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الحشرات المجنحة	عنوان المحاضرة باللغة العربية
Pterygota	عنوان المحاضرة باللغة الإنكليزية
2	رقم المحاضرة

PTERYGOTA

The subclass Pterygota comprises a total of twenty-five orders. Out of these, 16 orders containing hemimetabolous insects are kept under the Division Exopterygota and 9 orders including holometabolous insects are placed under the Division Endopterygota.

The winged insects (Pterygota) go through distinct stages of development before they become adult. There are two forms of development:

1. Complete metamorphosis
2. Incomplete metamorphosis

Both of these life cycles involve the insect shedding its skin in order to move to the next life stage. The process of shedding the skin is called *moulting*, or *ecdysis*. The stages between moults are called *instars*.

Metamorphosis is controlled by three types of hormones, including a neurosecretory hormone. Neurosecretory means it is produced in the insect brain. The details of the process of metamorphosis allows the winged insects to be classified into two main groups:

- [Exopterygota](#)
- [Endopterygota](#)

Division: Exopterygota

The word **Exopterygota** refers to the development of the wings outside the body. Insects that develop in this way are said to show incomplete metamorphosis.

In the orders of insects which make up the Exopterygota, the larvae are usually called nymphs. After one or two moults, developing wings can start to be seen in sheaths on the outside of the nymphs.

Then there comes a time when they stop growing, moult again and become adults (also known as an imago). They become sexually mature in this final, adult stage.

In one order of insects, the mayflies ([Ephemeroptera](#)) there is also a sub-imago stage, just before the final adult stage. Nymphs of some orders of Exopterygota, including mayflies, live in water and crawl out of the water to achieve the land living sub-imago and adult stages.

The insect orders that undergo incomplete metamorphosis are:

- [Biting and Sucking lice](#) (Order: Phthiraptera)
- [Booklice and Barklice](#) (Order: Psocoptera)
- [Cockroaches](#) (Order: Blattodea)
- [Dragonflies and Damselflies](#) (Order: Odonata)
- [Earwigs](#) (Order: Dermaptera)
- [Grasshoppers and Crickets](#) (Order: Orthoptera)
- [Praying Mantids](#) (Order: Mantodea)
- [Mayflies](#) (Order: Ephemeroptera)
- [Stick insects and Leaf insects](#) (Order: Phasmatodea)
- [Stoneflies](#) (Order: Plecoptera)
- [Termites](#) (Previously Order: Isoptera but now part of [Order: Blattodea](#))
- [Thrips](#) (Order: Thysanoptera)
- [True Bugs](#) (Order: Hemiptera)
- [Web-spinners](#) (Order: Embioptera)
- [Zorapterans](#) (Order: Zoraptera)

Division: Endopterygota

In the Endopterygota, the [larval stage](#) is totally different from that of the adult, and it is wingless until it reaches the last [instar](#). In many cases the larva feeds on quite different foods and lives in quite different environments from the adult, which gives the species a survival advantage in that it doesn't depend on the same foods or locations throughout its lifecycle.

When it reaches its final instar, the larval skin splits to reveal not another larva but a pupa. This stage is an immobile, non-feeding stage inside which the adult structures are formed. Organs that were undeveloped in the larva grow faster than the rest of the body, especially the wings and sexual and other adult organs.

In the [true flies](#) (Diptera), [beetles](#) (Coleoptera) and the [butterflies and moths](#) (Lepidoptera) the [pupa](#) is sometimes contained in a cocoon. Pupae of the true flies can also be enclosed in a [puparium](#), formed from the old hardened larval skin.

Most pupae are *exarate*, which means that the legs, wings, mouthparts and antennae are not closely pressed to the body. Others, such as the Lepidoptera, have *obtect* pupae, which means that these structures are cemented to the body and the surface hardened.

The insect orders that undergo complete metamorphosis are:

- [Alderflies, Dobsonflies & Fishflies](#) (Order: Megaloptera)
- [Bees, Wasps and Ants](#) (Order: Hymenoptera)
- [Beetles](#) (Order: Coleoptera)
- [Butterflies and Moths](#) (Order: Lepidoptera)
- [Caddisflies](#) (Order: Trichoptera)
- [Fleas](#) (Order: Siphonaptera)
- [Flies](#) (Order: Diptera)
- [Lacewings, Antlions & Mantidflies](#) (Order: Neuroptera)
- [Scorpionflies](#) (Order: Mecoptera)
- [Snakeflies](#) (Order: Raphidioptera)
- [Strepsipterans](#) (Order: Strepsiptera)

[Mayflies \(Order: Ephemeroptera\)](#)

This is a small group of aquatic insects, often referred to as Mayflies. The name comes from a Greek word meaning 'living a day' due to the adults having very short lives, usually between one and four days only.

Main characteristics of Mayflies

- Transparent wings, of which the forewings are larger than the hindwings.
- Three long tail filaments

- Very short antennae
- Wings held over their backs when at rest



- Metamorphosis is incomplete with aquatic nymphal stage
- The males are often seen swarming over the surface of the water
- A weak flight

Life-cycle

- The eggs are laid in or on fresh water, the female often dipping her abdomen below the surface as she flies
- The nymphs live in the water
- The nymphs have gills, each generally a single or double plate attached to the side of the abdomen.



Important family belonging to this order is **Baetiscidae**

Class Insecta

- Order Ephemeroptera
 - Suborder Carapacea (the armored mayflies)
 - [Family Baetiscidae](#)
 - [Genus *Baetisca*](#) *berneri*

(Order: Odonata)

Main characteristics

- Two pairs of wings of similar size and have a dark mark, or pterostigma, near the tip of each.
- Long and slender abdomens
- Large heads
- Very large compound eyes
- Small, hair-like antennae



Life-cycle

The small yellowish eggs are laid directly in to the water or inserted in to water plants, floating debris or mud. The males of many species help by holding on to the females and then pulling them up in to the air again.

The aquatic nymphs take from one to five years to complete their development, according to species. Like the adults, they are carnivorous, preying upon many forms of aquatic fauna.

There are 2 sub-orders

- The **Anisoptera**, or dragonflies, are characterised by having the hindwing noticeably broader at the base than the forewing. In addition, the eyes meet on top of the head with the exception of one species and they rest with their wings stretched out flat. Its most important species *Libellula forensis*



- The **Zygoptera**, or damselflies, are smaller more fragile insects with similar fore and hindwings, have widely separated eyes, and rest with their wings folded over their abdomens. Below the sub-order are the following genus

Lestes



Kingdom:Animalia
Phylum:Arthropoda
Class:Insecta
Order:Odonata
Sub-order:Zygopter
Family:Lestidae
Genus:*Lestes*
Species: *dryas*

THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

The Basics: Anisoptera vs. Zygoptera

<p>Western Pondhawk, C.A.S. Mazzacano</p>	<p>Sooty Dancer, Celeste Mazzacano</p>
<ul style="list-style-type: none"> ✧ Large body, wider abdomen ✧ Eyes touch or nearly so ✧ Unequally-sized wings ✧ Wings held out horizontal when perched 	<ul style="list-style-type: none"> ✧ Smaller body, slender abdomen ✧ Eyes separated ✧ Equal-sized wings, stalked at the base ✧ Wings folded above or along body when perched

Q1/Can I use Dragonflies to control mosquitoes or other flying pests?

Q2/What is the difference between Dragonflies and Damselflies?

Q3/ Mention 5 orders undergo to complete metamorphosis

