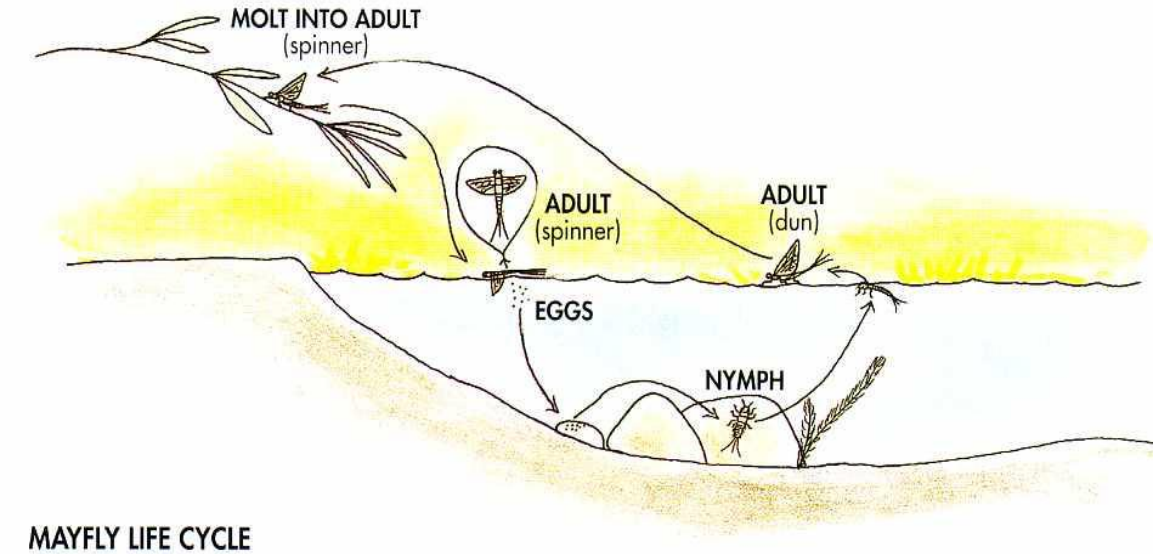
front wings large, triangular. hind wing smaller, fan-shaped.
Front legs long and often held out in front body.

c) Abdomen : Abdomen slender, bearing two (or sometimes three) long terminal filaments **.**

4 -Metamorphosis : gradual metamorphosis. Mating occurs during flight and large swarms of mayflies close to the fresh water. Eggs are laid on the water surface. Upon hatching the nymphs live on the bottom. Development can

take from several months up to a year and can involve from 20 to 50 molts depending on the species .

Mayfly nymphs are aquatic and have a similar body shape to the adults but lack wings. The nymphs have gills along the sides of their abdomen, which look similar to fine leaves.




MAYFLY LIFE CYCLE

8 – Examples :

*Ephemera*

*Hexagenia*

Mayfly nymph

## Order : *Odonata*

## (Dragonflies and Damselflies)

This scientific name is derived from a Greek word, *odon*, meaning " tooth," possibly referring to the teeth on the mandibles or tusk-like shape of the insect's abdomen.

Classification of Order:Odonata

The majority of odonata belong to two suborders, the Anisoptera (Dragon flies) and Zygoptera (Damsel flies).

Order : Odonata (dragonflies and damselflies)
Suborder : Anisoptera (dragonflies)
Family : Libellulidae
Genus : *Crocothemis*
Species :*Crocothemis erythraea*
Suborder :Zygoptera (damselflies)
Family :Coenagrionidae
Genus :*Ischnura*
Species :*Ischnura senegalensis*

General Characters of order : Odonata

1-shape : this insects have beautiful colors.
2-size : medium to large.
3-Body is divided into :
a) Head : very mobile hypognathous head.
Short filiform antenna.
Mandibulate (chewing) mouth parts.
Large compound eyes, 3 ocelli.
b)Thorax : Short and compact.
Two pairs of nearly similar net-veined wings with pterostigmata. In the hindwing, the inner margine is broader than the outer margine.
Short walking legs.

**c) Abdomen :** Elongated, slender with 10 segments.

One segmented cerci work as catch organ in male.

Male capulatory organs on second abdominal sternites (ventral side).

Female genitalia on the last abdominal segment.

**4- Metamorphosis :** Incomplete metamorphosis.

Eggs are laid in water or on vegetation near water or wet places, and hatch to produce pronymphs.

They then develop into instars with approximately

9-14molts

that are) in most species) voracious predators on other aquatic organisms ، including small fishes.These insects later transform into reproductive adults

couples damselfly two of flight Ovipositing


5- habitat :Dragonflies and damselflies range from the arctic to the tropics and are even found in desert regions where water is present. Immature dragonflies and damselflies, called naiads, live in water and often have preferences for a specific kind of aquatic habitat, some preferring streams and others ponds or lakes.

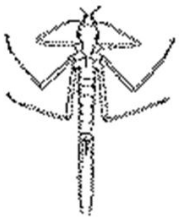
6- Feeding :Adult dragonflies and damselflies catch and eat insects while they are flying, including flies, wasps, moths, and beetles.

Naiads are voracious predators and feed mostly on other insects in water, but they also can be cannibals by feeding on other naiads of their own species. Some large naiads have been known to feed on small fish.

7-Differences between the Anisoptera and the Zygoptera

| *Anisoptera* | *Zygoptera* |
|---|---|
| 1-Strong fliers. | 1-weak fliers. |
| 2-large and robust at all stages. | 2-small and delicate at all stages. |
| 3-Hindwings broader at base, held horizontally at rest. | 3-Wings of equal size,narrow at base, held vertically at rest. |
| 4-Eyes not projecting from sides of head. | 4-Eyes bulbous and prominent. |
| 5-Most females with reduced or vestigial ovipositors. | 5-Females with well developed ovipositors. |
| 6-Nymphs robust, with rectal gills. | 6-Nymphs slender, with paddle-like caudal gills. |
| 7-Eggs usually laid at water surface or on surfaces of aquatic plants. | 7-Eggs inserted into stems of aquatic plants. |

Dragon fly nymph



Damsel fly nymph

8 – Examples :

Dragon fly


Damsel fly

*Ischnura*

*Ischnura senegalensis*

*Ischnura senegalensis*

*Ischnura senegalensis*

Order :Mantodea

Mantids

Mantids

Mantodea or mantids is an order of predatory insects which contains approximately 2,200 species in 9 families world wide in temperate and tropical habitats

The common name of the order is “ praying mantises” because of the typical “ prayer form “

1- Size :Large

2- Body is divided into :

a- Head : flexible, bearing :

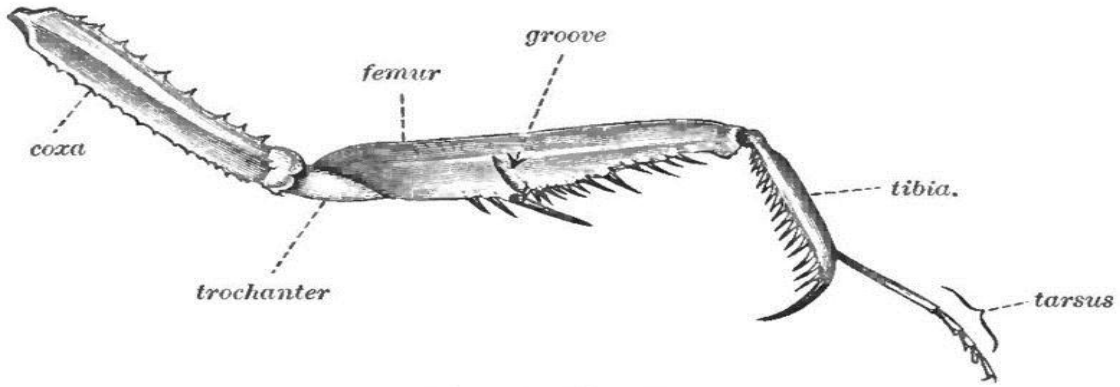
Eyes: compound

Mouthparts : chewing

b- Thorax : with

Elongated flexible prothorax  Seizing prey legs

c- Abdomen : Flattened




Leg of a Mantis.

Food:

Mantids are predaceous , typically feeding on insects and other arthropods

Large mantids have also been known to prey on small birds , lizards and amphipians

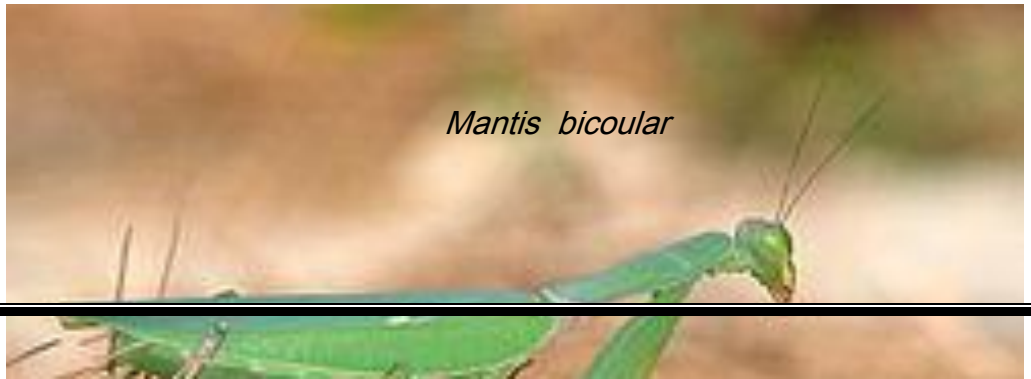
Life cycle

1- Mantises carry out incomplete metamorphosis

2- Generally molting 7 or more times to reach maturity

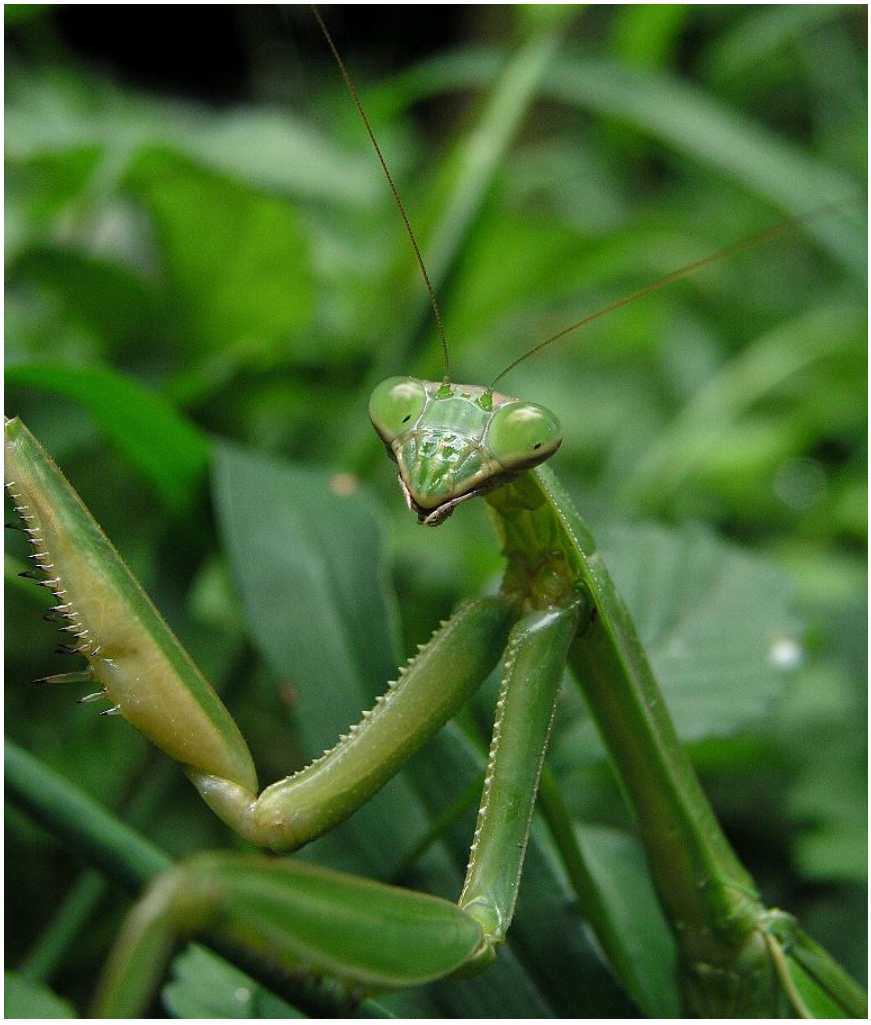
3- Eggs are laid during autumn in an ootheca (egg sac ) which hatch in the spring

Examples:



*Mantis bicoular*

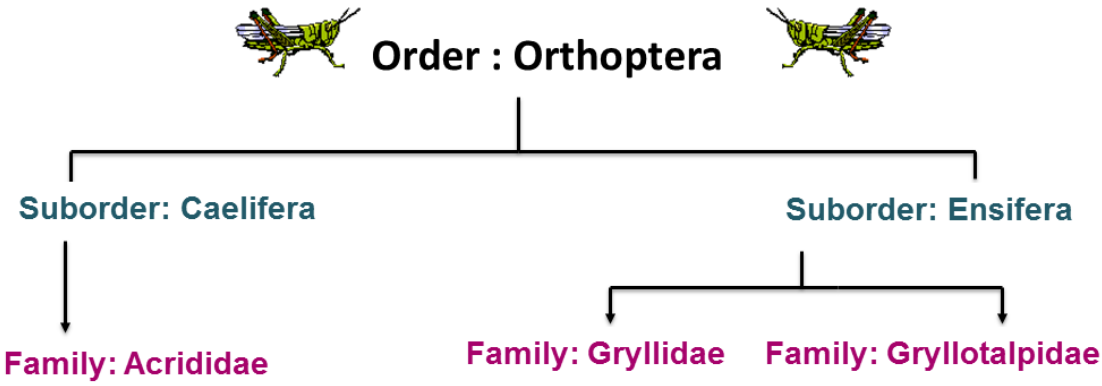

Sphadromantis viridus



# Order: Orthoptera

*(Grasshoppers, crickets, and katydids)*

## Classification of Order Orthoptera



**Scientific Classification**

**Kingdom: Animalia**

**Phylum: Arthropoda**

**Class: Insecta**

**Subclass: Pterygota**

**Division: Exopterygota**

**order: Orthoptera**

**General Characters of Order Orthoptera**

- The **Orthoptera** (from the Greek, *orthos* = "straight" and, *pteron* = "wing")
- There are about 20 000 known species distributed around the world
- Including the grasshoppers, crickets and locusts.
- Many insects in this order produce sound (known as a "stridulation") by rubbing their wings against each other or their legs.
- The tympanum or ear is located in the front tibia in crickets, mole crickets, and katydids.

These organisms use vibrations to locate other individuals.

**1- Size:** Varies from less than 5mm to some cm. of the world's largest insects

**2- Body is divided into:**

- **Head:**

**Eyes:** large compound eyes and 3 ocelli (may present or absent).

**Antenna:** Length vary with species(sometimes filamentous, setaceous or multiarticulate)
**Mouth parts:** Mandibulated

- **Thorax:**

Prothorax: Large and covered by shield-like pronotum

Mesothorax: Small

Metathorax: Large

Wings: Two pairs of wings; the forewings or tegmina are narrower than hind wings and hardened at the base. They are held overlapping the abdomen at rest. The hind wings are membranous and held folded fan-like under the forewings when at rest.

**Legs:** Walking legs with saltorial hind legs are elongated for jumping.

**Abdomen:** about 8-9 segments and the three terminal abdominal segments are reduced. There is short unsegmented cerci. The female usually has well developed ovipositor.

**3- Metamorphosis:** They undergo incomplete (gradual) metamorphosis (having nymphs that look like small adults and no pupa).

Most grasshoppers lay their eggs in the ground or on vegetation. The eggs hatch and the young nymphs resemble adults but lack wings and at this stage are often called *hoppers*. Through successive molts the nymphs develop wings until their final molt into a mature adult with fully developed wings.

The number of molts varies between species; growth is also very variable and may take a few weeks to some months depending on food availability and weather conditions.

**4- Habitat:** The Orthoptera can be found in most habitats, as well as the more familiar species found in Grassland and Forest, Sea-shores, Bogs and Marshes, Camel Crickets are naturally cave dwellers, the Desert Locust *Schistocerca gregaria* lives in Desert and Semi-Desert, while the Mole-cricket (Gryllotalpa gryllotalpa) lives under ground. Many species are arboreal (live in trees).

Though some species are very cosmopolitan, others can be quite specific in the habitat requirements i.e. the Ant Cricket is only found in ant nests.

**5- Feeding:** Leaves, flowers, bark, and seeds, but many species are exclusively predatory, feeding on other insects, snails or even small vertebrates such as snakes and lizards. Some are also considered pests by commercial crop growers.

**Grasshopppers mating**

**Instars of Grasshoppers: from the newly-hatched nymph to the fully-winged adult.**

**6- Economic Importance:**

Orthoptera is generally regarded as a dominant group in most terrestrial habitats.

They are one of the largest and most important groups of plant-feeding insects. As they feed on all types of plants and often cause serious economic damage. Swarms of grasshoppers (locusts) regularly appear in parts of Africa, Asia, and North America and destroy crops over wide land areas. Several species of field crickets are reared commercially as fish bait.

## Differences Between Suborder Caelifera and Suborder Ensifera

| **Characters** | **Suborder Caelifera *(Short-horned grasshoppers)*** | **Suborder Ensifera *(Long-horned grasshopper)*** |
|---|---|---|
| **Living** | **Diurnal** | **Nocturnal** |
| **Antennae** | **Short** | **Longer than the body** |
| **Eyes** | **Sharp & Large eyes** | **Small eyes** |
| **Hearing** | **Strong hearing** | **Weak hearing** |
| **Legs** | **Hind legs modified into jumping legs** | **Fore legs modified into digging legs** |
| **Tarsi** | **Three segmented tarsi** | |
| **Ovipositor** | **Short** | **Long or vestigeal** |

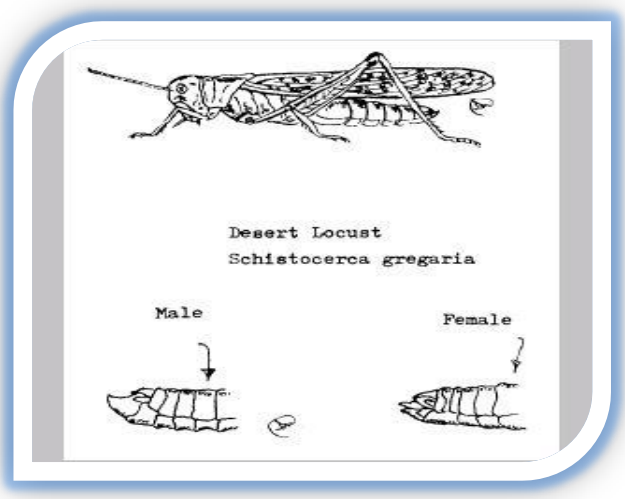
| **Characters** | **Suborder Caelifera *(Short-horned grasshoppers)*** | **Suborder Ensifera *(Long-horned grasshopper)*** |
|---|---|---|
| Auditory organ | Located on the tergum of the 1st abdominal segment under the fore wing | Located on the tibia of the fore legs |
| Stridulatory organs | The sound produced from the projections on the inner side of the femur of the hind legs which is rubbed against the hardness radial vein on the fore wing. | The sound produced as the following:<br>A- The fore wings are moved backward and foreword laterally.<br>B- The scraper of the left |

| | | |
|---|---|---|
| | | wing is rubbed against the file of the right wing. |
| Characters | Suborder Caelifera (Short-horned grasshoppers) | Suborder Ensifera (Long-horned grasshopper) |
| Family | Acrididae | Gryllidae |
| | e.g.:<br>Schistocerca gregaria | e.g.: Gryllus bimaculatus |
| | e.g.: Locusta donica | e.g.: Gryllus domisticus |
| | e.g.: Anacridium aegyptium | Gryllotalpide |
| | e.g.: Tryxalis nasuta | e.g.: Gryllotalpa africana |

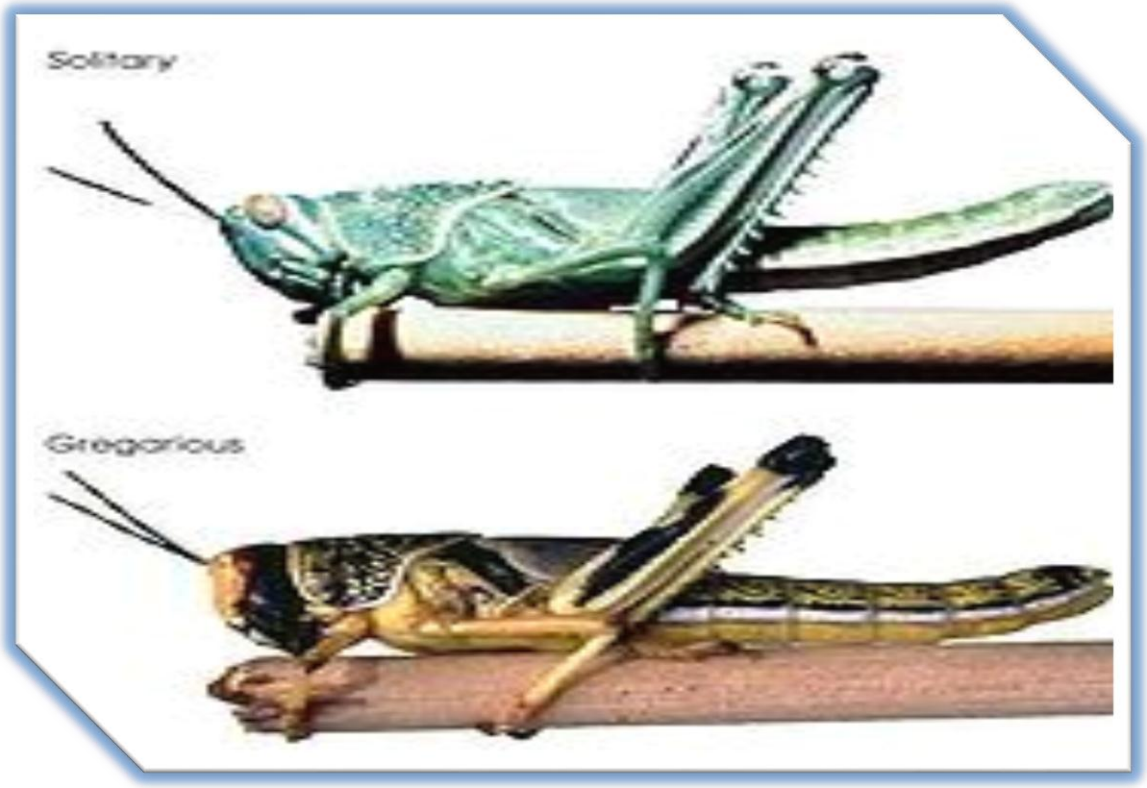
**Examples**

Compound eyes in Desert Locust

*Schistocerca gregaria*

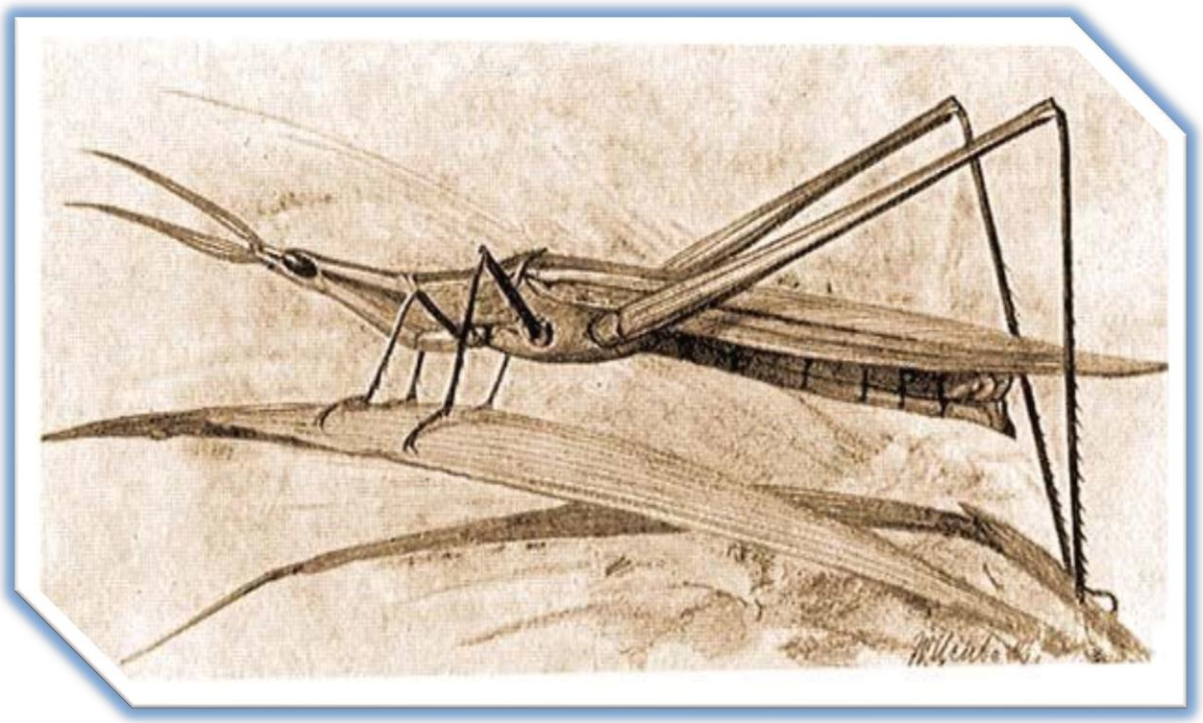


# Desert Locust




**Solitary (top) and gregarious (bottom) desert locust nymphs**

***Anacridium aegyptium***

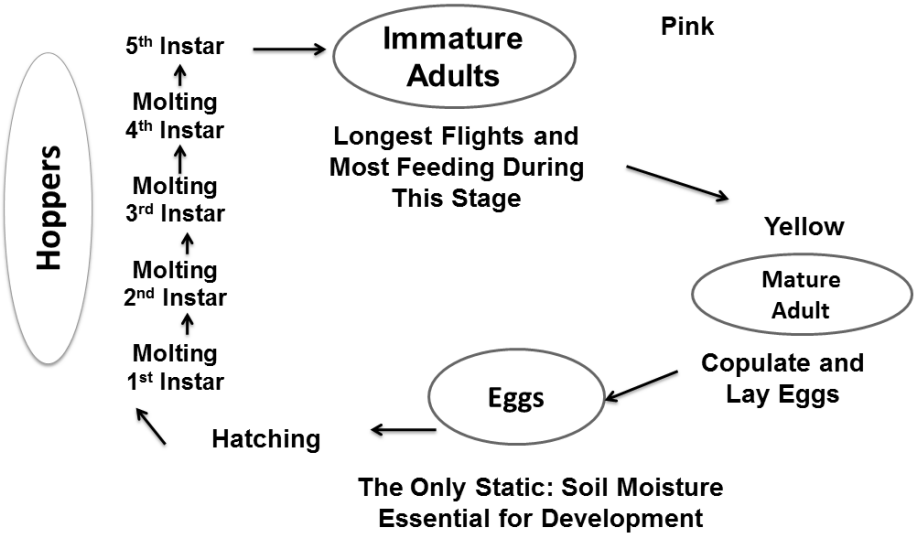


***Tryxalis nosuta***

**Common Field Cricket, *Gryllus domesticus***

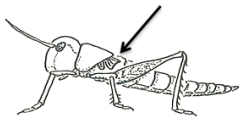
***Gryllus bimaculatus***

## Life cycle of Desert Locust *Schistocerca gregaria*



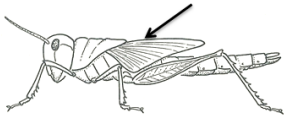

1st Instar nymph (8mm)

Wing bud



3rd Instar nymph (20mm)

Developing wing



5th Instar nymph (50mm)

## Order: Dermaptera
***(Earwig)***

**Scientific Classification**

**Kingdom: Animalia**

**Phylum: Arthropoda**

**Class: Insecta**

**Subclass: Pterygota**

**Division: Exopterygota**

**Order: Dermaptera**

**General Characters of Order Dermaptera**

Dermaptera = "skin wings" Refers to the leathery texture of the forewings. The name earwig comes from a superstition that the insects would enter the ears of a sleeping person and tunnel into the brain.

**1- Size:** 6-35 mm long

**2- Shape:** Earwigs have slender, flattened bodies.

**3- Color:** Adults are pale-brown to reddish-black in color.

**4- Body:** Is divided into :

**A- Head:**

**Antennae:** bead-like antennae

**Mouth Parts:** Chewing mouth parts.
**B- Thorax:** The front wings are short and meet in a straight-line down the back. The hind wings are membranous and folded underneath the front wings.

**C- Abdomen:** Adult males have 10 abdominal segments, while the females have 8 segments.

Both the males and females have large, pincers (cerci) that stick out from the back of the abdomen (the pincers are one segment). The pincers are used in defense for protection against predators or to capture prey.

**5- Metamorphosis:**
Simple metamorphosis with visible changes including increasing antennal segments and progressive wing development until sexual maturity. The mother cares for the eggs and nymphs.

**6- Habitat:**

Earwigs tend to hide under debris during the day, but feed on plants, organic matter, and smaller insects at night.

**7- Feeding:**

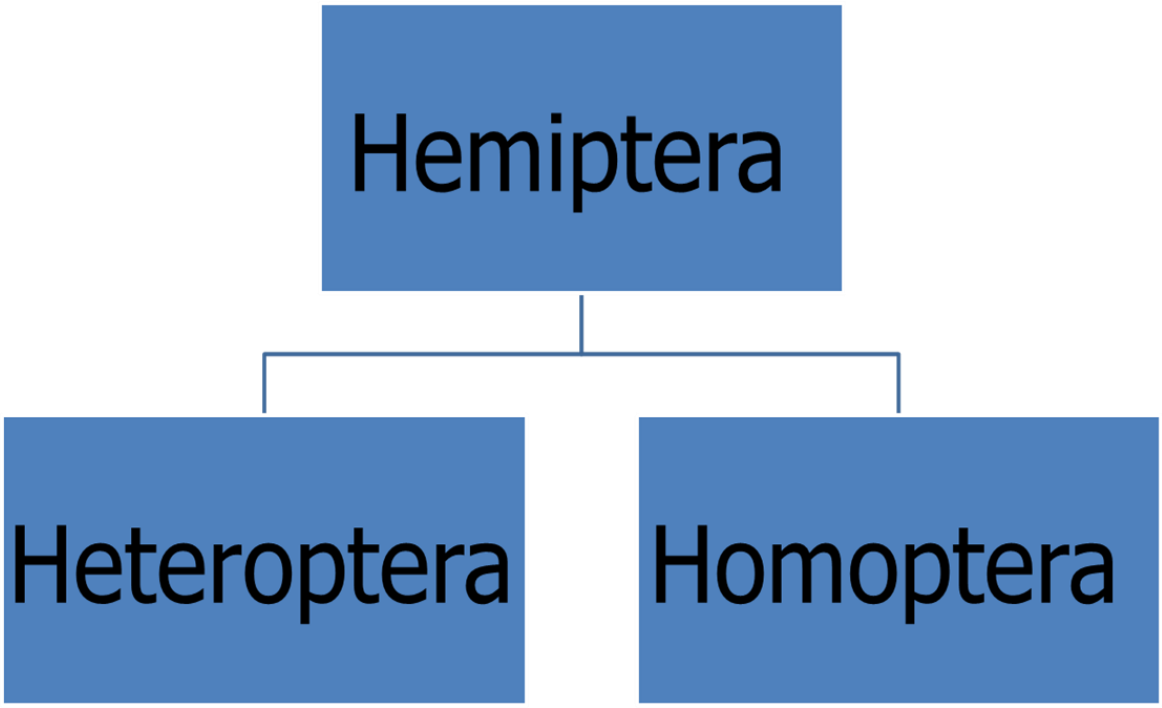
Plants, organic matter, other small insects.

**8- Life Cycle:**
Earwigs hibernate in the soil as adults during the winter. In spring, adult females lay 30 to 55 eggs in the soil. The females nurture and protect the eggs and young (maternal care), which is uncommon for insects. The eggs hatch into young nymphs. Earwigs have four to five nymphal stages before becoming adults. Earwigs are nocturnal, hiding during the daytime and active at night. They tend to prefer moist environments. During the day, they usually inhabit dark confined or shaded areas such as under plants, debris, stones, organic mulch, tree bark, and flower pots. They are less likely to be found in exposed sunny areas.

**9- Economic Importance:**
Earwigs are not a major pest; however they do feed on flowers and can be a nuisance inside homes.

***Labidura reparia***

**Order :Hemiptera**




Suborder: Heteroptera
Family : Belostomatidae

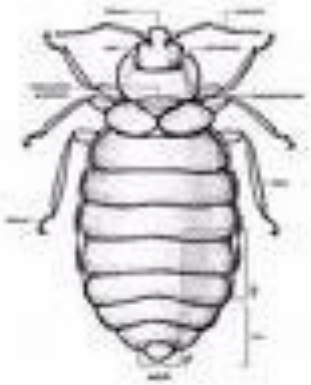
- Antenna short to long, filiform or setaceous
- Compound eyes large, ocelli present or absent
- Mouth parts: piercing and sucking
- Thorax: prothorax large, distinct ,mesothorax represented dorsally by scutellum. forewings large than hind wings ,flexed flat over abdomen
- Legs: Walking, in some species predatory
- Abdomen with anterior1-2segment reduced or absent, posterior1-2 segment reduced

Cerci absent

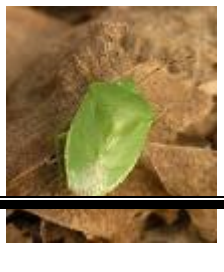
*e.g.: Lethocerius niloticus*

- Family: Cimicidae
- *Cimex lectularius*

- mandible and maxilla become specialized as two channeled
- Piercing to delivering saliva, and talking up food injection of saliva
- Is the major factor in transmission of pathogens?
- In predatory species saliva is highly toxic enabling large prey
- Reproduction bisexually



- Most hemiptera hemimetabolous,nymphs differ from adults in such details,such as number of antennal segments
- presence of ocelli
- wings development
- Reproduction bisexually ,oviposition on plant tissue or on soil
- basal portion of fore
- Wings thickned, rostrum arising interiorly on the head
- *Nezara veridula*



- Bentatomidae
- Heteroptera
- Hemiptera

Homoptera

wings uniformly membranous

rostrum arising near

posterior margin of the head

*e.g.:Aphis faba*

*e.g.:Aphis gossypyii*

Family: Aphididae

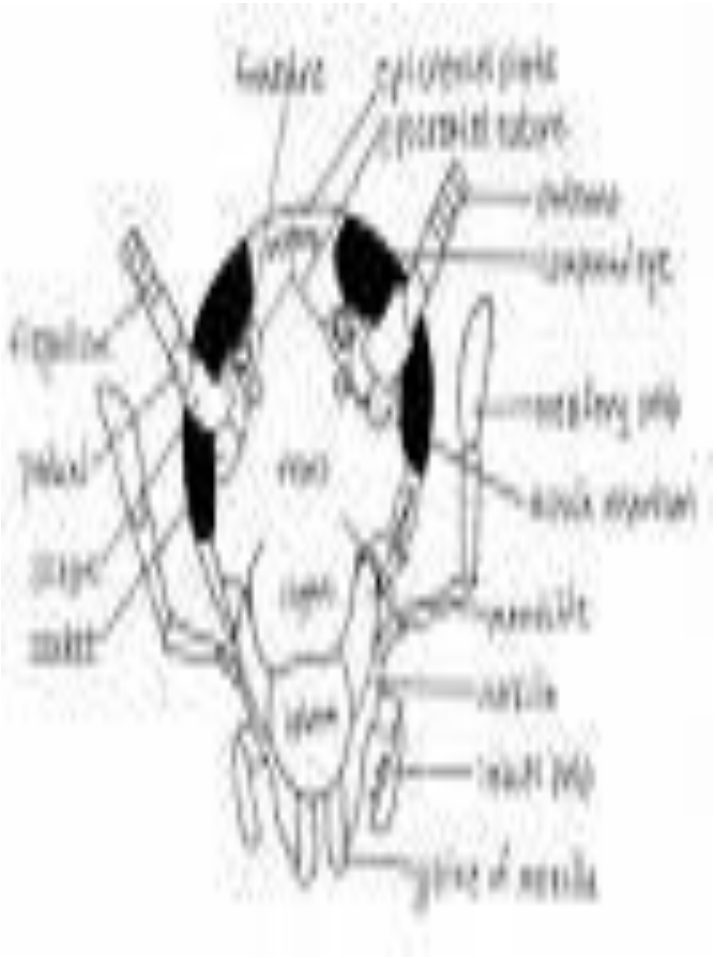
Order: Blattodeae(Dictyoptera)

- About 30 species of cockroaches are cosmopolitan inhabitants of man dwellings , placing them among most familiar insects to non- entomologist yet they must considered potential medical importance because large number of pathogenic micro-organisms isolated from their bodies.

- Cockroaches have been important subject for investigation of hormonal control of insect growth , development , study insecticidal mode of action and insecticide resistance , cockroaches adults are long lived , some species surviving 4-years under experimental conditions

General characters

- Flattend broad body ,mouthparts mandibulate, compound eyes large , with 2-ocelli
- Antenna :very long ,multiarticulat
- Thorax :prothorax large ,mobile , with shield-like notum
- Meso and meta thorax smaller than prothorax



- Wings : fore wings scelerotized  hind wings membranous
- Legs :coxae long , tarsi 5-segments ,abdomen  10-segments
- Tergit 10 bearing cerci tergit 5-6 bearing scentgland.
- Order:Dyctyoptera(Blattodeae)

  Family : Blattidae

  e. g:*Periplaneta amricana*

  *e.g :Blattela germanica*

  *e. g: Polyphaga aegyptiaca*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## Order : Isoptera

### Termite-White ant

The name Isoptera, derived from the Greek "iso" meaning equal and "ptera" meaning wings, refers to the similar size, shape, and venation of the four wings.

General characteristics

1- Social insects living in large communities, with several different forms or castes, reproductive ('kings' and queens'),non reproductive (soldiers and workers).
2- All are soft-bodied and generally pale in color, with biting mouthparts. The soldiers have a large head - in some species with large, powerful jaws - in others with a pointed rostrum from which a poisonous, repellent liquid can be ejected.

3-The reproductive castes have two pairs of similar long, narrow wings, but these are soon shed once they start nesting. Other castes are wingless. The wingless forms have rudimentary eyes or none at all.

4- Abdominal cerci always very short.

5- Metamorphosis simple. All castes are long-lived. A king and queen may live together in their colony for many years - up to 50 years has been quoted for some species - and individual soldiers and workers may live up to four or five years.

Termite castes

Termite queen with its workers

Life History & Ecology:

The termites are another group of insects that appear to be closely related to cockroaches. This conclusion is based on behavioral and ecological similarities between termites and wood roaches (members of the family Cryptocercidae). These cockroaches live in fallen timber on the forest floor, feeding on wood fibers which are then digested by symbiotic microorganisms within their digestive systems. They live in small family groups where each female provides care for her young offspring. Termites and wood roaches are thought to be close relatives because they both occupy similar habitats, share the same type of food resources, have the same intestinal symbionts, and provide care for their offspring.

Termites are the only hemimetabolous insects that exhibit true social behavior. They build large communal nests that house an entire colony. Each nest contains adult reproductives (one queen and one king) plus hundreds or thousands of immatures that serve as workers and soldiers. Like cockroaches and mantids, the termites are most abundant in tropical and subtropical climates.

Distribution:

Extremely common in tropical and subtropical climates. Generally less abundant in temperate regions.

| | North America | Worldwide |
|---|---|---|
| Number of Families | 4 | 7 |
| Number of Species | 44 | ~2300 |

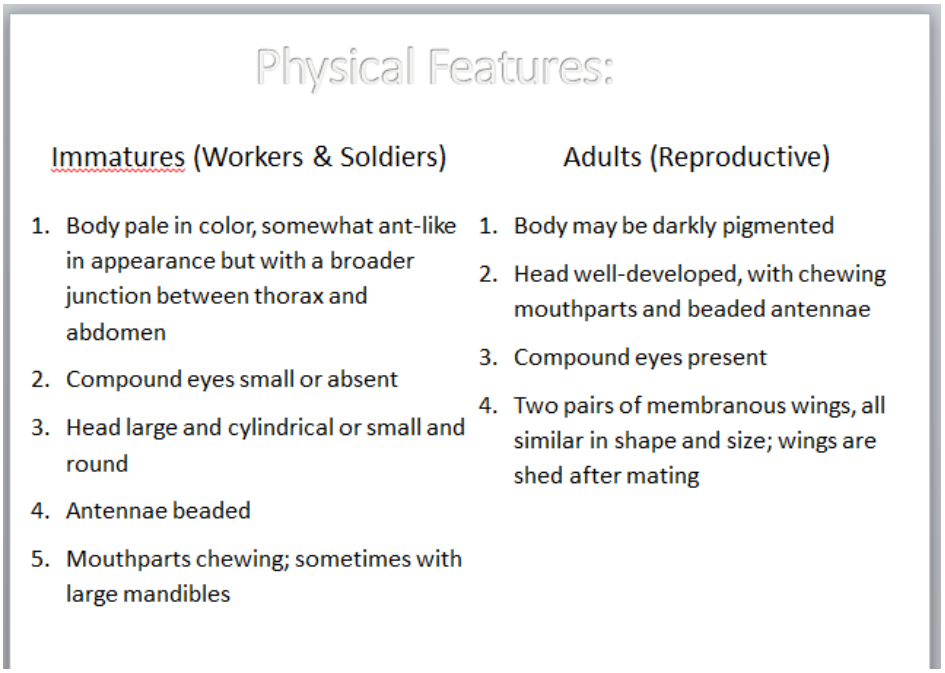
Classification:

Hemimetabola

incomplete development (egg, nymph, adult)

Major Families :

- **Rhinotermitidae** (Subterranean termites) -- These insects build nests in the soil and generally infest wood that is in contact with the ground. This family includes the most destructive species found in the United States: the eastern subterranean termite (*Reticulitermes flavipes*), the western subterranean termite (*R. hesperus*), and the Formosan subterranean termite (*Coptotermes formosanus*).
- **Hodotermitidae** (Rottenwood termites) -- Generally found inhabiting moist wood. Contact with the soil is not a requirement. This family includes the Pacific dampwood termite, *Zootermopsis angusticollis*.
- **Kalotermitidae** (Drywood and dampwood termites) -- These insects nest in the wood itself and do not require contact with the soil. Pest species include the western drywood termite (*Incisitermes minor*) and the forest tree termite (*Neotermes connexus*).
- **Termitidae** -- This is the largest family of termites worldwide, but all of the North American species are relatively minor in importance.




Life Cycle of termites

1. Winged reproductive ('alates') emerge from the nest entrance, surrounded by workers trying to protect them from predators.

2. The alate female flies some distance from the nest, then settles on the ground, tips her abdomen in the air and releases a sex pheromone into the air, its dispersal aided by beating of the wings.

3. A male locates the advertising female, settles beside her, they recognize each other, brake off their wings and then scuttle off together to find a suitable nest site.

4. After finding a nest site, the male ('king') mates with the female ('queen') and the queen starts laying eggs. The colony steadily grows, in many species a large mound is formed and eventually it reaches a size where they have sufficient resources to produce reproductive and repeat the cycle.

Economic Importance**:**

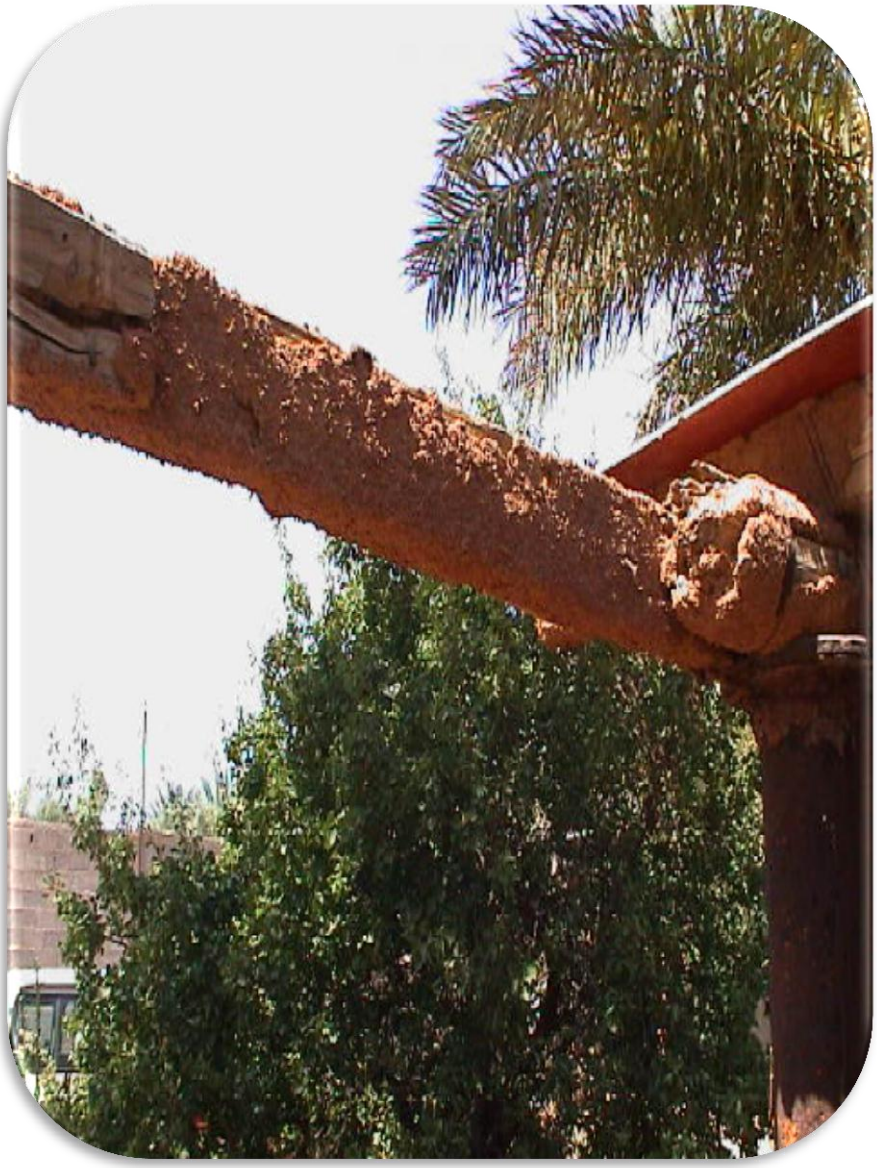
Termites are an important part of the community of decomposers. They are abundant in tropical and subtropical environments where they help break down and recycle up to one third of the annual production of dead wood. Termites become economic pests when their appetite for wood and wood products extends to human homes, building materials, forests,

and other commercial products. In the United States alone, annual losses due to termite infestations are estimated at more than 800 million dollars.

**Termite attacking dry wood (Damages)**

**Termite attacking books**


**Aljouf**



**Termite attacking Mango trunks**

Order Neuroptera

- The Neuroptera comprise a small but highly variable order of predominately predatory insects ,which display mixture of premative and specialized feature ,Neuroptera are occur in all parts of the world but many families show restricted distribution e.g Ithonidae are restricted to north America ,Polystoechotidae to north America and south America

**General characters of Neuroptera**

Adult

They are soft-bodied in generalized body Plan.

Mouth parts are adapted for chewing with large mandible and maxilla.

Compound eyes large widely separated.

Antenna usually filiform or moniliform

Thoracic segments semi-equal with free

mobile pro-thorax

They have two pairs of membranous wings ,which are similar in size and held

roof-like over abdomen at rest wing occur in several families

Cerci absent

Larva

All Neuropteran larvae are predatory With clearly defined head capsule

Mandible and maxillae are elongate, slender,modefied for sucking

Thoracic segments bearing walking

Legs with 1-segmented tarsus

Cerci absent

- Pupa

Excreta ,detaches ,enclosed in silken cocoon

- Family Chrysopidae

Body and wings usually green ,larva and adult are predatory , wing coupling occur by bristle like frenulum on the base of hind wings

e. g. *Chrysopa vulgaris*

Family Mermeleontidae

Antenna about as long as head and thorax gradually thickened

Legs of larvae adapted for digging

Larva construct conical pitfalls ,in dry soil, or sand and buried at the bottom with open jaws

E g : *Creoleon africanus*

- Family Mantispidae

In which fore legs are raptorial

Larva are specialized parasitoid on

Spider egg mass ,or immature stages of Vespidae wasps

**Order: Hymenoptera**

*Ants, Wasps, Bees, Sawflies, Horntails*

**Scientific Classification**

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Subclass: Pterygota
Superorder: Endopterygota
Order: Hymenoptera

The name Hymenoptera is derived from the Greek words "*hymen*" meaning membrane and "*ptera*" meaning wings. It is also a reference to Hymeno, the Greek god of marriage. The name is appropriate not only for the membranous nature of the wings, but also for the manner in which they are "joined together as one" by the hamuli. The Hymenoptera with over 130 000 named species are a contender for the second largest order of insects in the world, the Beetles (Coleoptera) boast the greatest number of species.

Within the Hymenoptera are the Aculeates or stinging insects, these are all the Bees ants and wasps as well as a few smaller groups such as the Ruby Tailed Wasps and the Velvet Ants. Within the Aculeates are the 'social insects' an indistinct group comprising all the Ants (Formicoidae) and many of the Bees (Apoidea) and Wasps (Vespoidea) and (Sphecoidea) these are perhaps the most commonly seen insects after the True Flies (Diptera).

## General Characters

### Size

Most are of moderate size, but they range in size from miniscule (less than a millimeter) to 50 mm. Arnett gives a range of 0.2-115 mm, but typically 2-30 mm.

### Identification

1- Two pairs of wings, with forewings usually larger than hindwings, but some groups (such as ants) wingless in most life stages, Wings have few cross-veins, these are angled to form closed cells

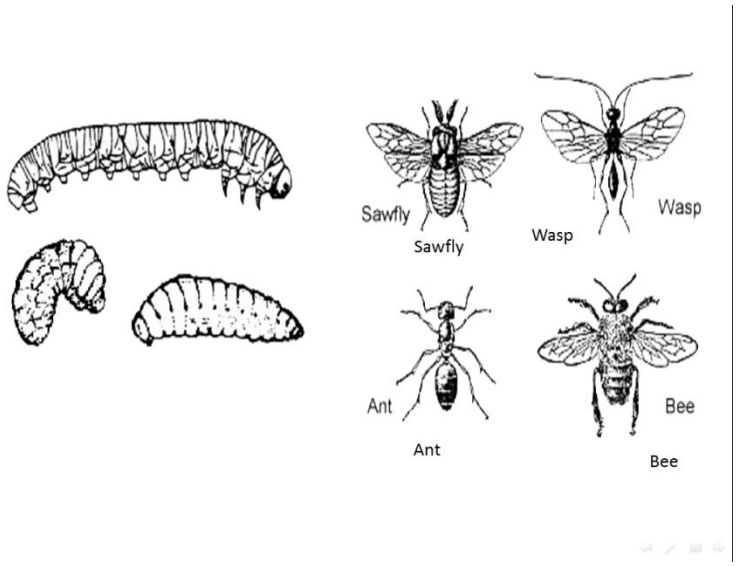
2- Antennae typically with 10 or more segments. Often 13 segments in male, 12 in female, but sometimes as few as 3 or up to 60 segments. Antennae longer than head, but usually not highly elongated (longer than head and thorax combined). Highly elongated in some parasitic groups.

3- Chewing mouthparts, but some groups have a "tongue" used for lapping up fluids, such as nectar
4- Females have prominent ovipositor, modified in some groups to be a "stinger", used to paralyze prey and in defense
5- Complete metamorphosis
6- Several groups highly social (eusocial), with separate reproductive and worker castes.

The Hymenoptera is divided into two suborders:

- **Symphyta** (sawflies and horntails) have a broad junction between thorax and abdomen (have no discernible waist).
- **Apocrita** (ants, bees, and wasps) have a narrow junction between the thorax and abdomen (have a distinct waist).

| Immatures | Adults |
|---|---|
| 1. **Sawflies:** Eruciform (caterpillar-like); well developed head capsule; chewing mouthparts; fleshy abdominal prolegs<br>2. **Bees and wasps:** Grub-like; well developed head; chewing mouthparts; legless and eyeless<br>3. **Parasitic wasps:** Body form highly reduced; lacking head, eyes or appendages | 1. Chewing mouthparts - except in bees where maxillae and labium form a proboscis for collecting nectar.<br>2. Compound eyes well developed.<br>3. Tarsi usually 5-segmented.<br>4. Triangular stigma in front wings.<br>5. Hind wings smaller than front wings, linked together by small hooks (hamuli).<br>6. Narrow junction (wasp waist) between thorax and abdomen - except in sawflies and horntails. |




## Habitat

Hymenopterans are found in nearly all terrestrial habitats throughout Australia and may occur in soil, leaf litter and a range of vegetation types, especially flowers. Some species are often observed drinking at the edges of water or gathering mud that is used to construct nests, often in man-made environments.

## Feeding

Hymenopterans feed on a wide range of foods depending on the species. Adult wasps mostly feed on nectar and honeydew and can often be seen at flowers. Some species are predators or parasites and spend their time searching out invertebrate hosts to lay their eggs on these hosts.

The feeding habits of adult ants vary and may range from specialist to generalist predators, scavengers and omnivores, to seedeaters, fungus feeders or honeydew feeders.

**Life Cycle**

Complete metamorphosis (holometabolus). Life cycle has egg, larva, pupa, and adult. Some larvae (such as sawflies) are caterpillar-like, most are grub-like, lacking legs. Males usually develop from unfertilized eggs in this order, a feature of their biology which likely contributed to the evolution of sociality independently in several groups.

In many groups, young are provisioned by the adults, however in many groups the larvae are parasitoids (predatory parasites) of other insects. Larvae of sawflies feed on plants, and these are believed to be a basal group, linking hymenoptera with related orders, such as Lepidoptera. Predatory, provisioning, and parasitoid life-styles are believed to have evolved in groups descended from plant-feeding (as larvae) hymenoptera.

**Remarks**

Ordinarily, Hymenoptera stings will only cause local pain and swelling.
However, some individuals may be allergic to Hymenoptera stings. An allergic reaction to Hymenoptera stings occurs once the victim becomes sensitized to the venom from a previous sting. The allergic reaction is caused by the immune system, which has now been over sensitized to the venom and releases histamines into the blood stream.

**Economic Importance**

Although some species are regarded as pests (e.g., sawflies, gall wasps, and some ants), most members of the Hymenoptera are extremely beneficial, either as natural enemies of insect pests (parasitic wasps) or as pollinators of flowering plants (bees and wasps).

**Classification of order Hymenoptera**

**1-suborder: Symyphyta**

**Junction between thorax and abdomen is broader**

**Family: Cephidae (**Stem sawflies)

**e. g:** ***Cephus tabidus***

Sawflies: Larvae feed on foliage or burrow into plant tissues.

**2-Suborder:Apocrita**

**Junction between thorax and abdomen is waist**

**Family:Ichneumonidae**

**e. g:** ***Pimpla robarator***

parasitoids of other holometabolous insects (or spiders)
ovipositor is long , the color of the body and legs is red , while the head and antenna is black.

Family :**Vespidae** (potter wasps) -- prey on caterpillars
- Social Wasps: True social insects. Paper-like nests are tended by sterile female workers.
Vespidae -- yellowjackets, hornets, paper wasps
e. g: *Vespa orientalis*
e. g *: Euminus (Delta ) maxillosa*
Family : Apidae
Subfamily: Apinae
e. g : *Apis mellifica (mellifera)*
Subfamily : Xylocopinae
e. g: *Xylocopa aestuans*

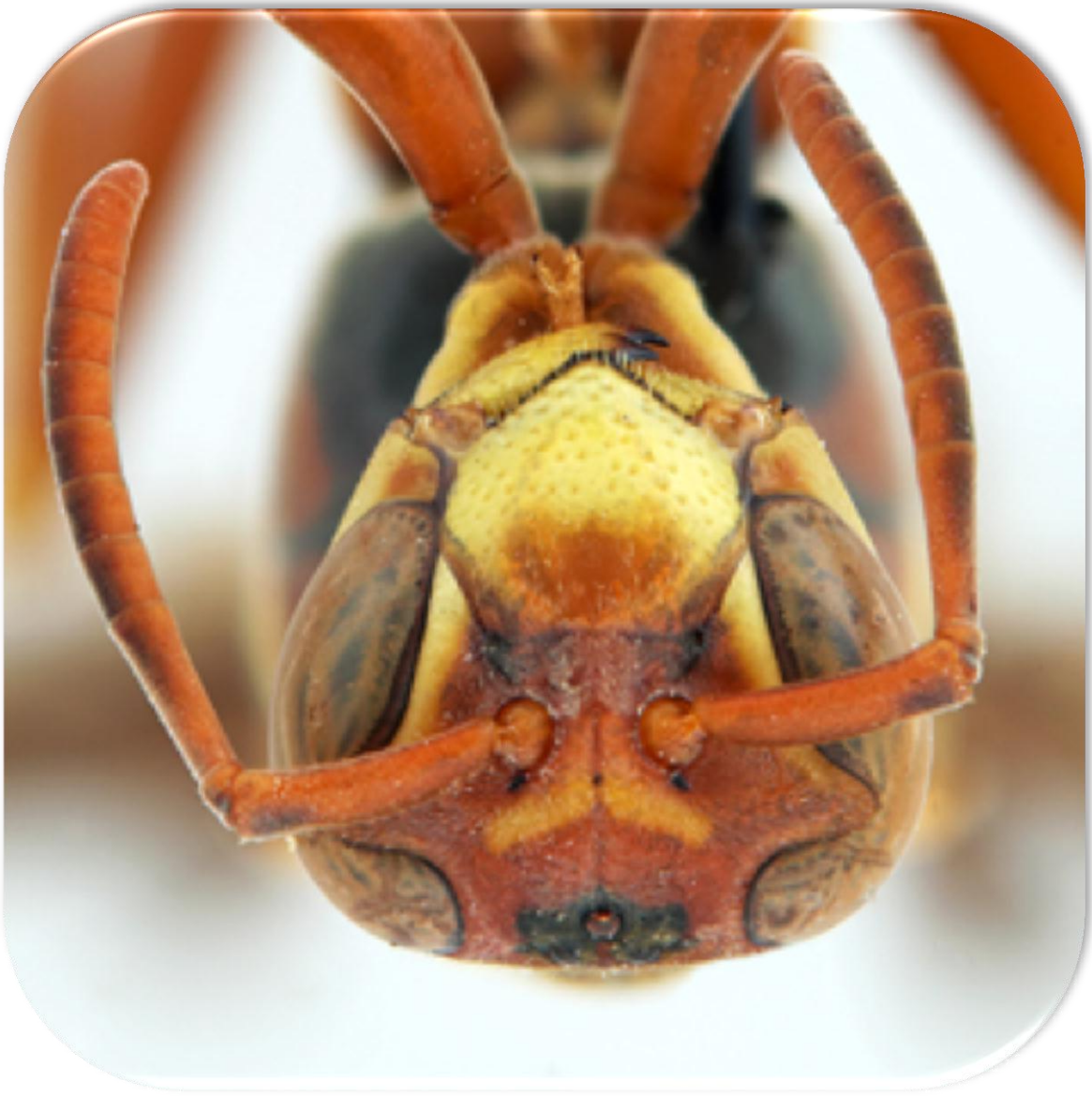
Family: Evanidae
e. g: *Evania appendigaster*
beneficial insects because parasite on egg sac of cockroaches .

Ants: True social insects. Wingless

- **Family : Formicidae (** Ants)

e. g: *Cataglyphus bicolor*
e. g: *Componotus maculatus aegyptiacus*
many types of ants are danger home pests and agricultural field and feed on food plant materials


U F Ent Dep, James L Ca



***Vespa orientalis***

**The Social Bees = Apidae.**

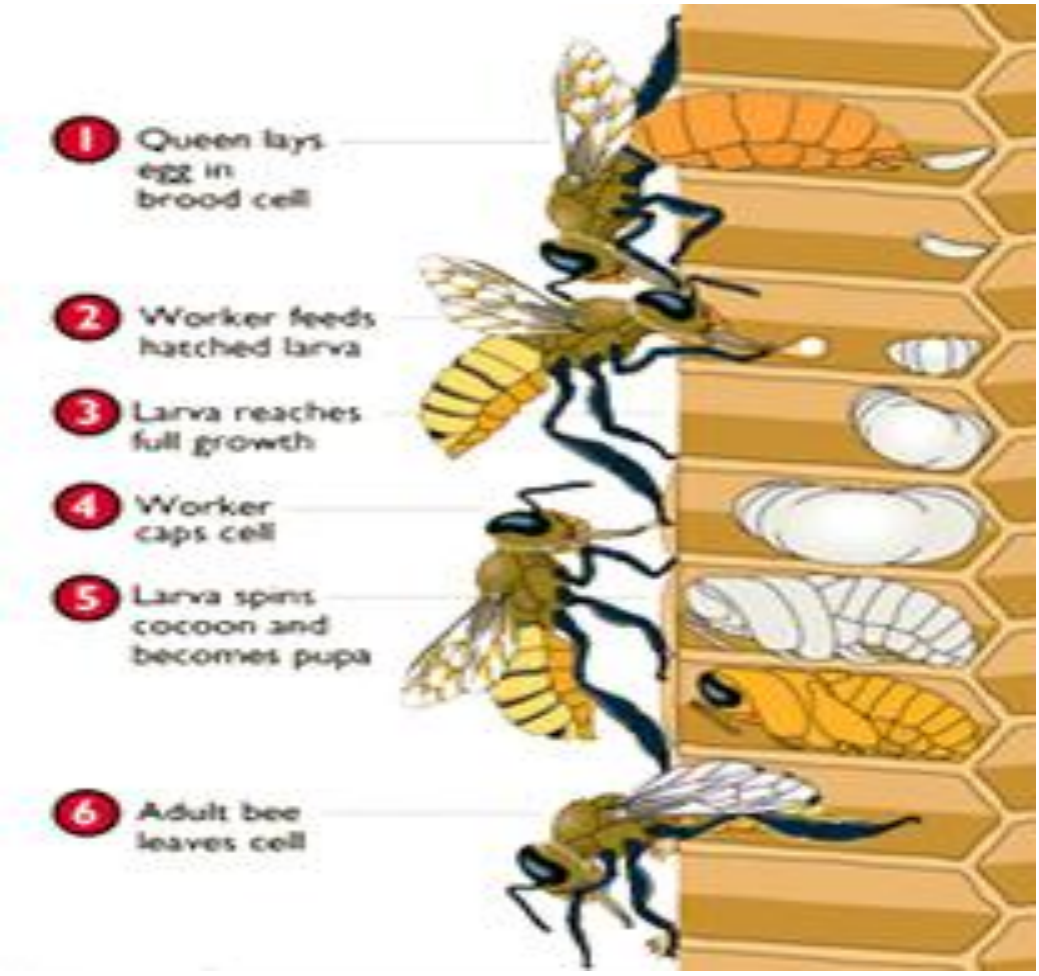
Not all the Apidae are social insects

Honey Bees have a long history of association with man. 9 000 years ago gathering wild honey was already such an important part of mankind's activities that he was painting scenes about it on the walls of his caves, a few thousand years later people in China and Egypt were keeping bees in hives made out of wicker baskets, nowadays thousands of pages of literature are devoted to Honey Bees and their culture every year. Recently a subspecies of *Apis mellifera, A.mellifera scutellata* has become infamous as Africanised Honey Bee. Honey Bees however are not the only social bees, both the Bumble Bees (Bombinae) and the mostly South American Stingless Bees (Meliponinae) are also social.

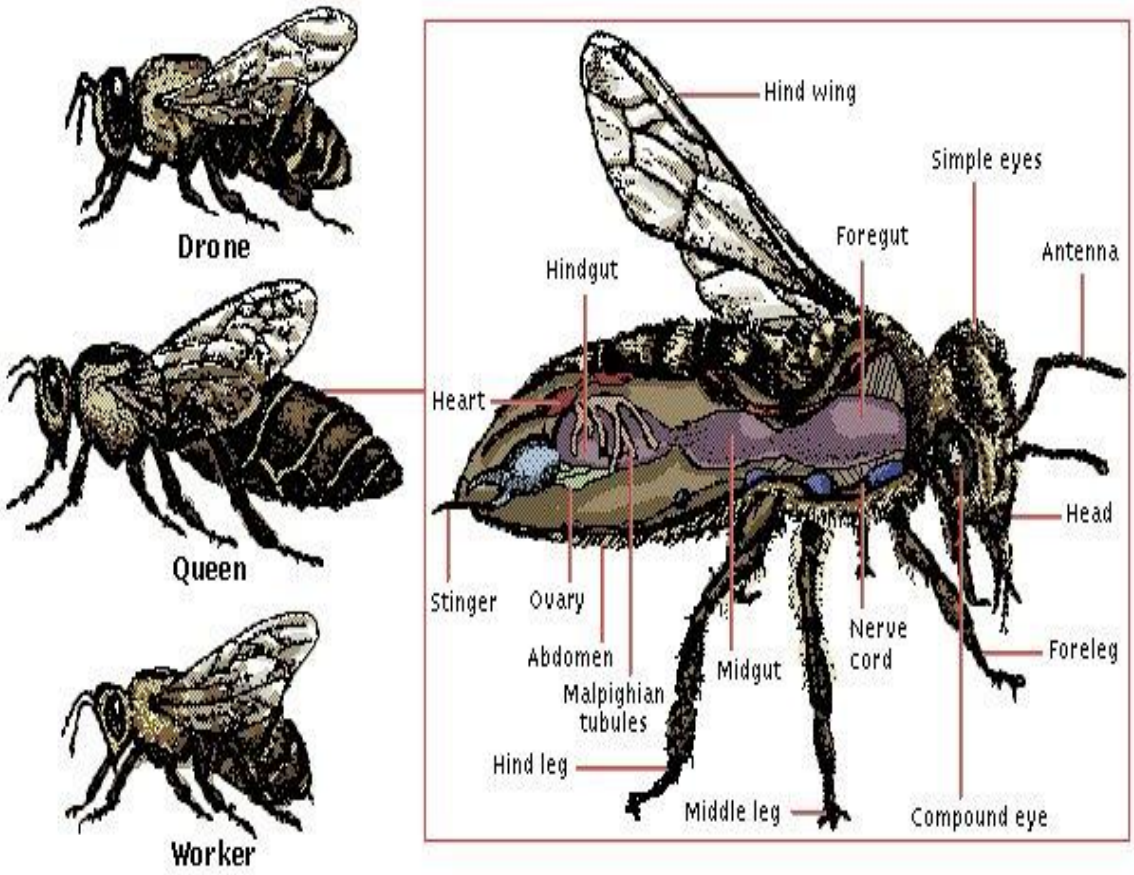
**Bumble bee**

The Honey Bee is a social insect. A small hive may contain 20,000 bees. These bees are divided into three castes: queen, drone, and worker. There is usually only one queen in the colony. She is the only fertile female in the hive, and her job is to lay eggs. The drone is a male bee. His only job is to mate with the queen. There can be up to 500 drones in the hive. The rest of the bees are workers. They are actually infertile females. The workers have lots of tasks to perform, such as feeding the queen, cleaning the hive, tending to the young and defending the hive from invaders. The worker is equipped with a stinger and a venom pouch (The ovipositor is modified into a stinger). When used, the stinger is ripped out of the workers body and left in the invaders. The worker bee soon dies from the rupture.

Honey Bees are not likely to sting unless they are provoked. If a hive gets overcrowded, it happens that the queen leaves the hive with some of her workers to start a new colony somewhere else. This is called “swarming”. The mother queen leaves a daughter queen behind, to take over the old colony.




**Honey bee develop**


Drone
Queen
Worker
Hind wing
Simple eyes
Foregut
Antenna
Hindgut
Heart
Head
Stinger
Ovary
Nerve cord
Abdomen
Midgut
Foreleg
Malpighian tubules
Hind leg
Middle leg
Compound eye

**A naturally built queen cell for a honey bee queen**

**Honey bee queen**

**The drone of the honey bee**

**Bee pupae**

**The pupae of western honey bee drones. After passing through their larval stage within cells of the honeycomb, they continue there**

**until they develop into their adult form. Due to the protection this provides, the pupae do not need to be surrounded by a chrysalis or other shell, but instead have their legs and proboscis free.**

**Honey bee worker**

**Order: *Diptera***

True Flies / Mosquitoes / Midges

The name Diptera, derived from the Greek words "di" meaning two and "ptera" meaning wings, refers to the fact that true flies have only a single pair of wings.

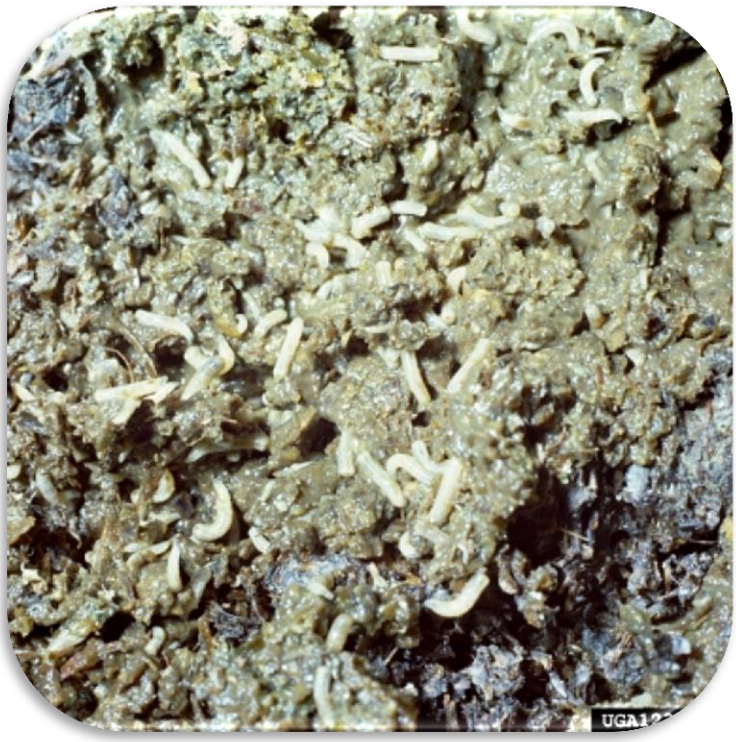
## General characteristics

1. Flies are well adapted for aerial movement, and typically have short bodies.
2. Flies have a mobile head with a distinct neck and have large compound eyes on the sides of the head, with three small ocelli on the top, and antennae, either long or short.
3. Mouthparts of sucking type. Often adapted to absorb liquids, sometimes piercing.
4. Only 1 pair of wings (on mesothorax). Hind wings are reduced to halters used for balance during flight.
5. Complete metamorphosis.
6. Larvae are called maggots. Legless, wormlike larvae, often with a reduced head. Many larvae live in water. In plant feeding species the larvae often live within the plant tissues, leaf miners, stem or root borers.

## Life History & Ecology:

The order Diptera includes all true flies. These insects are distinctive because their hind wings are reduced to small, club-shaped structures called halteres -- only the membranous front wings serve as aerodynamic surfaces. The halteres vibrate during flight and work much like a gyroscope to help the insect maintain balance.

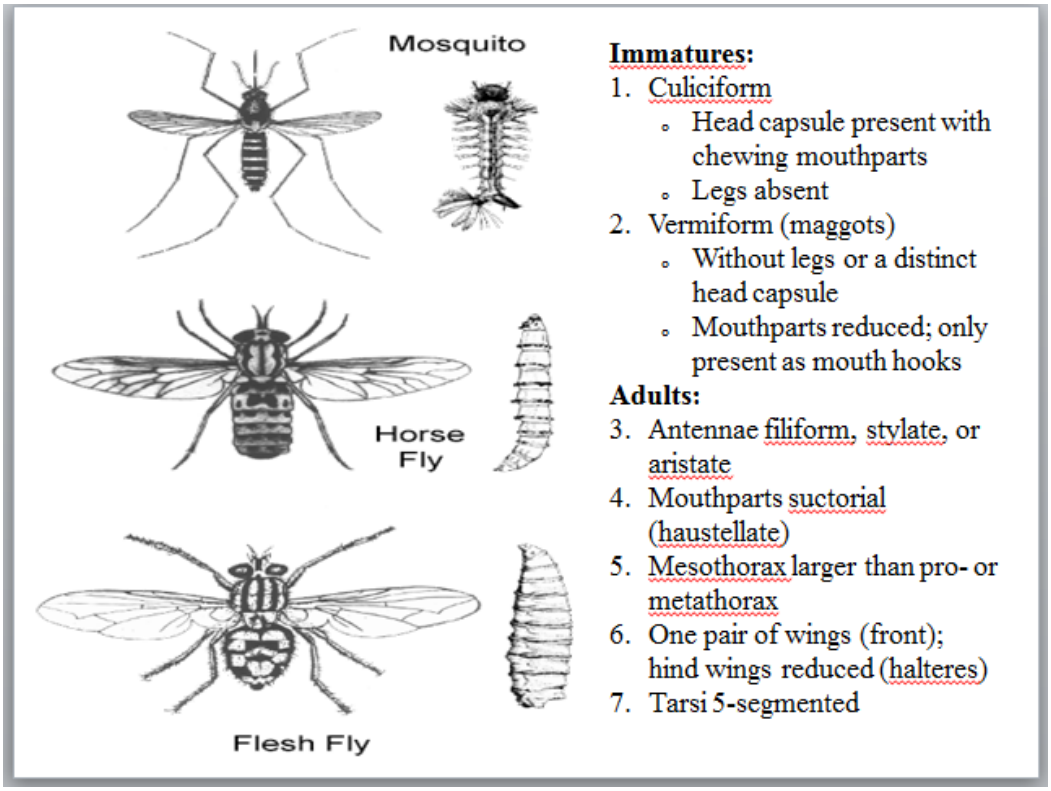
All Dipteran larvae are legless. They live in aquatic (fresh water), semi-aquatic, or moist terrestrial environments. They are commonly found in the soil, in plant or animal tissues, and in carrion or dung. Some species are herbivores, but most feed on dead organic matter or parasitize other animals, especially vertebrates, molluscs, and other arthropods. In the more primitive families (suborder Nematocera), fly larvae have well-developed head capsules with mandibulate mouthparts. These structures are reduced or absent in the more advanced suborders (Brachycera and Cyclorrhapha) where the larvae have worm-like bodies and only a pair of mouth hooks for feeding.



Larva(e) of house fly

Fruit fly maggots found feeding on mango

Adult flies live in a wide range of habitats and display enormous variation in appearance and life style. In many families, the proboscis (rostrum) is adapted for sponging and/or lapping. These flies survive on honeydew, nectar, or the exudates of various plants and animals (dead or a live). In other families, the proboscis is adapted for cutting or piercing the tissues of a host. Some of these flies are predators of other arthropods (e.g., robber flies), but most of them are external parasites (e.g., mosquitoes and deer flies) that feed on the blood of their vertebrate hosts, including humans and most wild and domestic animals.




## Classification

Holometabola

complete development (egg, larva, pupa, adult)

The Diptera have been divided into three suborders:

- Nematocera (flies with multisegmented antennae)
- Brachycera (flies with stylate antennae)
- Cyclorrhapha (flies with aristate antennae)

In some newer classifications, Brachycera includes the Cyclorrhapha.

There are two generally accepted suborders of Diptera. The Nematocera are usually recognized by their elongated bodies and feathery antennae as represented by mosquitoes

and crane flies. The Brachycera tend to have a more roundly proportioned body and very short antennae.

1. Suborder Nematocera (77 families, 35 of them extinct) – long antennae, pronotum distinct from mesonotum. In Nematocera, larvae are either eucephalic or hemicephalic and often aquatic.

2. Suborder Brachycera (141 families, 8 of them extinct) – short antennae, the pupa is inside a puparium formed from the last larval skin. Brachycera are generally robust flies with larvae having reduced mouthparts.

Major Families

**Biting flies:** In most cases, only the adult females take blood meals.

1. **Culicidae** (mosquitoes) -- may spread malaria, yellow fever, filariasis, and other diseases.

2. **Tabanidae** (horse flies / deer flies) -- may spread trypanosomiasis, and other diseases.

3. **Simulidae** (black flies) -- may spread leucocytozoon infections of poultry.

4. **Psychodidae** (moth flies) -- may spread leishmaniasis, sand fly fever, and other diseases.

5. **Ceratopogonidae** -- small but vicious biters that have been linked to the spread of several roundworm, protozoan, and viral pathogens in humans and other animals.

6. **Muscidae** (House flies) -- these are among the most cosmopolitan of all insects. Some species have biting mouthparts, others are scavengers. Diseases such as dysentery, cholera, and yaws may be transmitted on their feet and mouthparts.

**Herbivores:** larvae feed on plant tissues.

1. **Cecidomyiidae** (gall midges) -- some induce the formation of plant galls; others are scavengers, predators, or parasites.

2. **Tephritidae** (fruit flies) -- many species are agricultural pests; such as the apple maggot,

3. **Agromyzidae** -- most larvae are leaf miners, some are stem and seed borers. Several species are agricultural pests.

4. **Anthomyiidae** -- many species are root or seed maggots.

**Scavengers:** larvae feed in dung, carrion, garbage, or other organic matter.

1. **Drosophilidae** (fruit flies) -- feed on decaying fruit.
2. **Tipulidae** (crane flies) -- larvae live in soil or mud.
3. **Calliphoridae** (blow flies) -- larvae feed on garbage and carrion; includes the screwworm.
4. **Sarcophagidae** (flesh flies) -- larvae typically feed on carrion. Some species may cause human myiasis.

**Predators:** adults and/or larvae attack other insects as prey.

1. **Asilidae** (robber flies) -- general predators of other insects.
2. **Bombyliidae** (bee flies) -- predatory larvae; adult bee mimics.
3. **Empididae** (dance flies) -- adults are predatory.
4. **Syrphidae** (flower flies) -- some larvae are aphid predators; most adults mimic bees or wasps.

**Parasites:** larvae are parasites or parasitoids of other animals.

1. **Tachinidae** -- parasitoids of other insects. Several species are important biocontrol agents.
2. **Sciomyzidae** (marsh flies) -- larvae parasitize slugs and snails.
3. **Oestridae** (boat flies / warble flies) -- larvae are endoparasites of mammals, including humans.
4. **Hippoboscidae** (louse flies) -- adults are blood-feeding ectoparasites of birds and mammals.

**Muscoid fly**

Hexapoda (including Insect) > Diptera > Muscidae

**horse fly**

Hexapoda (including Insecta) > Diptera > Tabanidae

**Syrphid fly,** *Eristalinus aeneus*

Hexapoda (including Insecta) > Diptera > Syrphidae

**Syrphid fly,** *Arctophila superbiens*

Hexapoda (including Insecta) > Diptera > Syrphidae

**snipefly**

Rhagionidae , *Chrysopilus spp.*


**mosquito**

Culicidae , *Anopheles spp.*


**Tabanid flies**

Hexapoda (including Insecta) > Diptera > Tabanidae

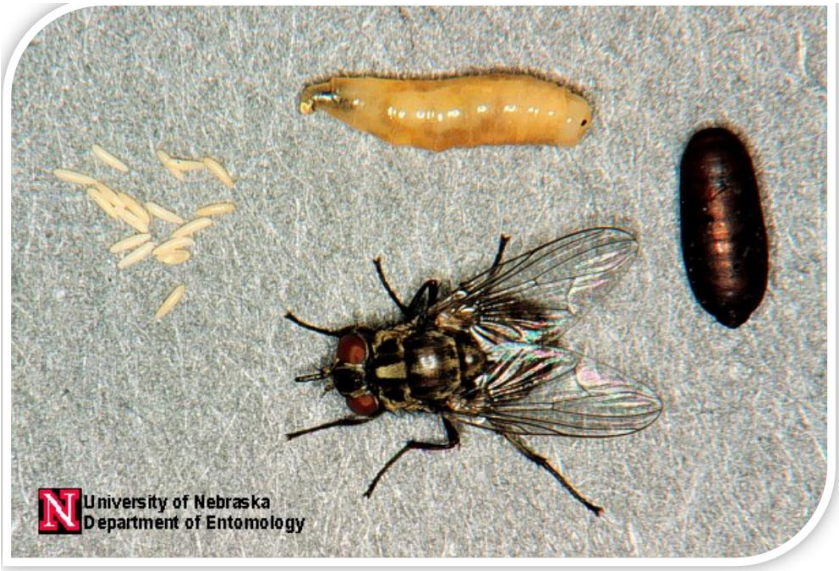

**guava fruit fly**

Diptera > Tephritidae , *Bactrocera correcta*

## Life Cycle

The female lays her eggs as close to the food source as possible, and development is generally rapid, allowing the larva to consume as much food as possible in a short period of time before transforming into the adult. In extreme cases, the eggs hatch immediately after being laid, while a few flies are ovoviviparous, with the larva hatching inside the mother.

The pupae take various forms, and in some cases develop inside a silk cocoon. After emerging from the pupa, the adult fly rarely lives more than a few weeks, and serves mainly to reproduce and to disperse in search of new food sources.




Life Stages of the stable fly, *Stomoxys calcitrans*


Life Stages of the house fly

## Economic Importance

The Diptera probably have a greater economic impact on humans than any other group of insects. Some flies are pests of agricultural plants, others transmit diseases to humans and domestic animals. On the other hand, many flies are beneficial -- particularly those that pollinate flowering plants, assist in the decomposition of organic matter, or serve as biocontrol agents of insect pests.

## Order :*Siphonaptera*

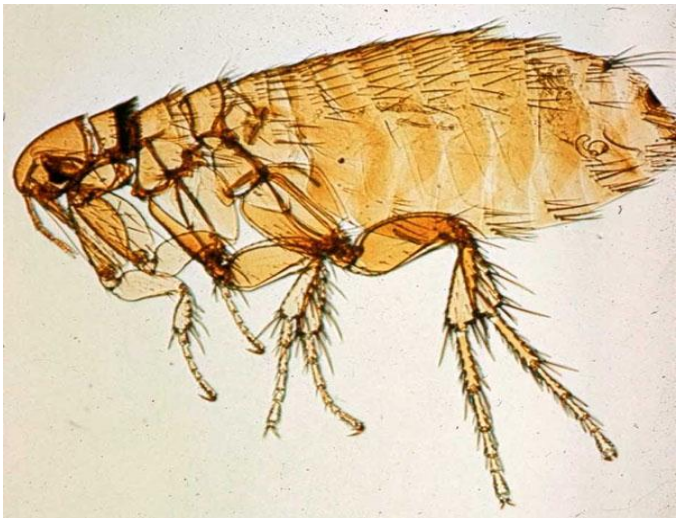
Fleas

SIPHONAPTERA: from the Greek "siphon" (hollow tube) + "a" (without) + "pteron" (wing); fleas are wingless and have tube-like mouthparts for sucking blood.

## General characteristics

1. Fleas are small, wingless insects ranging in size from approximately 1-10 millimetres in length depending on the species.
2. Laterally compressed bodies .
3. Piercing-sucking mouthparts .
4. Enlarged hind legs adapted for jumping .
5. Strong tarsal claws adapted for holding onto their hosts.
6. Small antennae which tuck away into special groves in the head .
7. row of large bristles often present on head and/or thorax (called genal and pronotal combs)

**cat,dog flea**



**Oriental rat flea**

**Life History & Ecology:**

all fleas are blood-sucking external parasites. Most species feed on mammals, although a few (less than 10%) live on birds. Only adult fleas inhabit the host's body and feed on its blood. They are active insects with a hard exoskeleton, strong hind legs adapted for jumping, and a laterally flattened body that can move easily within the host's fur or feathers. Unlike lice, most fleas spend a considerable amount of time away from their host. Adults may live for a year or more and can survive for weeks or months without a blood meal

Flea larvae are worm-like (vermiform) in shape with a sparse covering of bristles. They rarely live on the body of their host. Instead, they are usually found in its nest or bedding where they feed as scavengers on organic debris (including adult feces). After a larval period that includes two molts, fleas pupate within a thin silken cocoon. Under favorable conditions, the life cycle can be completed in less than a month.

## Distribution:

Commonly associated with mammals
The greatest diversity occurs in temperate zones throughout the world.

| | North America | Worldwide |
|---|---|---|
| Number of Families | ٧ | ١٦ |
| Number of Species | ٣٢٥ | ٢,٣٨٠~ |

## Physical Features:

| Immatures | Adults |
|---|---|
| Body vermiform (maggot-like), sparsely covered with hairs<br>Head reduced, eyeless, mouthparts mandibulate | Body bilaterally flattened<br>Mouthparts suctorial (haustellate)<br>Large bristles (ctenidia) often present on head or thorax (genal and pronotal combs)<br>Hind femur enlarged, adapted for jumping |

## Classification:

Holometabola
complete development) ) egg, larva, pupa, adult

Major Families in the Order:

- Pulicidae – common fleas
- Ceratophyllidae – bird and rodent fleas
- Ischnopsyllidae – bat fleas

- Rhopalopsyllidae – marsupial fleas

Families and Genera of Interest:

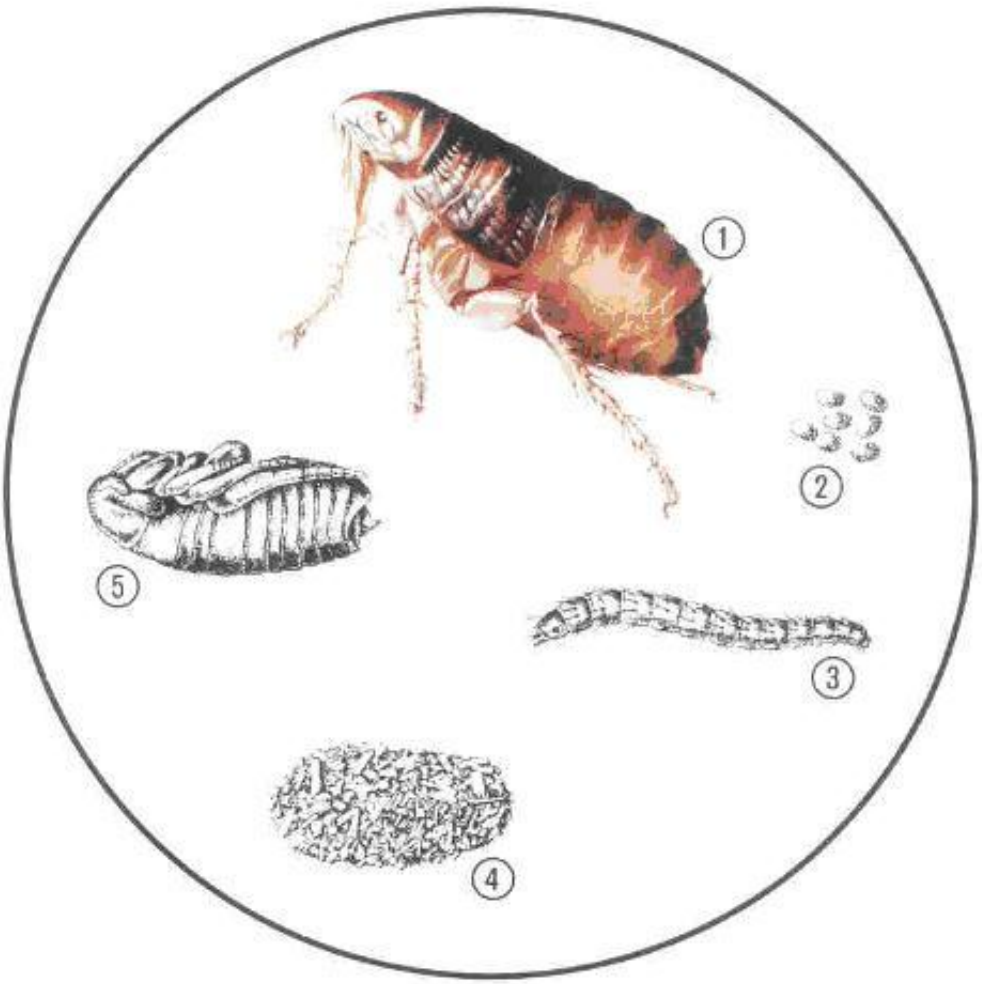
- Cat fleas, Ctenocephalides felis, are the most common fleas found on dogs (and cats, of course).
- Rodent fleas are best known as vectors of the Black Death, aka Bubonic Plague, which wiped out much of the world's population during the Middle Ages.
- Female sand fleas (Tunga penetrans) take up residence under people's toenails.

| **Common Name** | **Scientific Name** |
|---|---|
| **Cat Flea** | ***Ctenocephalides felis (Bouche)*** |
| **Dog Flea** | ***Ctenocephalides canis (Curtis)*** |
| **Northern Rat Flea** | ***Nosopsyllus fasciatus (Bosc)*** |

| | |
|---|---|
| **Oriental Rat Flea** | ***Xenopsylla cheopis (Rothschild)*** |
| **Rabbit Flea** | ***Cediopsylla simplex (Baker)*** |
| **Sand flea** | ***Tunga penetrans*** |
| **Human Flea** | ***Pulex irrttans*** |

**Life Cycle**

Fleas mate on their host animal and lay their eggs either onto the animal where they fall to the nest or directly in the nest. The small larvae hatch from the eggs and do not begin to feed on blood like that of their parents but consume the dead skin and dust from the host animal. The larvae develop through 3 instars and when fully grown spin a silken cocoon and pupate in the nest of the host. The vibrations of a host often trigger the emergence of the adult flea from the pupal case, enabling it to immediately find a host and begin feeding. The complete life cycle may take from several weeks to many months depending on the species.



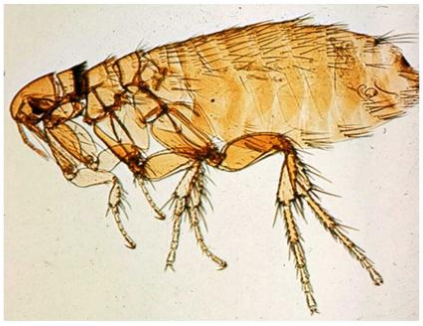

**Economic Importance**

In addition to their irritating bites, fleas may also transmit pathogens that cause disease in humans and other animals. Cat and dog fleas, for example, are intermediate hosts for a tapeworm (Dipylidium caninum) that infects dogs, cats, and humans. Rabbit fleas spread a myxomatosis virus within rabbit populations, and the oriental rat flea is the primary vector of Yersinia (=Pasturella) pestis, the bacterial pathogen for bubonic plague.

# Examples

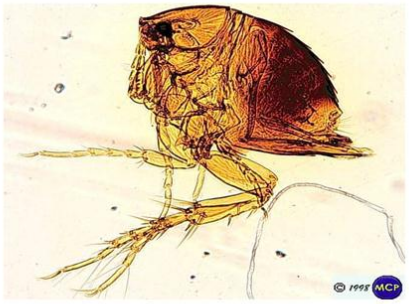
human flea

cat,dog flea



Oriental rat flea


Northern rat flea



sand flea


flea larvae

## Order : Lepidoptera

## Butterflies, skippers, and moths

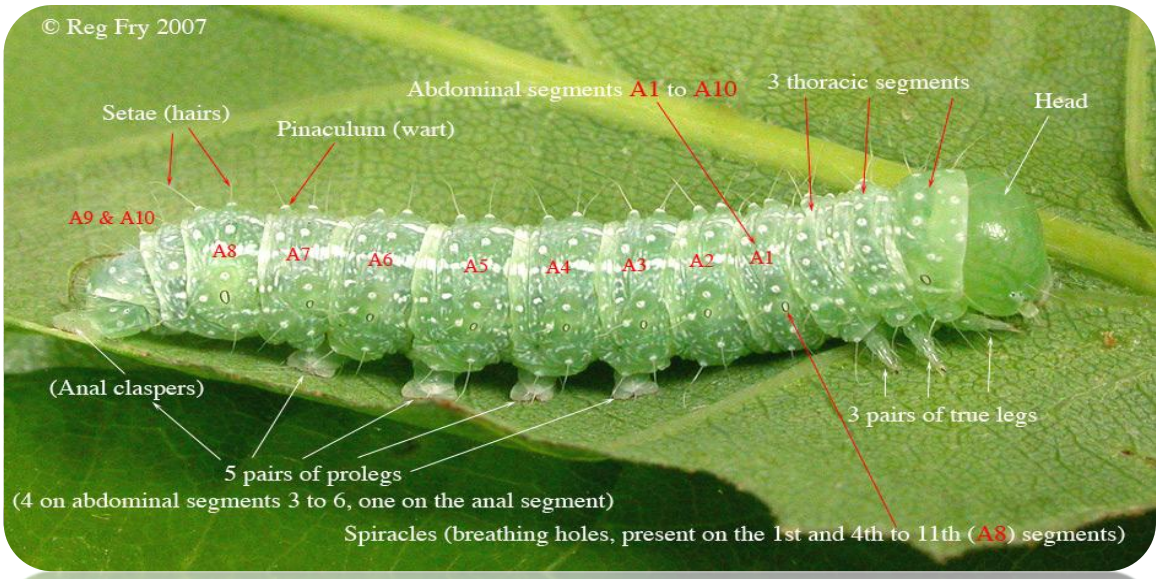
Lepidoptera means "scale wing", from Greek: lepis-"scale" + ptera - "wing". refers to the flattened hairs (scales) that cover the body and wings of most adults.

## General characteristics

1. pairs of membranous wings that are covered in tiny scales . A few moths are wingless .
2. Large compound eyes .
3. One ocelli present above each eye .
4. Antennae present. Antennae are long and slender in female moths and generally feathery in male moths. Butterflies have clubbed antennae .
5. Mouthparts are formed into a sucking tube known as a haustellum .

### Life History & Ecology

Lepidoptera (moths and butterflies) is the second largest order in the class Insecta. Nearly all lepidopteran larvae are called caterpillars. They have a well-developed head with chewing mouthparts. In addition to three pairs of legs on the thorax, they have two to eight pairs of fleshy abdominal prolegs that are structurally different from the thoracic legs. Most lepidopteran larvae are herbivores; some species eat foliage, some burrow into stems or roots, and some are leaf-miners.




Adults are distinctive for their large wings (relative to body size) which are covered with minute overlapping scales. Lepidopteran wing scales often produce distinctive color patterns that play an important role in courtship and intraspecific recognition.

In all other lepidopteran families, the mouthparts are vestigal or form a tubular proboscis that lies coiled like a watch spring beneath the head. This proboscis is derived from portions of the maxillae. It uncoils by hydrostatic pressure and acts as a siphon tube for sipping liquid nutrients, such as nectar, from flowers and other substrates.

*Acronicta oblinita* (smeared dagger moth)

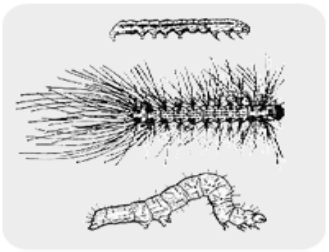
A Painted Arachnis (Arachnis picta), showing scales and hair

From a taxonomic standpoint, the distinction between moths and butterflies is largely artificial -- some moths are more similar to butterflies than to other moths. As a rule, butterflies are diurnal, brightly colored, and have knobs or hooks at the tip of the antennae. At rest, the wings are held vertically over the body. In contrast, most (but not all) moths are nocturnal. They are typically drab in appearance, and have thread-like, spindle-like, or comb-like antennae. At rest, their wings are held horizontally against the substrate, folded flat over the back, or curled around the body.

Bogong moth

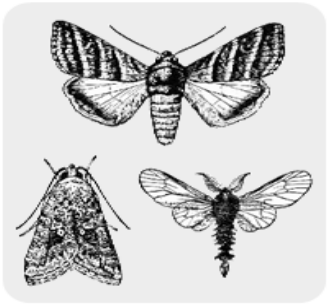
meadow argus butterfly

Physical Features



**Immatures**

Eruciform (caterpillar-like)
Head capsule well-developed, with chewing mouthparts
Abdomen with up to 5 pairs of prolegs



**Adults**

Mouthparts form a coiled tube (proboscis) beneath the head
Antennal type:
Butterflies: knobbed or hooked at tip
Moths: thread-like, spindle-shaped, or feather-like
Front wings large, triangular; hind wings large, fan-shaped
Body and wings covered with small, overlapping scales

## Classification

Holometabola

complete development (egg, larva, pupa ،adult)

**Butterflies:**

## 1- Superfamily Papillionoidea

Nymphalidae (brushfooted butterflies) -- front legs reduced in size. This is the largest butterfly family; it includes the fritillaries, admirals, emperors, and tortoiseshells.


**Danaidae** (milkweed butterflies) -- adults are reddish-orange with black and white markings. Larvae feed on various species of milkweed. Includes the monarch (*Danaus plexippus*).

**Monarch**

**Pieridae (whites and sulfurs) -- adults are predominantly white or yellow with black markings. The imported cabbageworm (*Pieris rapae*) is a pest throughout the world.**

**Western White**

**Dog Face**

Papillionidae (swallowtails) -- hind wings have a tail-like extension. The tiger swallowtail (*Papilio glaucus*) is a cosmopolitan species.

Giant Swallowtail

Tiger Swallowtail

Phoebus Parnassian

Lycaenidae (blues, coppers, and hairstreaks) -- small butterflies with fluted hind wings. Some species are extinct or nearing extinction, others are very common.

**American Copper**

**Spring Azure**

**2- Superfamily Hesperoidea (skippers)**

Hesperiidae (skippers) -- antennal club is hooked at the tip. The silverspotted skipper, *Epargyreus clarus*, is a common species.

Hobomok Skipper

White Striped Longtail

# Moths:

### 1- Superfamily Bombycoidea

**Lasiocampidae** (lappet moths) -- larvae feed on the leaves of trees and some spin large webs or tents on the foliage. Pests include the eastern tent caterpillar (*Malacosoma americana*) and the forest tent caterpillar (*M. disstria*).

Small Tolype

**Saturniidae** (giant silk moths) --- large, colorful moths. Larvae feed on a wide range of trees and shrubs. Well-known species include the cecropia moth (*Hyalophora cecropia*) and the luna moth (*Actias luna*).

Luna Moth

Cecropia Moth

### 2- Superfamily Noctuoidea

**Arctiidae** (tiger moths) -- distinctive adults, usually white with black, red, yellow, or orange markings. Many larvae are covered with long hairs (woollybears). Includes the fall webworm (*Hyphantria cunea*).

Scarlet Bodied Wasp Moth

Giant Leopard Moth

Great Tiger Moth

Faithful Beauty

Isabella Moth

**Noctuidae** (loopers, owlet moths, and underwings) -- this is the largest family in the Lepidoptera. Larvae are leaf feeders and stem borers. Many species are pests, including the fall armyworm (*Spodoptera frugiperda*), the black cutworm (*Agrotis ipsilon*), and the cabbage looper (*Trichoplusia ni*).

lia Underwing

The Herald

White Underwing

**Lymantriidae** (tussock moths) -- larvae are characterized by tufts of hair along the body. Adults do not feed. Pests include the gypsy moth (*Lymantria dispar*) and the browntail moth (*Euproctis chrysorrhoea*).

Gypsy Moth

**3- Superfamily Sphingoidea**

**Sphingidae** (hawk moths) -- medium to large adults with long proboscis for collecting nectar. Larvae are frequently called hornworms. Pests include the tobacco hornworm (*Manduca sexta*) and tomato hornworm (*M. quinquemaculata*).

Rustic Sphinx

Tersa Sphinx

**4- Superfamily Pyraloidea**

**Pyralidae** (snout moths) -- second largest family of Lepidoptera. Pests include the European corn borer (*Ostrinia nubilalis*), the Indianmeal moth (*Plodia interpunctella*), and the greater wax moth (*Galleria mellonella*).

Grape Leaffolder Moth

**5- Superfamily Geometridea**

**Geometridae** -- third largest family of Lepidoptera. Larvae are often called inchworms or spanworms. Includes the winter moth (*Operophtera brumata*) and the fall cankerworm (*Alsophila pometaria*).

Kent's Geometer

**6- Superfamily Sesioidea**

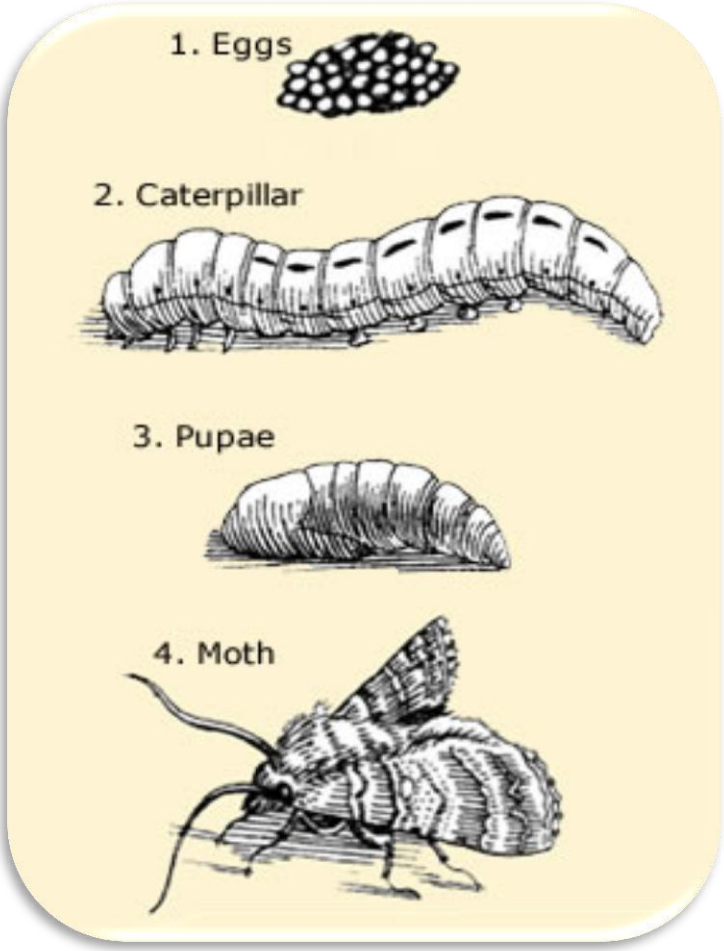
**Sesiidae** (clearwing moths) -- diurnally active adults mimic wasps. Many pests of fruit and vegetable crops, including the peachtree borer (*Synanthedon exitiosa*) and squash vine borer (*Melittia cucurbitae*).

Hornet Clearwing

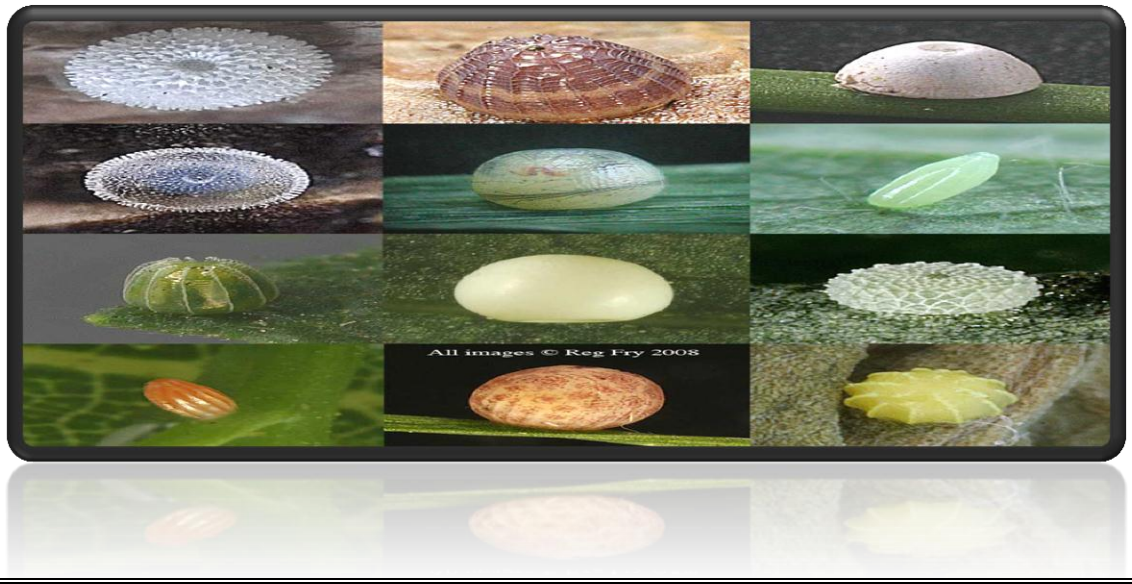
## Life Cycle

Moths and butterflies undergo a complete life cycle that includes four stages: egg, caterpillar (larvae), pupae and adult. The eggs are usually laid on or close to the caterpillar's food plant either singularly or in groups. A female may lay only a few eggs or tens of thousands depending on the species, but several hundred is reasonably typical. After hatching caterpillars usually develop through 4 to 7 instars over a period of a few weeks up to a few months depending on the species, before pupating .

When ready to pupate caterpillars generally find a sheltered site to spin their cocoons. Some may pupate attached to vegetation, others in the soil or leaf litter or inside the wood they have been tunneling in. Many moths and butterflies have one or two generations each year while others may breed continuously. Other species such as the large wood-boring Cossidae may take up to five years to develop.




**Examples of the eggs of twelve butterfly species are shown below**



Examples of the eggs of twelve moth species are shown below


**Examples of caterpillar (larvae)**


Least Black Arches © Reg Fry 2006

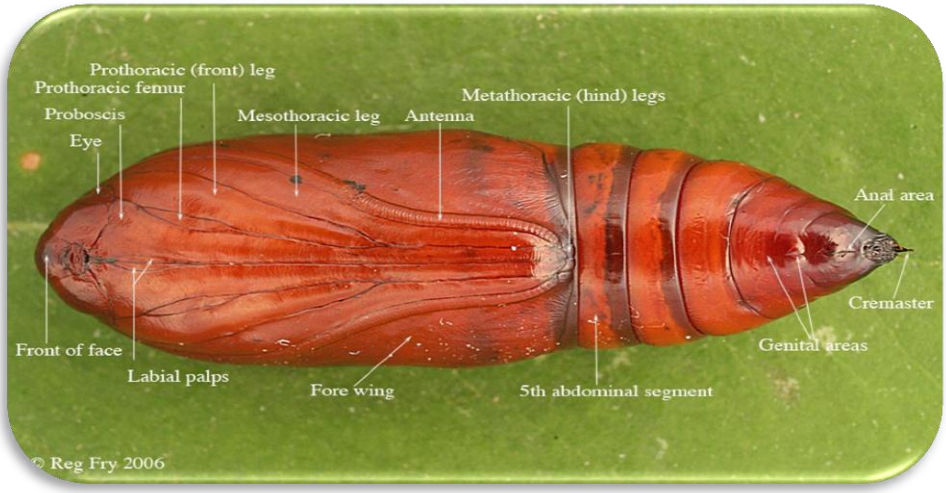

Pale Brindled Beauty © Reg Fry 2006
Orange Underwing © Jeroen Voogd 2006
March Moth © Jeroen Voogd 2006
Light Emerald © Mark Boddington 2006
Scalloped Hazel © Reg Fry


© Mark Boddington 2007


Tiny hooks

Tiger Swallowtail

THE CHRYSALIS OR PUPA AND EXAMPLES OF COCOONS





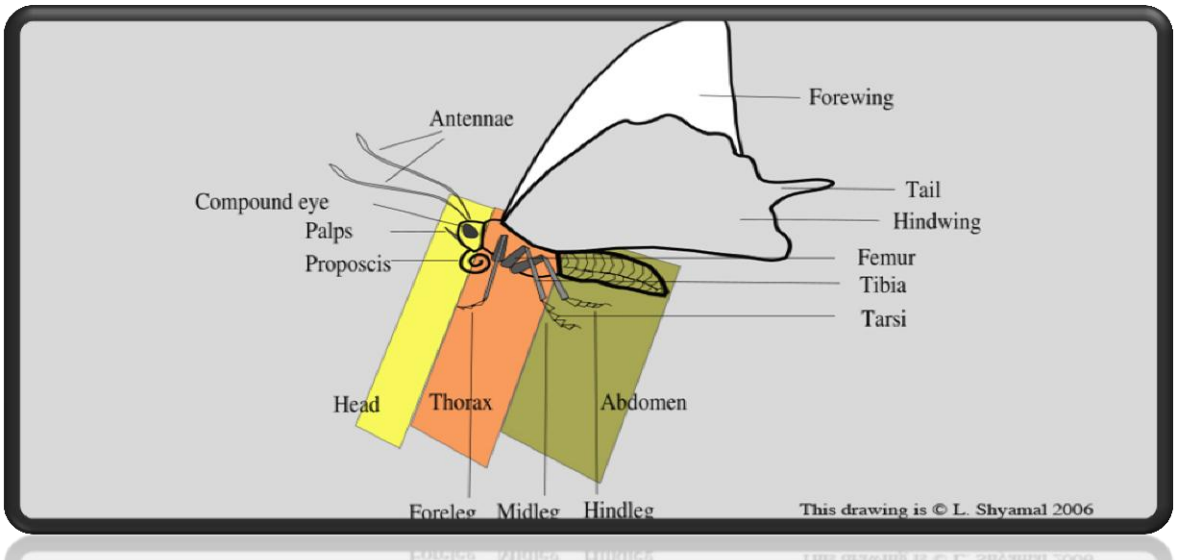
Spice Bush Swallowtail


© Reg Fry 200


Vertical escape hatch
© Reg Fry 20


Fibres making a trap-door
Neck of the cocoon

# THE ADULT BUTTERFLY OR MOTH




*sylvia Parthenos* ،The Clipper

(Limenitidinae :Nymphalidae :Papilionoidea)

*Junonia villida calybe*

(meadow argus butterfly)

California Sister (Adelpha bredowii)

Luna Moth (Actias luna)

*Asterocampa celtis*

Actias luna; Luna Moth

Economic Importance

Although many Lepidoptera are valued for their beauty, and a few are useful in commerce (e.g., the silkworm, Bombyx mori), the larvae of these insects are probably more destructive to agricultural crops and forest trees than any other group of insects.

# Order Coleoptera

- Beetles are insects with the largest number of known species, constituting about 25% of all known life forms, about 40% of all described insects are beetles
- The name Coleoptera are derived from Greek words (coleo=sheath ,and pteron =wings)

## Coleoptera habitats

- Beetles can be found in all habitats , but are not known to occur in polar regions , or in the sea they interact with their ecosystem in several ways, they feed mainly on plants or fungi break down animals and plant debris , and eat other invertebrates ,certain species are well known as agricultural pest such boll weevil.
- And red flour beetles , while other species are important controls of agriculture pest like beetles of family Coccinellidae") ladybirds "or" ladybugs ("consume aphids ، scale insects ،thrips ،and other plant-sucking insects that damage crops.

## Feeding

- herbivores ،scavengers or predators ،Beetles are generally although some adult beetles do not feed at all. The greatest numbers are plant feeders in one form or another, such as nectar feeders (some Buprestidae), foliage eaters (Chrysomelidae), seed-eaters

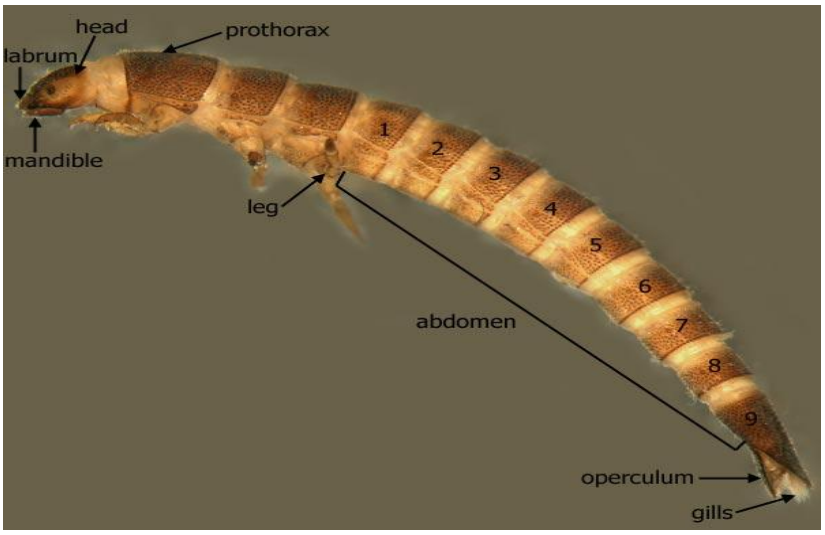
(many Curculionidae) or timber (Cerambycidae) or bark borers (Scolytidae). Others may feed on rotting wood (Lucanidae), carrion (Silphidae), dung (some Scarabaeidae), fungi or leaf litter. Some species are also predators (Carabidae) of other invertebrates. The feeding habits between larvae and adults may be the same or can vary. For example some beetle species are predatory when in the larval stage and plant-feeders when adults.

**Life cycle**

Beetles have a complete life cycle and development may take anywhere from a few weeks to several years. Eggs are usually laid on or near the food source such as in the soil or on a host plant, depending on the species. The number of eggs laid will depend on the species and may range from one or two up to hundreds. After hatching the larvae develop through a series of growth stages known as instars (usually 3 to 5) before pupating into adults.

Scarbidae form larva

Weir form larva .family( staphylinidae)




**Family Cicindelidae**

- The **tiger beetles** are a large group of beetles known for their aggressive predatory habits and running speed. The fastest species of tiger beetle can run at a speed of 9 km/h (5.6 mph), which, relative to its body length,

Family :**Cicindelidae**

*Cicindela* ***melancholica***

**Family Carabidae**

- common habitats are under the bark of trees, under logs, or among rocks or sand by the edge of ponds rivers. Most species are carnivorous and actively hunt for any invertebrate prey they can overpower. Some will run swiftly to catch their prey ،tiger beetles) Cicindelinae) can sustain speeds of 8 km/h (5 mph) – in relation to their body length they are among the very fastest land animals on Earth. Unlike most Carabidae which are nocturnal ،the tiger beetles are active diurnal hunters and often brightly coloured; they have large eyes and hunt by sight.

- Calosoma Ground Beetle
- *Calosoma semilaeve*

**Family dytiscidae**

- Its beetle adapted to living in water, it rise to water surface to take atmospheric air into their tracheal system , many water beetles take carry an air bubble between their abdomens and wings , and prevents water from getting into spiracles ,they have fringed ,hairy hind legs adapted for swimming

*Cybister tripunctatus*

**Family elateridae**

- Click beetles can be large and colorful (e.g. *Agrypnus notodonta*), but most are small to medium-sized (<2 cm) and dull. The adults are typically nocturnal and phytophagous, but rarely of economic importance. In hot weather, they may enter people's houses at night if entries or windows are left opened but are not a pest. Click beetle larvae, called **wireworms**, are usually saprophagous, but some species are serious agricultural pests, and other species are predators of other insect larvae.


**Family Curculionidae**

- They are usually smaller than 6mm and herbivorous, many weevil damaging to crops. The grain weevil damaging the stored grains. boll weevil attacks cotton crops it lays their eggs in the cotton bolls , and the larvae eat their way out


**Family Scarabidae**

- The beetle of this family are medium to large size occasionally with bright colors . They have distinctive lamellate antennae. Witch open like small fan. and they can close it as compact club . Beetles of other families may have similar antennae but they can not fore legs adapted for digging . And most of them are active flyers

*Scarabaeus sacer*

**Family Cocccinellidae**

The member of this family has bright colors With black head, legs ,and antennae , with black spots on their wings' a few species considered as pests ,but majority are useful insects ,as they feed on aphid , or scale insects ,

- Most of this family over winter as adults
- Aggregation on the south sides of larg objects such as trees ,houses .
- Dispersin in responding to the increasing  in day length in the spring


**Family Staphylinidae**

- Rove beetles are a large family of Coleoptera primarily distinguished by their short elytra ,that leave more than half of their abdomens exposed.
- Staphylinidae regarded as second largest
- family of Coleoptera after Curculionidae


- الحشرة الرواغةRover Beetle

*( Paederus alfierii )*

- Rove beetles are known from every type of habitat that beetles occur , and their diets include just about everything except the living tissues of higher plants .Most rove beetles are predators of insects and other kinds of invertebrates, living in forest leaf litter and similar kinds of decaying plant matter. They are also commonly found under stones, and around freshwater margins

# الجزء العملى

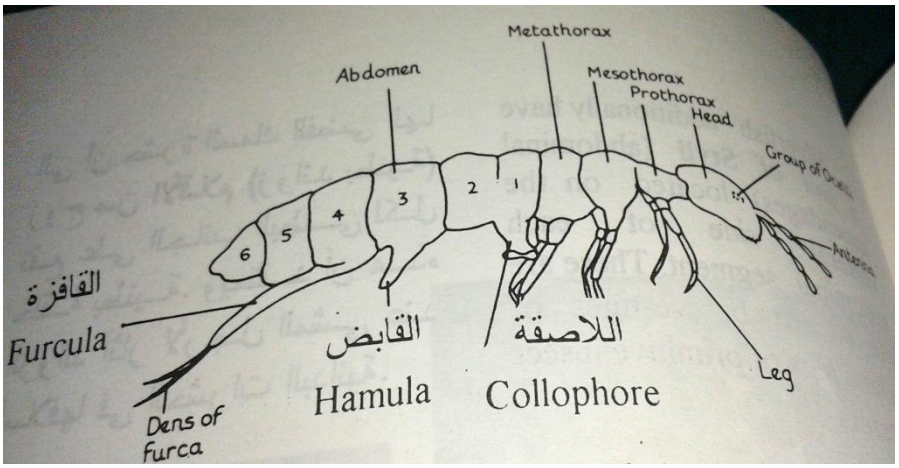
**Class : Insecta**

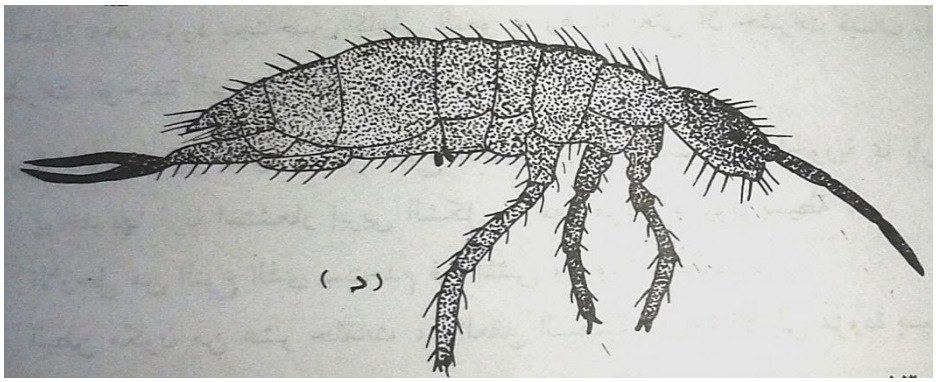
**Subclass : Apterygota**

**Order : Collembola**

**Family : Entomobryidae**

**e. g. : <u>Collembola</u> sp. الكلمبولا**



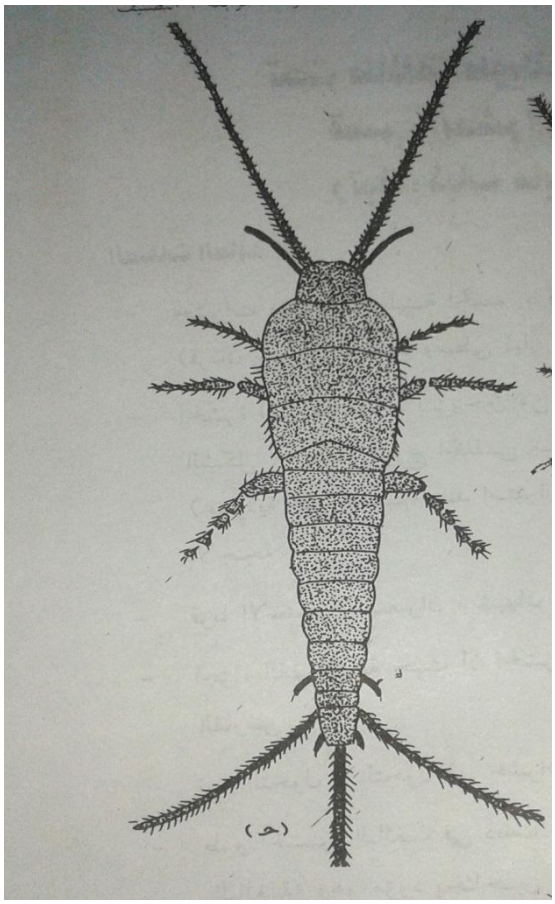
**Class : Insecta**

**Subclass : Apterygota**

**Order : Thysanura**

**Family : Lepismatidae**

**e. g. : Lepisma saccharina السمك الفضى**



**Class : Insecta**

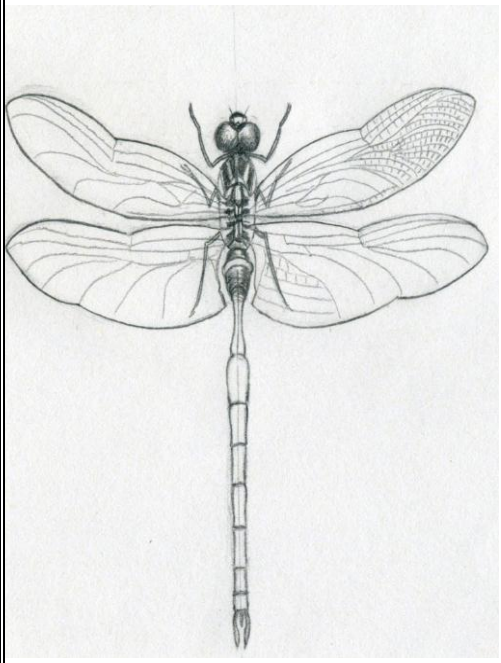
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Odonata**

**Family : Libellulidae**

**e. g. : <u>Crocothemis</u> <u>erythraea** **الرعاش الكبير**



**Class : Insecta**

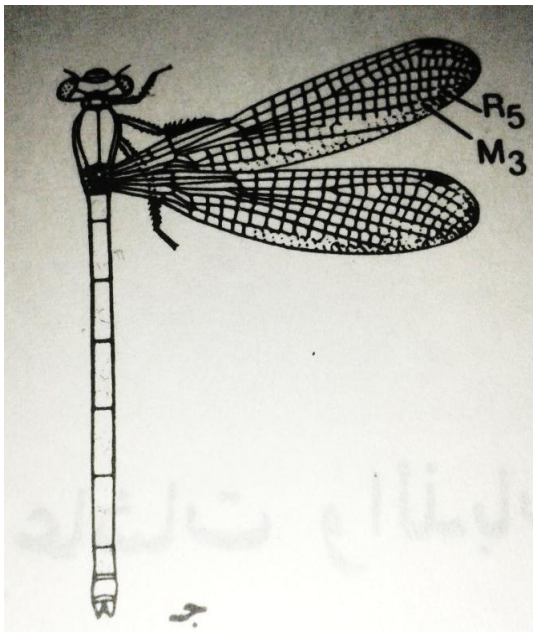
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Odonata**

**Family : Agrionidae**

**e. g. : <u>Ischnura</u> <u>senegalensis** **الرعاش الصغير**




**Class : Insecta**

**Subclass : Pterygota**

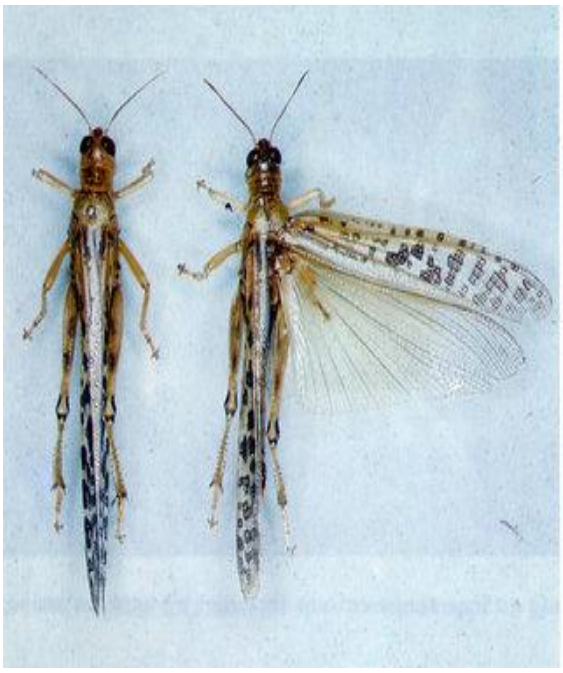
**Division : Exopterygota**

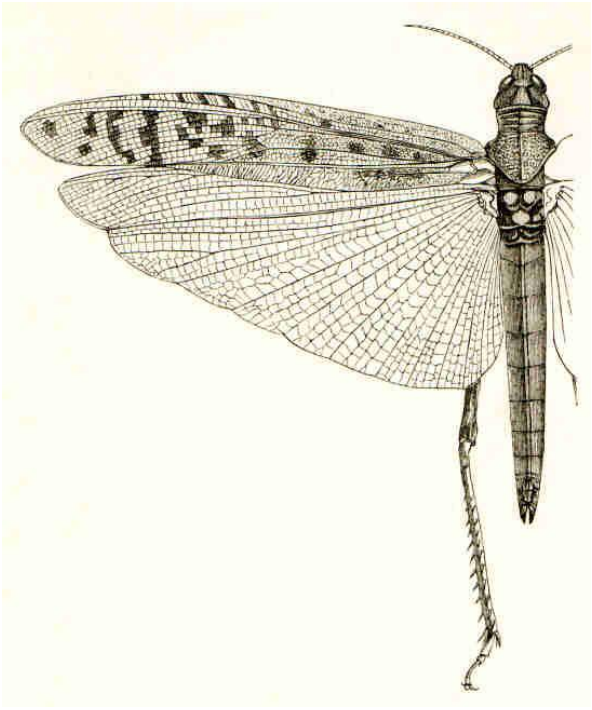
**Order : Orthoptera**

**Suborder : Caelifera**

**Family : Acrididae**

**e. g. : <u>Schistocerca</u> <u>gregaria</u> الجراد الصحراوى**





**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Caelifera**

**Family : Acrididae**

**e. g. : <u>Anacridium</u> <u>aegyptiaca** **الجراد المصرى**

**Class : Insecta**

**Subclass : Pterygota**

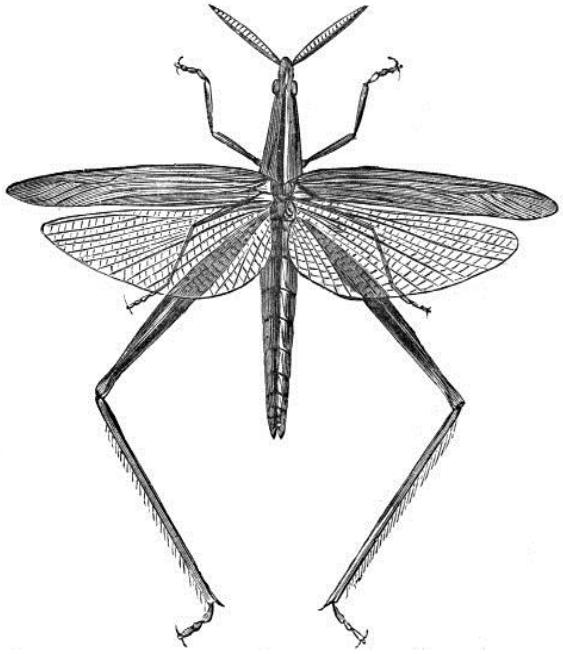
**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Caelifera**

**Family : Acrididae**

**e. g. : <u>Truxalis nasuta</u> الجراد ذو القرون الورقية**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Caelifera**

**Family : Acrididae**

**e. g. : <u>Locusta</u> <u>migratoria</u> الجراد الروسى**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Ensifera**

**Family : Tettigoniidae**

**e. g. : <u>Phaneroptera roseata</u>** **النطاط ذو القرون الطويلة**

**Class : Insecta**

**Subclass : Pterygota**

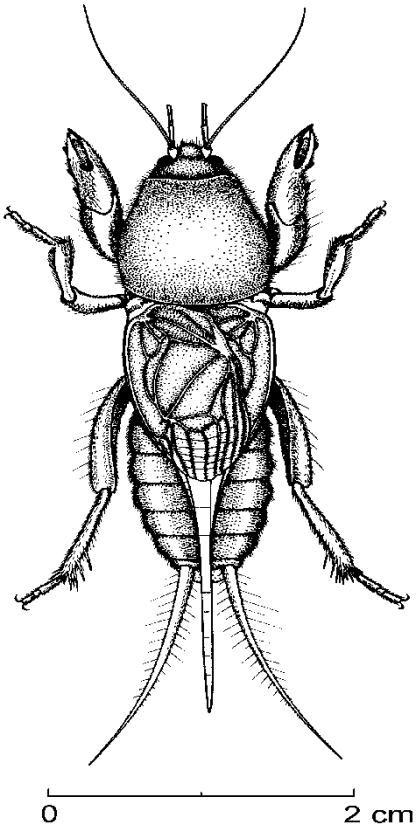
**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Ensifera**

**Family : Gryllotalpidae**

**e. g. : <u>Gryllotalpa</u> <u>africana** **الحفار الافريقى**




**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Ensifera**

**Family : Gryllidae**

**e. g. : <u>Gryllus</u> <u>bimaculatus** صرصور الغيط الاسود**</u>**

**Class : Insecta**

**Subclass : Pterygota**

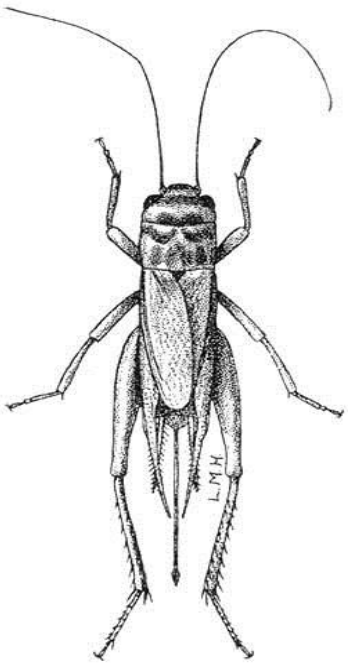
**Division : Exopterygota**

**Order : Orthoptera**

**Suborder : Ensifera**

**Family : Gryllidae**

**e. g. : <u>Gryllus</u> <u>domesticus</u> الصرصور المنزلى الاليف**



**Class : Insecta**

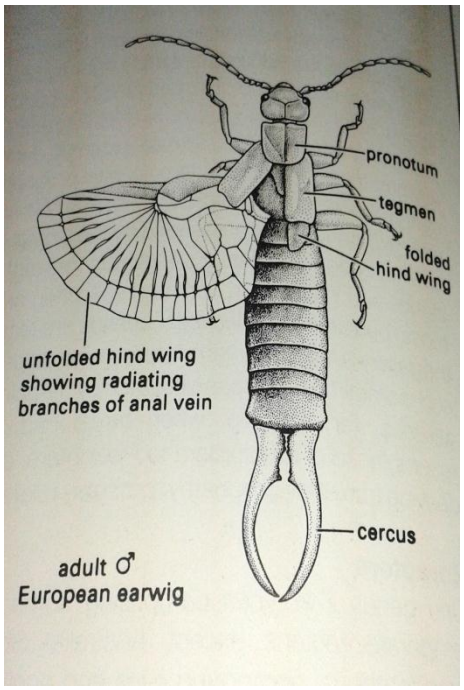
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Dermaptera**

**Family : Labiduridae**

**e. g. : <u>Labidura</u> <u>riparia</u> ابرة العجوز**

**Class : Insecta**

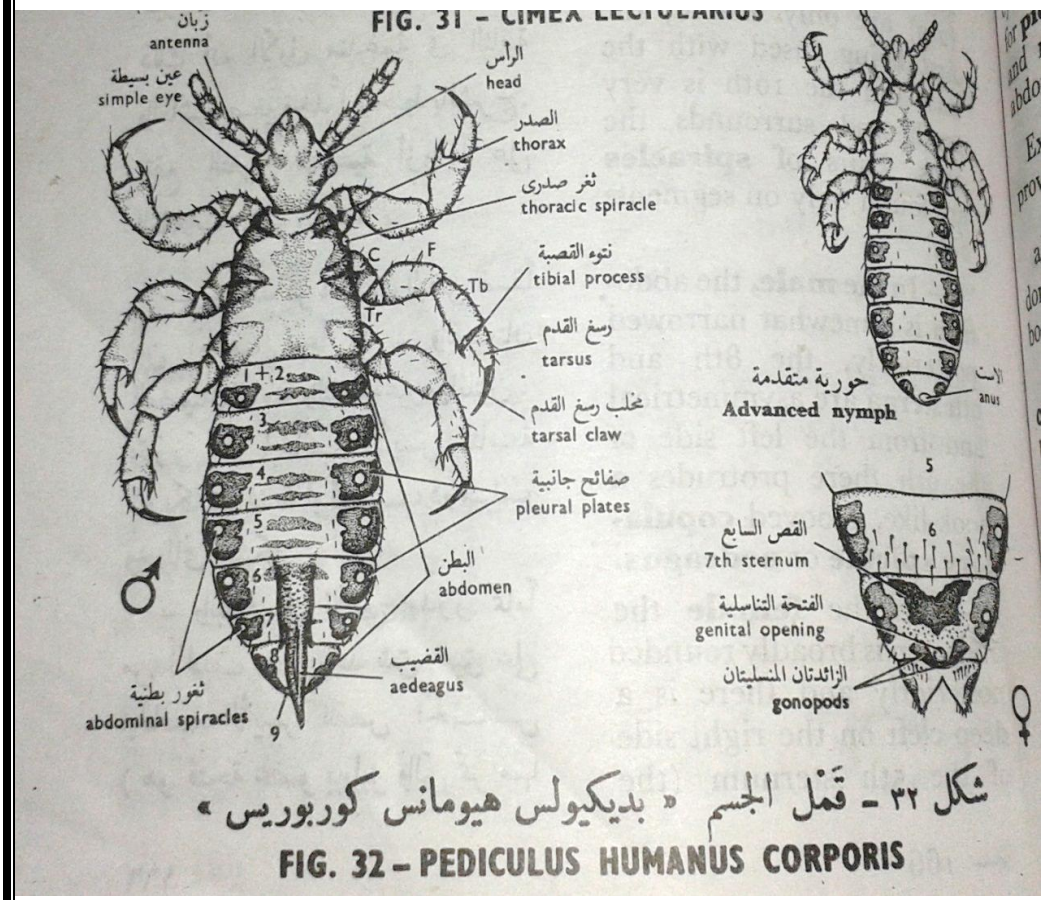
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Siphonculata**

**Family : Pediculidae**

**e. g. : <u>Pediculus</u> <u>humanus</u> قمل الانسان**




شكل ٣٢ ـ قَمْل الجسم « بديكيولس هيومانس كوربوريس »

FIG. 32 – PEDICULUS HUMANUS CORPORIS

**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Siphonculata**

**Family : Haematopinidae**

**e. g. : <u>Haematopinus</u> sp.**

**Class : Insecta**

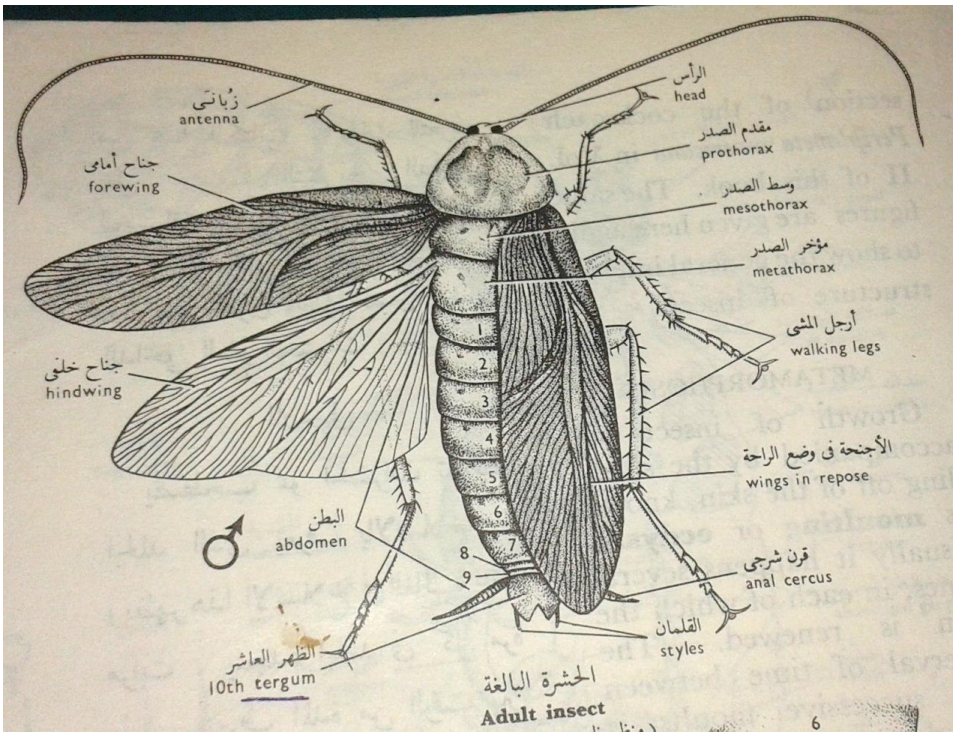
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Blattodea**

**Family : Blattidae**

**e. g. : <u>Periplaneta</u> <u>americana</u> الصرصور الامريكى**



**Class : Insecta**

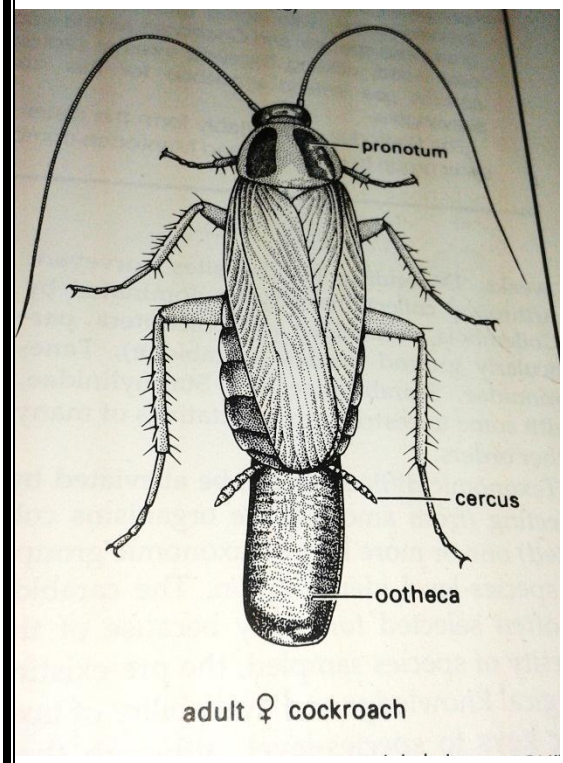
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Blattodea**

**Family : Blattidae**

**e. g. : <u>Blattella</u> <u>germanica</u> الصرصور الالمانى**




**Class : Insecta**

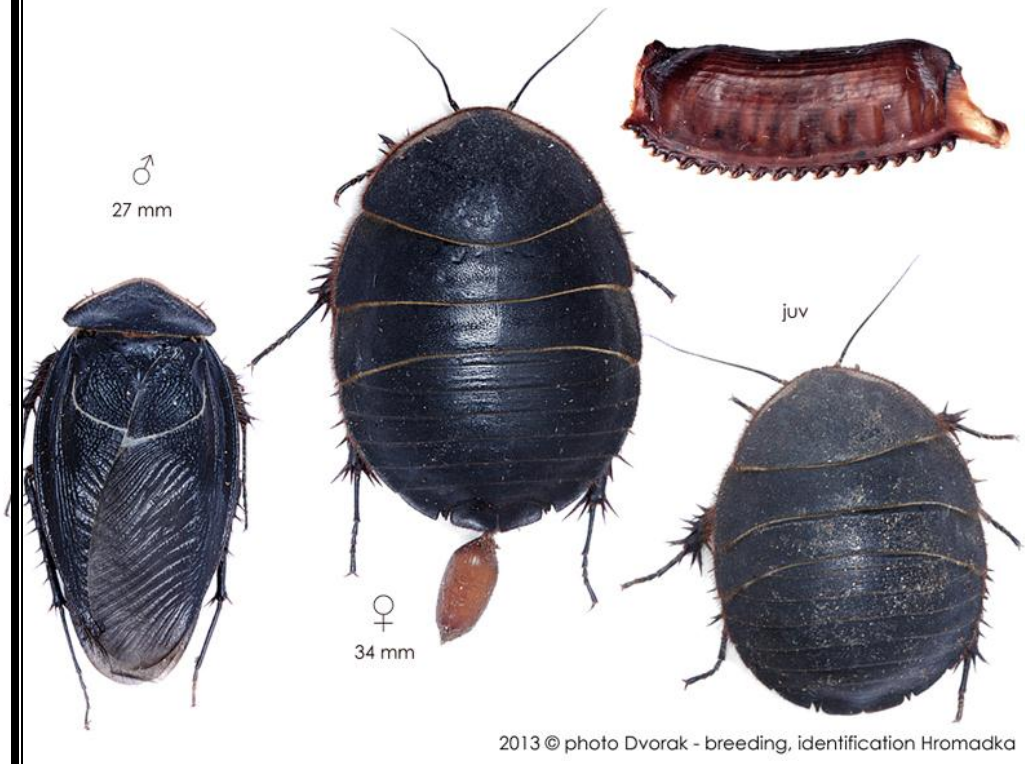
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Blattodea**

**Family : Polyphagidae**

**e. g. : <u>Polyphaga</u> <u>aegyptiaca</u>**



**Class : Insecta**

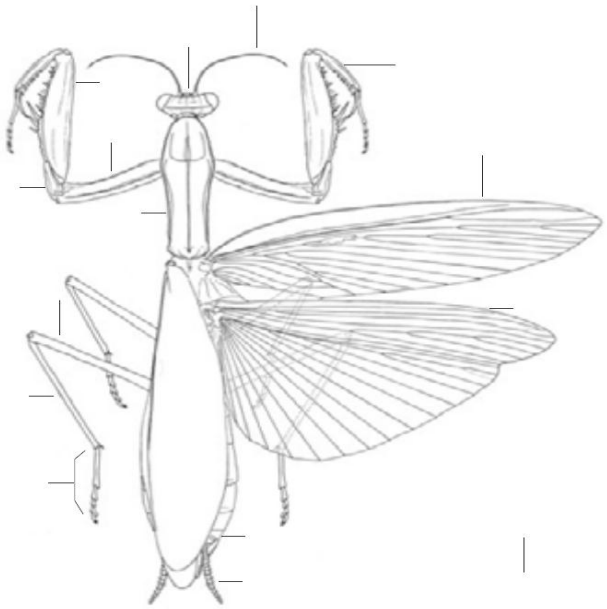
**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Mantodea**

**Family : Mantidae**

**e. g. : <u>Sphodromantis</u> <u>bimaculata</u> فرس النبى ذوالبقعتين**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Mantodea**

**Family : Mantidae**

**e. g. : <u>Calidomantis</u> <u>savignyi</u> فرس النبى الصغير**

**Class : Insecta**

**Subclass : Pterygota**

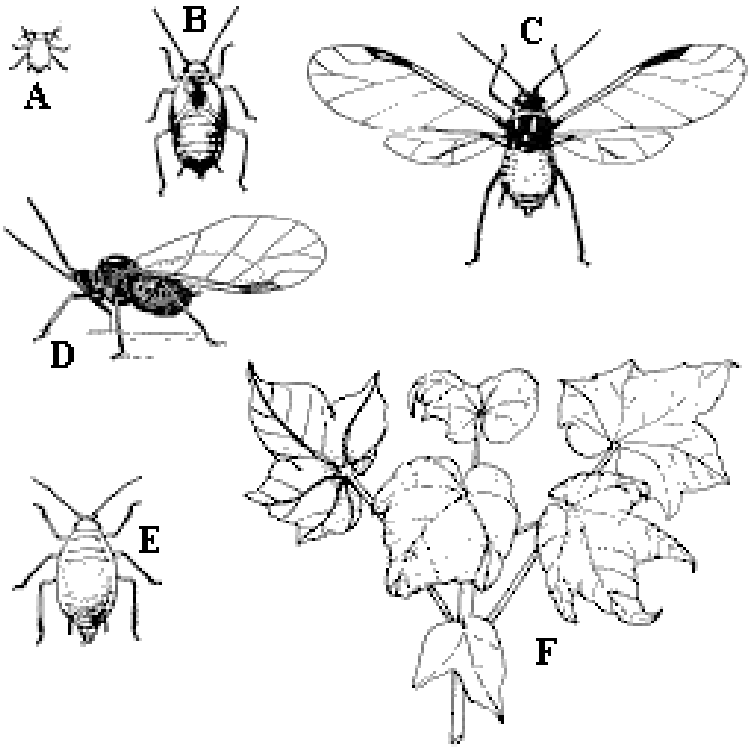
**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Homoptera**

**Family :Aphididae**

**e. g. : <u>Aphis gossypii</u> من القطـــــــن**




**Cotton aphid. A-B, Nymphs. C-E, Adults. F, Damage.**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Homoptera**

**Family : Monophlebidae**

**e. g. : Icerya aegyptiaca البق الدقيقى المصرى**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Homoptera**

**Family : Monophlebidae**

**e. g. : <u>Icerya</u> <u>purchasi</u> البق الدقيقى الاسترالى**

**Class : Insecta**

**Subclass : Pterygota**

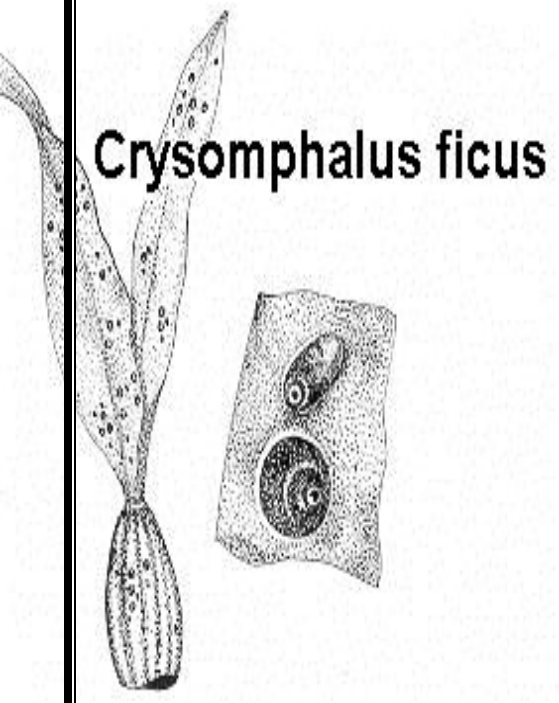
**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Homoptera**

**Family : Diaspididae**

**e. g. : <u>Chrysomphalus</u> <u>ficus** **الحشرة القشرية السوداء**




**Class : Insecta**

**Subclass : Pterygota**

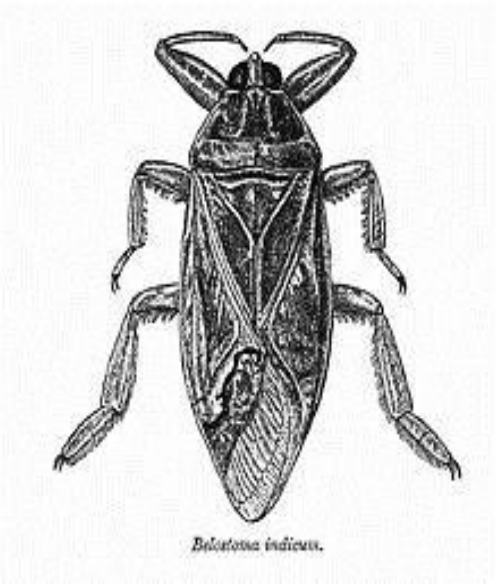
**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Heteroptera**

**Family : Belistomatidae**

**e. g. : <u>Lethocerus</u> <u>niloticus** **بق الماء المارد**




**Class : Insecta**

**Subclass : Pterygota**

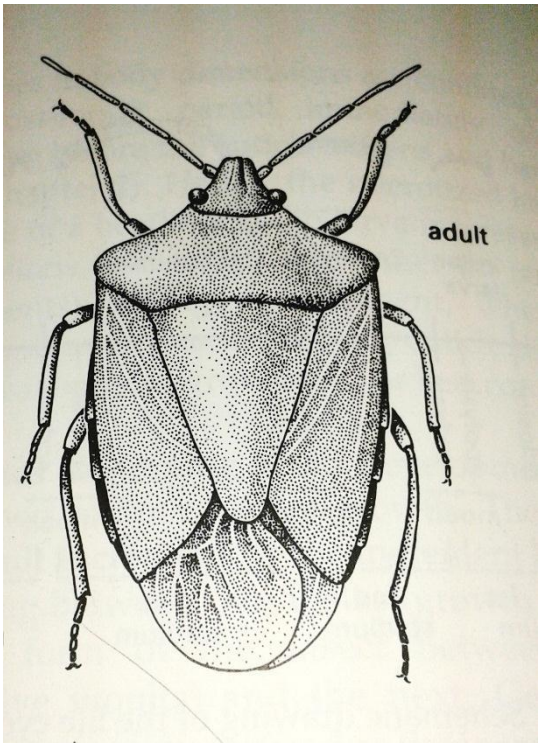
**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Heteroptera**

**Family : Pentatomatidae**

**e. g. : Nezara viridula البقة الخضراء**



**Class : Insecta**

**Subclass : Pterygota**

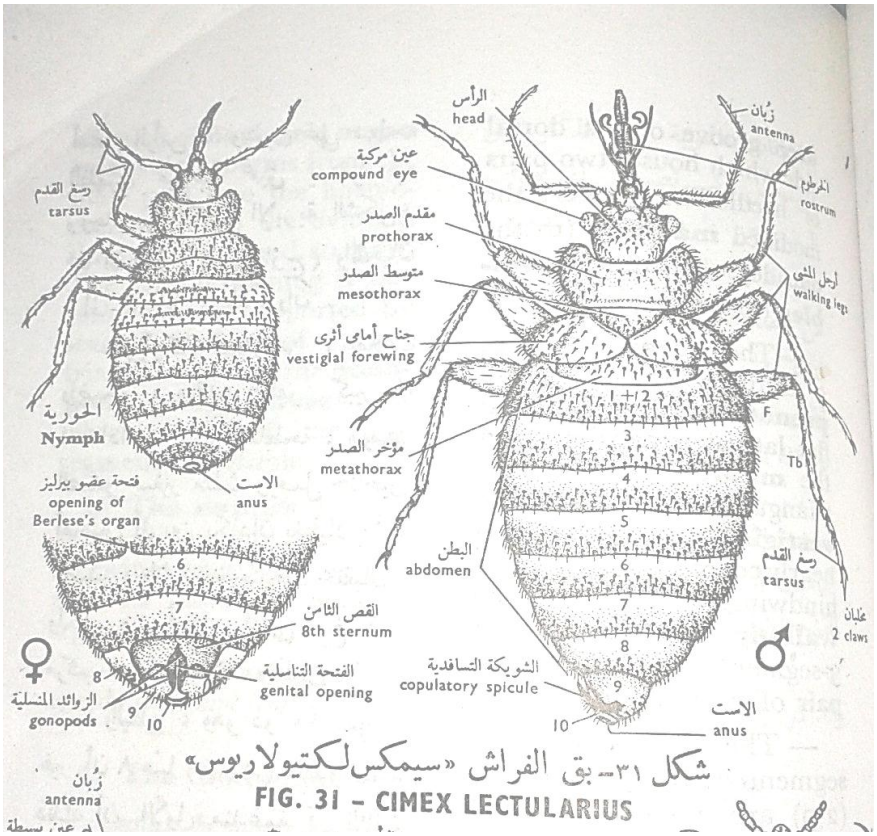
**Division : Exopterygota**

**Order : Hemiptera**

**Suborder : Heteroptera**

**Family : Cimicidae**

**e. g. : <u>Cimex</u> <u>lectularis</u> بق الفراش**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Neuroptera**

**Family : Myrmeleontidae**

**e. g. : <u>Creoleon</u> <u>africanus</u> اسد النمل**

**Class : Insecta**

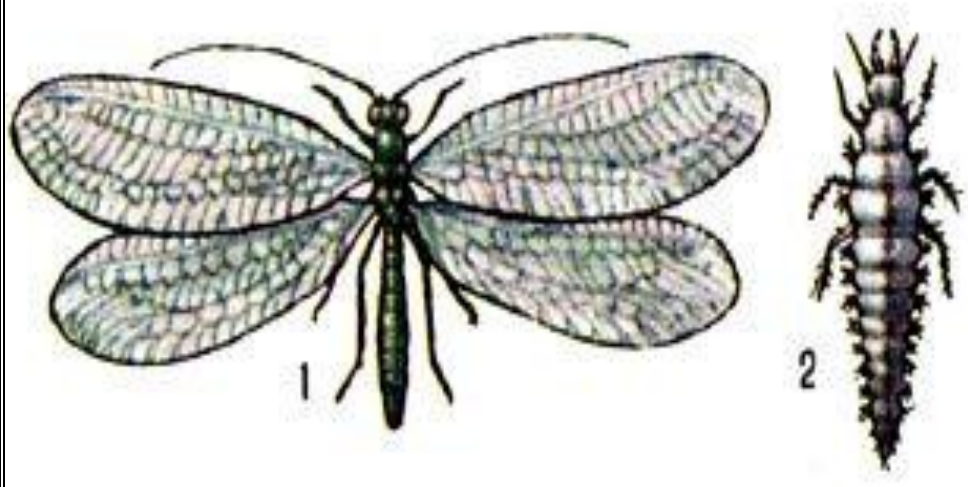
**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Neuroptera**

**Family : Chrysopidae**

**e. g. : <u>Chrysopa</u> <u>vulgaris** اسد المن



**Class : Insecta**

**Subclass : Pterygota**

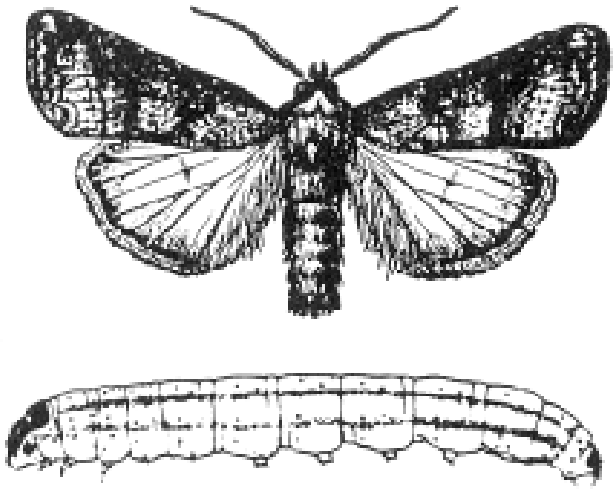
**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Noctuidae**

**e. g. : <u>Agrotis</u> <u>ipsilon** **الدودة القارضة**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Noctuidae**

**e. g. : Sesamia cretica دودة القصب الكبيرة**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Geometridae**

**e. g. : <u>Phytometra gamma y</u> الدودة نصف القياسية ذات الحرف**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Geometridae**

**e. g. : <u>Phytometra</u> <u>ni</u> الدودة نصف القياسية ذات البقعتين**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Geometridae**

**e. g. : <u>Spodoptera</u> <u>littoralis</u> دودة ورق القطن**

**Class : Insecta**

**Subclass : Pterygota**

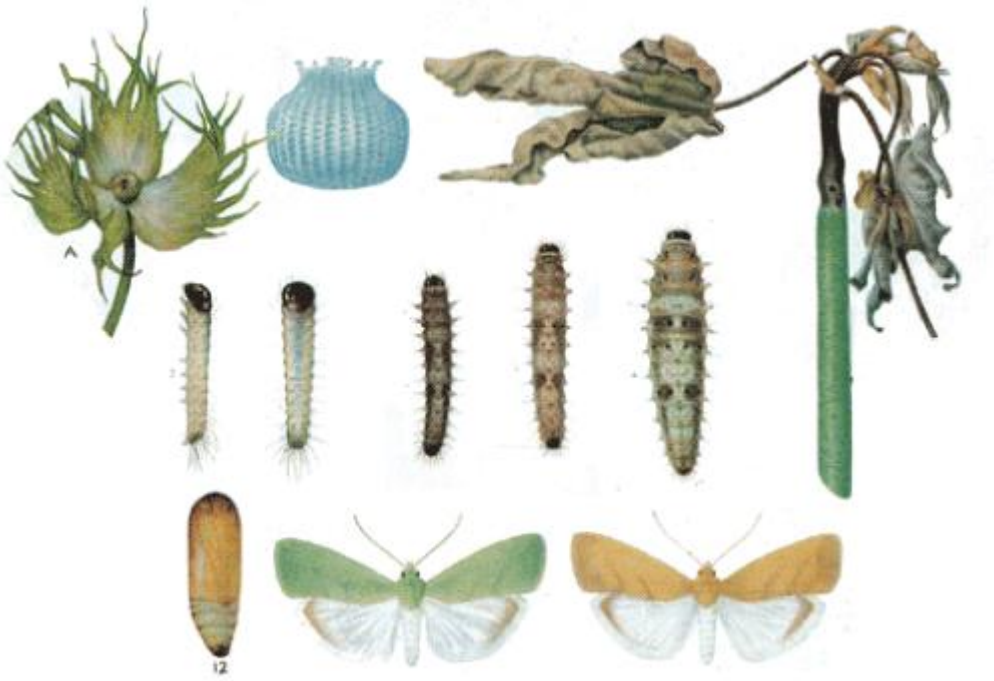
**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Noctuidae**

**e. g. : <u>Earias</u> <u>insulana** **دودة اللوز الشوكية**



**Class : Insecta**

**Subclass : Pterygota**

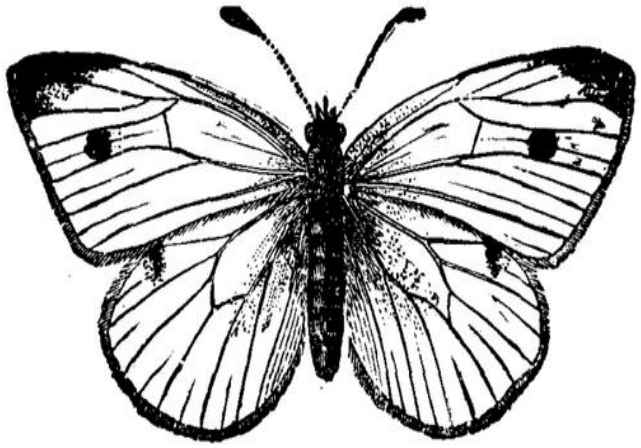
**Division : Endopterygota**

**Order : Lepidoptera**

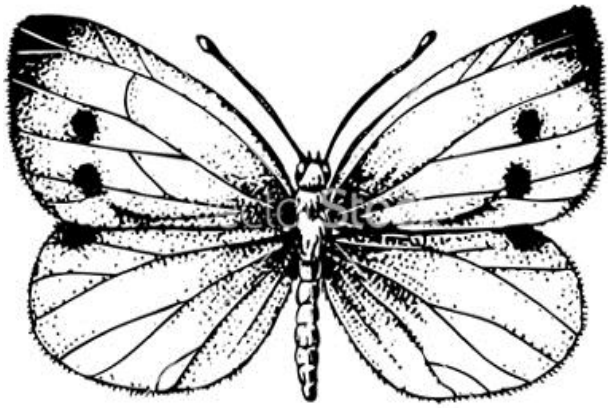
**Suborder : Heterocera**

**Family : Pieridae**

**e. g. : <u>Pieris</u> <u>rapae</u> ابو دقيق الكرنب**



**Female**



**Male**

**Class : Insecta**

**Subclass : Pterygota**

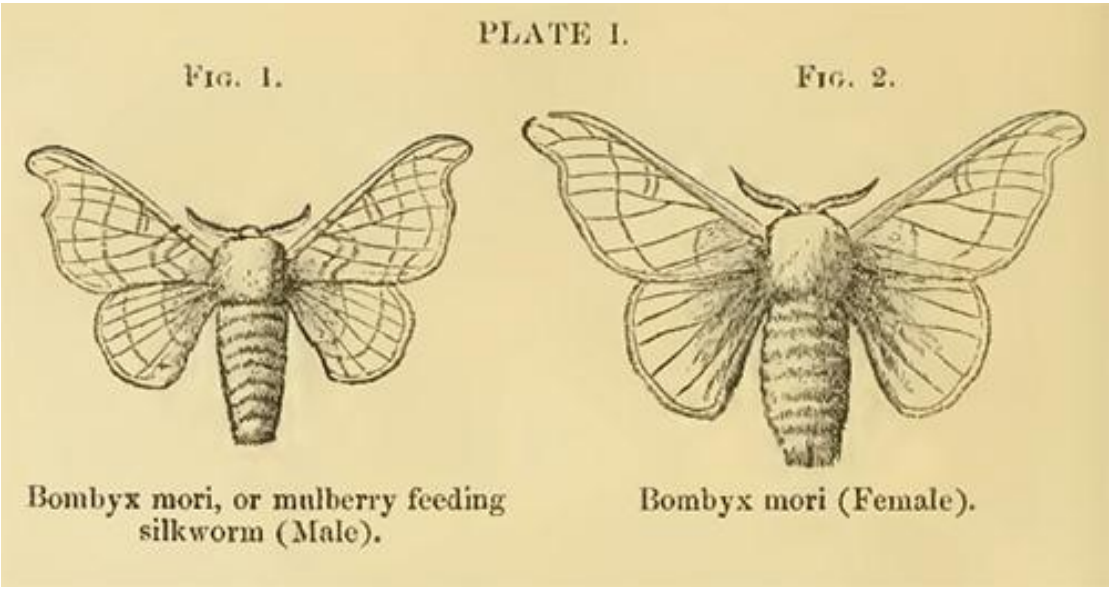
**Division : Endopterygota**

**Order : Lepidoptera**

**Suborder : Heterocera**

**Family : Bombycidae**

**e. g. : <u>Bombyx</u> <u>mori</u> دودة الحرير**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

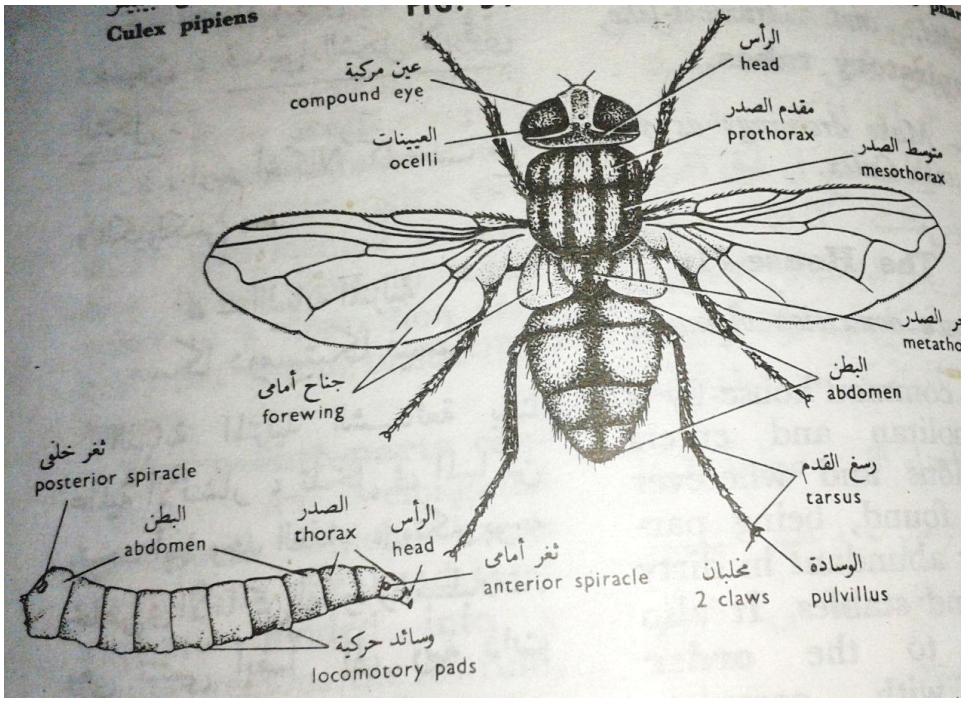
**Order : Diptera**

**Suborder : Brachycera**

**Division : Cyclorrhapha**

**Family : Muscidae**

**e. g. : <u>Musca</u> <u>domestica</u> الذبابة المنزلية**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

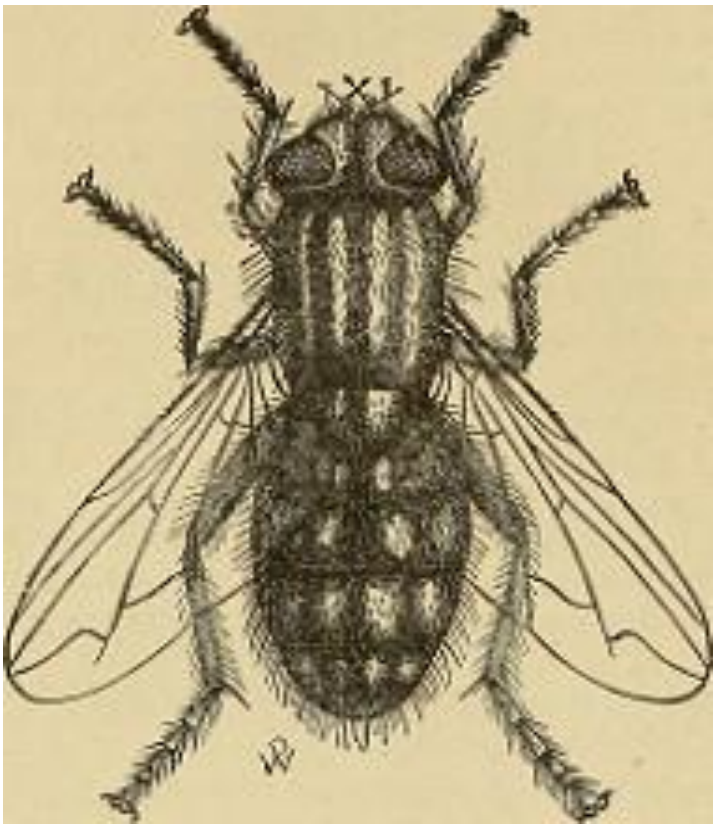
**Order : Diptera**

**Suborder : Brachycera**

**Division : Cyclorrhapha**

**Family : Sarcophagidae**

**e. g. : <u>Sarcophaga</u> <u>carnaria</u> ذبابة اللحم**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

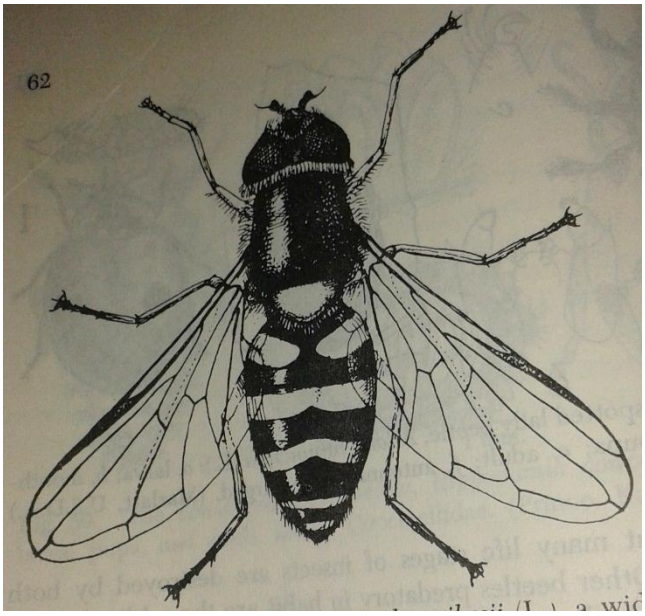
**Order : Diptera**

**Suborder : Brachycera**

**Division : Orthorrhapha**

**Family : Syrphidae**

**e. g. : <u>Syrphus</u> sp. ذبابة السيرفس**



**Class : Insecta**

**Subclass : Pterygota**

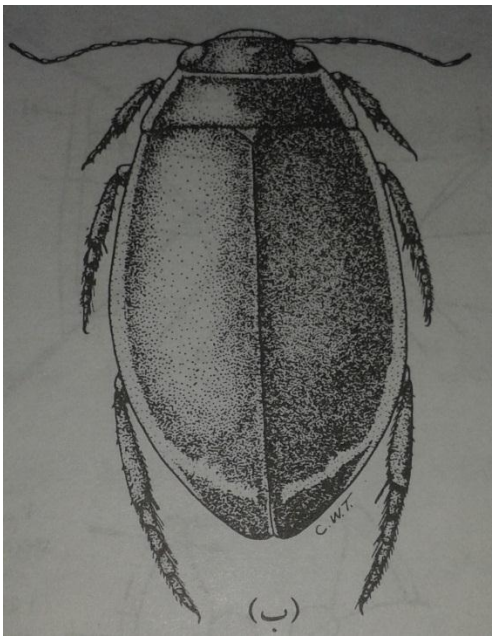
**Division : Endopterygota**

**Order : Coleoptera**

**Suborder : Adephaga**

**Family : Dytiscidae**

**e. g. : <u>Cybister</u> <u>tripunctatus</u> <u>africanus** خنفساء الماء




**Class : Insecta**

**Subclass : Pterygota**

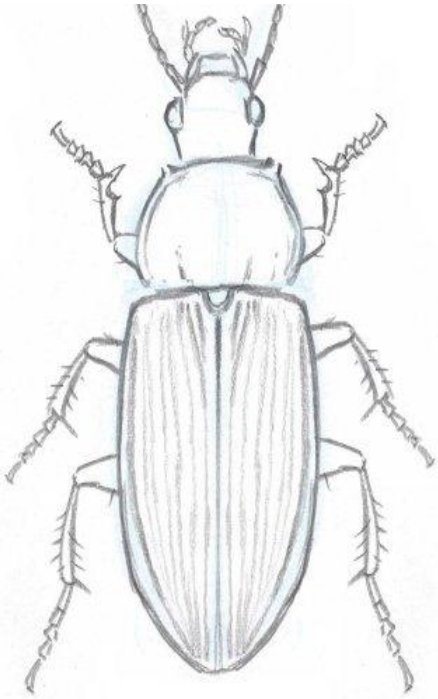
**Division : Endopterygota**

**Order : Coleoptera**

**Suborder : Adephaga**

**Family : Carabidae**

**e. g. : <u>Calosoma</u> <u>chlorostictum</u> خنفساء الكالوسوما**



**Class : Insecta**

**Subclass : Pterygota**

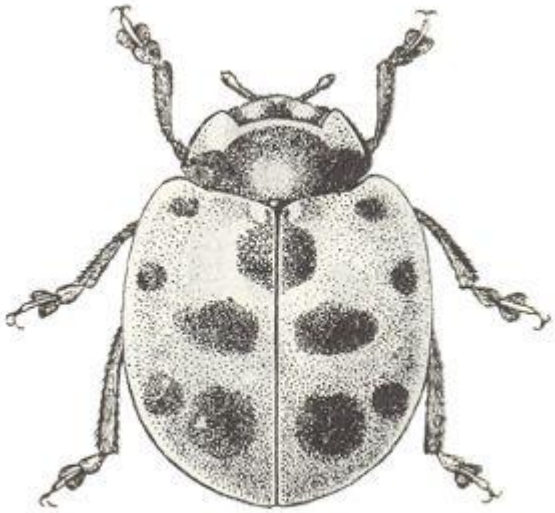
**Division : Endopterygota**

**Order : Coleoptera**

**Suborder : Polyphaga**

**Family : Coccinillidae**

**e. g. : <u>Coccinella</u> <u>undecimpunctata** **ابو العيد ذو ال ١١ نقطة**



**Class : Insecta**

**Subclass : Pterygota**

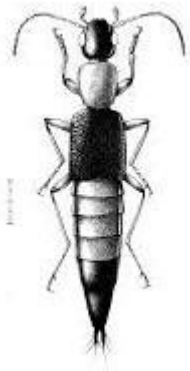
**Division : Endopterygota**

**Order : Coleoptera**

**Suborder : Polyphaga**

**Family : Staphylinidae**

**e. g. : <u>Paederus</u> <u>alfierii** **الحشرة الرواغة**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Hymenoptera**

**Suborder : Apocrita**

**Family : Vespidae**

**e. g. : Eumenes maxillosa دبور الطين البانى**

**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Hymenoptera**

**Suborder : Apocrita**

**Family : Vespidae**

**e. g. : <u>Vespa orientalis</u> دبور البلح**

**Class : Insecta**

**Subclass : Pterygota**

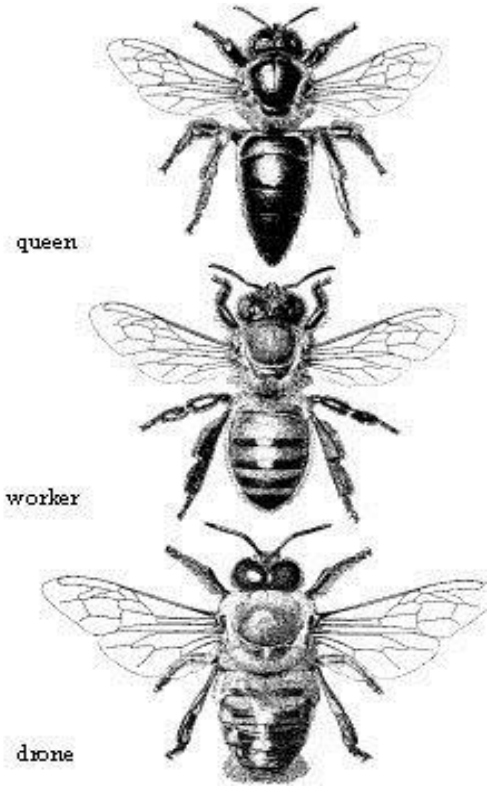
**Division : Endopterygota**

**Order : Hymenoptera**

**Suborder : Apocrita**

**Family : Apidae**

**e. g. : <u>Apis mellifera</u> نحل العسل**



**Class : Insecta**

**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Hymenoptera**

**Suborder : Apocrita**

**Family : Apidae**

**e. g. : <u>Xylocopa</u> <u>aestuans** نحل الخشب

**Male**

**Female**

**Class : Insecta**

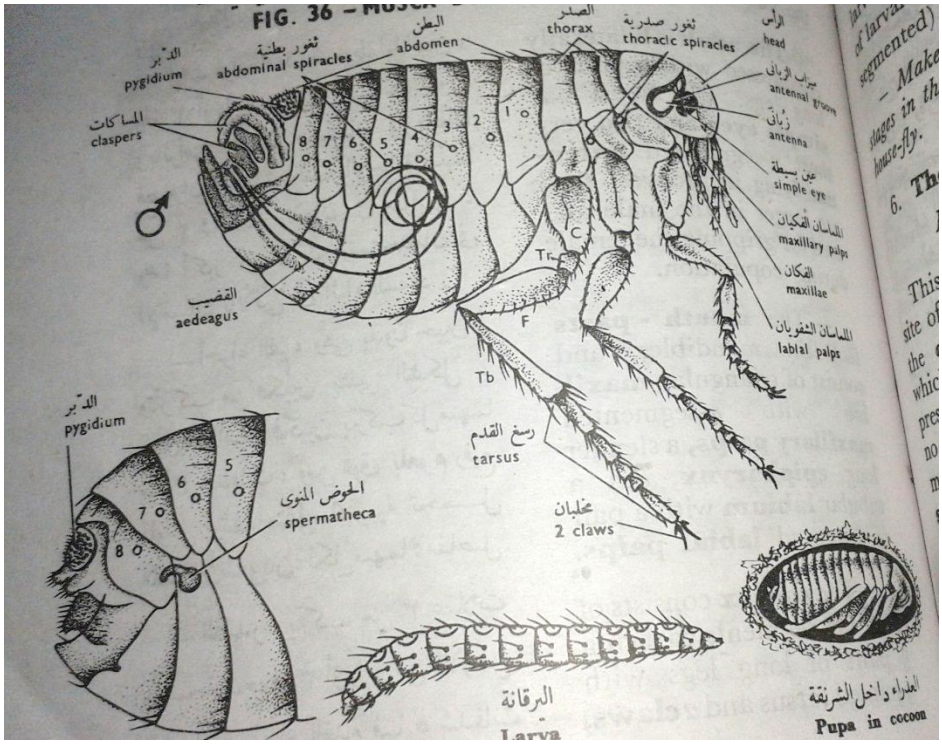
**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Siphonaptera**

**Family : Pulicidae**

**e. g. : <u>Pulex</u> <u>irritans</u> برغوث الانسان**



**Class : Insecta**

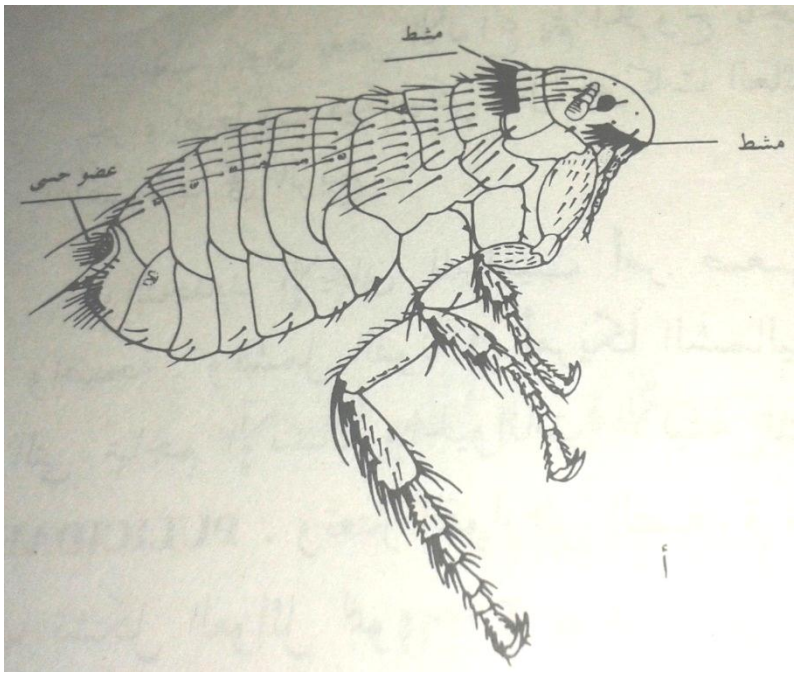
**Subclass : Pterygota**

**Division : Endopterygota**

**Order : Siphonaptera**

**Family : Pulicidae**

**e. g. : <u>Ctenocephalides</u> <u>canis** **برغوث الكلب**



**المراجع:**

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**٣-احمد حماد الحسينى و اميل دميان (١٩٦٩): بيولوجية الحيوان العملية الجزء الثالث .دار المعارف فى مصر.**