Adaptations in insects

Insects in extreme places

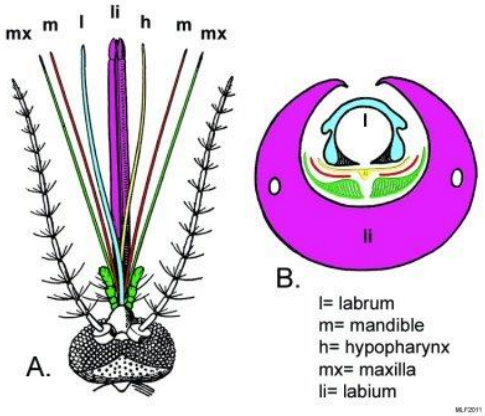
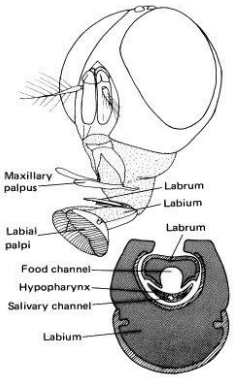
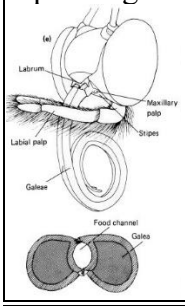
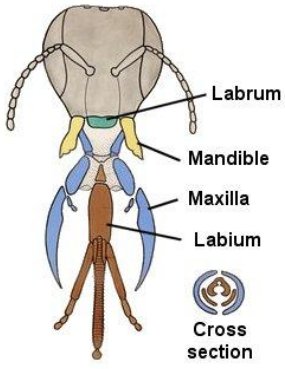
Extreme	Example Insect	Key Adaptation
Desert	Saharan silver ant (*Cataglyphis bombycine*)  http://bjornfree.com/galleries.html	Reflective hairs, heat tolerance
Arctic	Antarctic midge (*Belgica antarctica*)  By Tasteofcrayons - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=8446523	Antifreeze, no wings
High altitude	Himalayan bumblebee 	Can raise their body temperature by shivering their flight muscles
Caves	Cave beetle  https://commons.wikimedia.org/w/index.php?curid=35016231	Animals adapted to cave dwelling are troglobites – Cave beetles are blind with long legs and antennae covered by setae for sensing

Extreme	Example Insect	Key Adaptation
Polluted water	Rat-tailed maggot  By Brian Jones - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=5011814	Breathing siphon
Open ocean	Sea skater (***Halobates)***  By Pigmentsandsuch - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=145618753	Hydrophobic legs, UV resistance
Oil wells	Petroleum fly	Solvent tolerant gut bacteria

Insect mouthparts

Insect mouthparts are highly diverse and specialized depending on the insect's feeding habit—whether biting, sucking, lapping, or piercing. All insect mouthparts are modifications of a basic chewing type, with structures like mandibles, maxillae, and labium adapted differently.

Insect	Mouthpart Type	Function
Grasshopper	Chewing/ mandibulate 	Eats leaves

Insect	Mouthpart Type	Function
Mosquito	Piercing & sucking 	Drinks blood or plant sap
Housefly	Sponging/haustellate 	Laps up liquid food
Butterfly	Siphoning 	Sucks nectar
Honeybee	Chewing & lapping 	Eats pollen, licks nectar

Insect locomotion

Insects exhibit diverse and specialized types of locomotion to adapt to various environments. Their movements are powered mainly by muscles attached to the exoskeleton**, and** include walking, flying, swimming, jumping, and burrowing.

Locomotion Type	Terminology	Example Insects
Walking	Cursorial	Ant, cockroach
Flying	Wings + flight muscles	Butterfly, bee
Swimming	Natatorial	Water beetle, mosquito larva
Jumping	Saltatorial	Grasshopper, flea
Crawling	Larval movement	Caterpillar, maggot
Burrowing	Fossorial	Mole cricket, dung beetle

Insect reproduction

Most insects reproduce **sexually**, though some can reproduce **asexually**.

In aphids, parthenogenesis is a form of asexual reproduction where females produce offspring without fertilisation from a male. This is known as cyclical parthenogenesis, meaning aphids alternate between sexual and asexual reproductive generations, typically triggered by seasonal changes. Many aphid species are **viviparous**, meaning they give birth to live young rather than laying eggs

Insect navigation – How insects find their way

Insects rely on their senses, memory, environmental cues, and sometimes celestial or magnetic fields.

- Bees, wasps, dung beetles use visual landmarks in their environment and create mental maps for navigation.
- Honeybees and some butterflies like monarchs that fly long distances use sun’s position and an internal biological clock adjust for spatio-temporal navigation.
- Bees, ants, dragonflies can detect polarized light and use this for navigating on cloudy days.
- Monarch butterflies, some beetles can detect the Earth's magnetic field and use it like a compass especially for long-distance migration.
- Olfactory navigation (using smell)
- Insects follow scent trails or pheromones to find mates, food, or home.
- Highly evolved social insects such as bees perform a round or waggle dance to tell others the direction and distance to food sources based on the sun's angle.

Strategy	Cue Used	Example Insects
Path integration	Steps + angles	Desert ants
Landmark navigation	Visual memory	Bees, wasps
Sun compass	Sun + circadian clock	Honeybees, monarchs
Polarized light	Sky pattern	Ants, dragonflies
Magnetic compass	Earth's magnetic field	Monarch butterflies
Scent trails	Pheromones/odours	Ants, moths
Dance language	Symbolic motion	Honeybees

Parental care in insects

Some insect species exhibit remarkable forms of parental care, including guarding eggs, provisioning food, building nests, or even carrying young.

Type of Care	Description	Example Insects
Egg guarding	Parent guard eggs  Giant water bugs guard eggs or carry them on their back Giant water bugs are known as "super dads" in the insect world because males carry and oxygenate the eggs on their backs until hatching. (Image source: https://agbuyamarco.blogspot.com/2013/02/giant-water-bugs-mating-and-parental.html)	Stink bugs, water bugs
Nest building	Shelter for eggs/larvae  https://www.brisbaneinsects.com/brisbane_vespoidwasps/MudDauber.htm	Solitary bees, potter wasps
Food provisioning	Stores food with eggs	Dung beetles, wasps

Type of Care	Description	Example Insects
		
Social care	Worker caste nurtures young 	Bees, ants, termites
Caring for young	Eggs/nymphs are guarded by mother  https://commons.wikimedia.org/wiki/File:Subsocial_tortoise_beetle_Acromis_sparsa_%28Chrysomelidae-_Cassidinae%29_%28239843487 40%29.jpg	Acromis tortoise beetle