THE AMAZING WORLD OF INSECTS

If all the insects were to disappear from the earth, within 50 years all life on earth would end. If all human beings disappeared from the earth, within 50 years all forms of life would flourish"

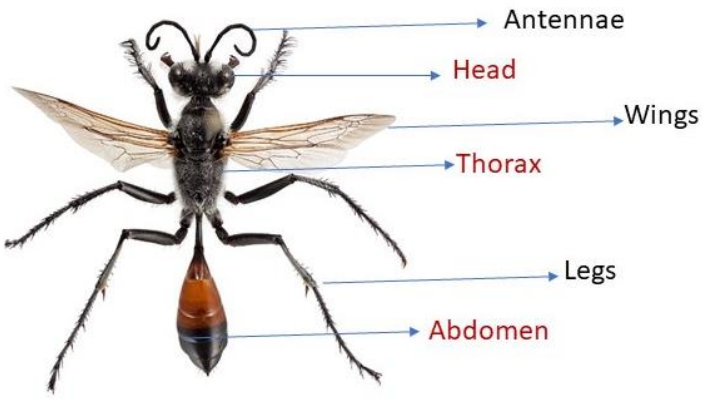
Jonas Salk

Diversity and Distribution of insects

Classification of Insects

Domain	: Eukaryota
Kingdom	: Animalia
Phylum	: Arthropoda
Clade	: Allotriocarida
Subphylum	: Hexapoda
Class	: Insecta

What is an insect? (Plate 1)



- Insects belong to the phylum Arthropoda - invertebrates with segmented bodies and jointed limbs
- The name Insect is derived from Latin "insectum" meaning "cut up" as the insects are divided into three major parts – the head the thorax and the abdomen
- Insects are characterised by a pair of wings (elytra), three pairs of jointed legs that gives them the name Hexapoda and a pair compound eyes and antennae
- Insects are invertebrates - Insects have an exoskeleton made of a polysaccharide, (large molecule made up of sugar units) called Chitin, a tough, protective substance. It plays the role of providing structural support similar to what skeletal system does in higher animals.
- More than a million described species and represent more than half of all animal species.

Other invertebrates that can be confused with Insects

Many other arthropods having jointed legs and segmented body are confused with insects. e.g. centipedes, millipedes, sowbugs, spiders (Plate 2). A closer examination will reveal more pairs of legs. The three pairs of legs are an important characteristic to identify insects.

Arthropods that are confused with insects

Centipedes
Many pairs of legs

Millipedes
Many pairs of legs

Sow bugs/ wood louse
Seven pairs of legs

Spiders
Four pairs of legs

Mites
Four pairs of legs

Insect classification based on various morphological features has been evolving and with recent advances in molecular phylogenetics.*

(*Phylogenetics is the study of the evolutionary history and relationships among biological entities, like species or genes).

The class Entognatha with orders Protura, Diplura and Collembola were historically, placed together with the insects (class Insecta), because like all other insects they, too, have six legs. The Entognatha, derived from Greek (entós), meaning "inside", and (gnáthos), meaning "jaw", are a class of wingless and ametabolous arthropods, which, together with the insects, makes up the subphylum Hexapoda. Their mouthparts are entognathous, meaning that they are retracted within the head, while in true insects the mouthparts are external.

Presently 29 orders of insects are well established and include the most primitive and the highly evolved groups.

Recognised Insect orders

	Order	Common Name	Key Features
Subclass Apterygota			
1.	Archaeognatha	Bristletails	Humpbacked, jump well, wingless
2.	Thysanura (now Zygentoma)	Silverfish, firebrats	Flat, fast-moving, long cerci (Cerci (singular cercus) are paired appendages found on the rear-most segments of many arthropods, including insects)
Subclass Palaeoptera			
3.	Ephemeroptera	Mayflies	Short adult life, adults and subimagos are seen with long caudal filaments (The subimago is a unique, winged stage in the life cycle of mayflies, occurring after the nymph stage and before the final adult form , the imago)
4.	Odonata	Dragonflies & damselflies	Long, slender bodies, aquatic nymphs, large eyes
Subclass Polyneoptera			
5.	Dermaptera	Earwigs	Pincers on abdomen
6.	Dictyoptera - Blattodea	Cockroaches	Flat bodies, chewing mouthparts
	Dictyoptera - Isoptera	Termites	Social, cellulose digestion
	Dictyoptera - Mantodea	Praying mantis	Predatory front legs
7.	Embioptera	Webspinners	Spin silk from front legs
8.	Grylloblattodea	Ice crawlers/ Rock crawlers	Cold-dwelling, wingless insects
9.	Mantophasmatodea	Heelwalkers	Resemble praying mantids and stick insects, but have large arolia (fleshy pads between claws) and hold the last segment of their legs up when walking.
10.	Orthoptera	Grasshoppers & crickets	Jumping hind legs, chewing mouthparts
11.	Phasmatodea	Stick and Leaf insects	Camouflage, long bodies
12.	Plecoptera	Stoneflies	Aquatic nymphs, indicators of water quality
13.	Zoraptera	Angel insects	Rare, tiny, termite-like
Subclass Paraneoptera			
14.	Hemiptera	True bugs	Piercing-sucking mouthparts, half-membranous wings

	Order	Common Name	Key Features
15.	Phthiraptera	Lice	Wingless flattened body parasites
16.	Psocoptera	Booklice, Barklice	Chewing or sucking mouthparts
17.	Thysanoptera	Thrips	Fringed wings, piercing-sucking mouthparts
Subclass Endopterygota			
18.	Coleoptera	Beetles	Hard forewings (elytra), chewing mouthparts
19.	Diptera	True flies	One pair of wings, sponging or piercing mouthparts
20.	Hymenoptera	Ants, bees, wasps	Narrow waist, social behaviour, stingers
21.	Lepidoptera	Butterflies & moths	Scaly wings, proboscis
22.	Megaloptera	Dobsonflies	Membranous large wings and prominent antennae
23.	Mecoptera	Scorpion flies	Long face, scorpion-like tail (males
24.	Neuroptera	Owlflies, antlions, and lace wings	Net-veined wings
25.	Raphidioptera	Snakeflies	Long neck, predatory adults & larvae
26.	Siphonaptera	Fleas	Jumping, wingless
27.	Strepsiptera	Twisted-wing parasites	Internal parasites of other insects
28.	Trichoptera	Caddisflies	Aquatic larvae, hairy wings

Adapted from Gullan P.J. & P. S. Cranston. 2010. *The Insects: An Outline of Entomology*.