INSECTS · CLASSIFICATION & NAMING

Insect Orders

Names, roots and memory tricks — decode every order name and make a beetle, a bug or a fly as easy to name as a kudu.

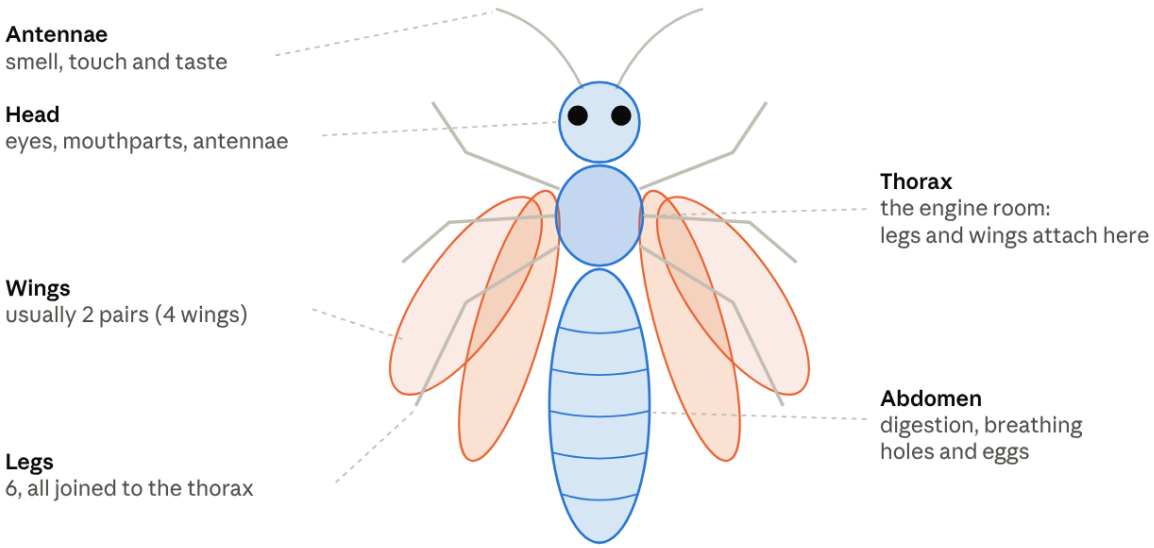
SERIES **SAFARI NOTES** FORMAT **FIELD & GUIDING NOTES** PUBLISHED BY **THE SAFARI SHOW**

> Welcome to the bug club. Insects make up more than half of all the animal species ever named, and every one of their order names hides a little story. Learn the story and the name sticks. This guide turns the insect orders into pictures, jokes and a walk around camp, so naming a beetle, a bug or a fly becomes as easy as naming a kudu.

01 Meet the insect

Every order in this guide is a variation on one body plan. Most of the order names describe just one part of it: **the wings**.

Every insect: 3 body parts, 6 legs, 2 antennae



Count the legs: six means insect. Eight means spider, scorpion or tick.

The body plan every order shares.

02 Cracking the code: how insect names work

Most insect order names are **Greek words written in Latin form**, and most of them simply describe the wings. Learn about 30 word roots and you can decode almost every order on sight.

Where an order sits. Kingdom Animalia › Phylum Arthropoda (“jointed feet”) › Class Insecta › **Order** › Family › Genus › species. Each rank has a tell-tale ending:

RANK	ENDING	EXAMPLE
Order	usually **-ptera**, sometimes -odea or -ata	Coleoptera, Mantodea, Odonata
Superfamily	-oidea	Scarabaeoidea
Family	-idae	Scarabaeidae (scarab and dung beetles)
Subfamily	-inae	Scarabaeinae
Tribe	-ini	Scarabaeini
Genus + species	italic, genus capitalised	*Kheper nigroaeneus*

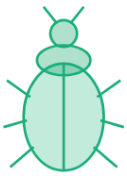
The word “insect” itself comes from Latin *insectum*, “cut into”, because the body looks notched into segments. It is a direct translation of the Greek *entomon* (also “cut into”), which gives us **entomology**.

THE GOLDEN RULE

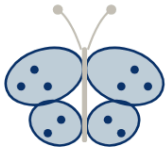
-ptera = wing. From Greek *pteron*, wing — the same root as pterodactyl (“wing-finger”) and helicopter (“spiral wing”). For any -ptera order, ask: *what kind of wing is this?* Coleo-ptera = sheath wing. Di-ptera = two wings. Lepido-ptera = scale wings.

Read the wing, read the name

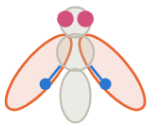
Each -ptera name describes the wing you can see



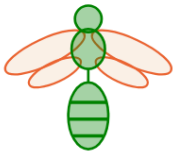
Coleoptera
sheath wing: hard cases



Lepidoptera
scale wing: dusty scales



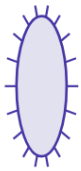
Diptera
two wings + 2 knobs



Hymenoptera
membrane wing, hooked



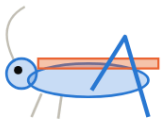
Hemiptera
half leather, half clear



Trichoptera
hair wing: furry edges



Neuroptera
net wing: veins galore



Orthoptera
straight wing, big legs

Wing gallery: eight orders named after their wings. See the wing, say the name. The fly’s two little knobs are its old hindwings, now tiny gyroscopes.

THE OTHER ENDINGS

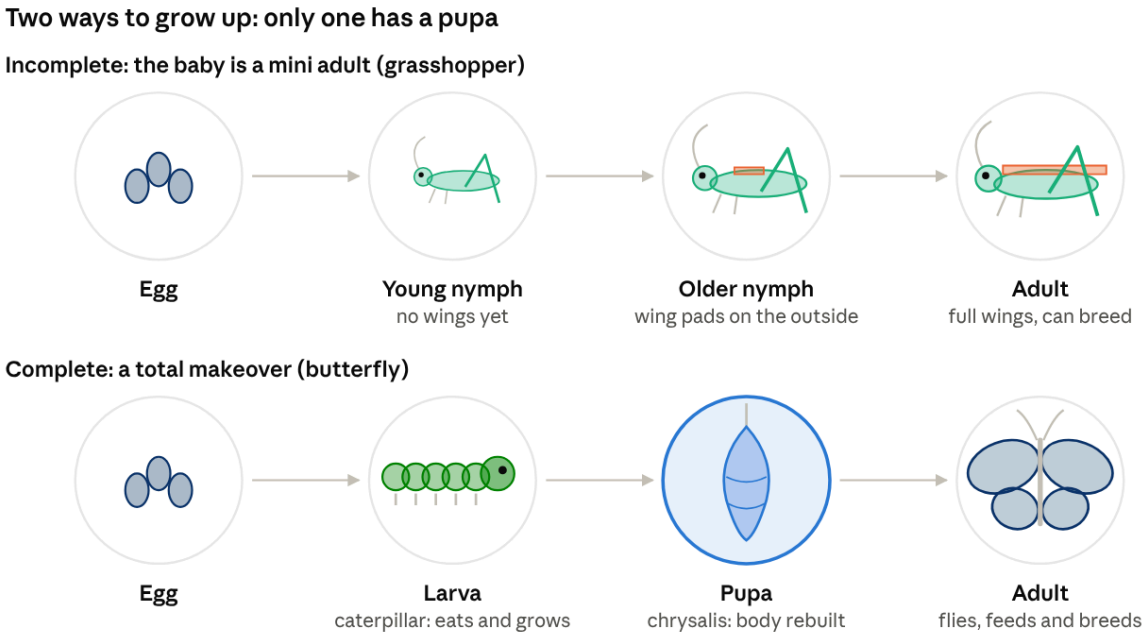
- **-odea** (Greek *-oeides*, "like, resembling"): Mantodea = mantis-like, Blattodea = cockroach-like, Phasmatodea = phantom-like.
- **-ata**: just a Latin "having" ending. Odonata = "the toothed ones".
- **-gnatha** = jaw; **-ura** = tail; **-entoma** = insects.

THE THREE BIG LIFE-CYCLE GROUPS

The single most useful split for exams:

GROUP	MEANING	LIFE CYCLE	WINGS DEVELOP	ORDERS
Apterygota	a- (without) + pteryx (wing)	No metamorphosis: young are mini adults	Never had wings	Archaeognatha, Zygentoma
Exopterygota (Hemimetabola)	exo (outside) + pteryx	Incomplete: egg › nymph › adult	Wing pads grow on the outside of the nymph	Dragonflies, grasshoppers, bugs, termites, mantids and others
Endopterygota (Holometabola)	endo (inside) + pteryx	Complete: egg › larva › pupa › adult	Wings form hidden inside the larva	Beetles, flies, butterflies, ants/bees/wasps, fleas and others

Hemi-metabola = half change (*metabole* = change); **holo**-metabola = whole change. About **85% of insect species** are in the complete-change group.



Life cycles: incomplete vs complete metamorphosis.

QUICK TEST

If you ever find a **pupa, cocoon or chrysalis**, you are in the complete group. A mopane worm is a larva; the emperor moth it becomes is the adult.

03 The secret decoder ring: root dictionary

These roots build every order name. Most are Greek (Gk); a few are Latin (L). The “everyday echo” is an English word you already know with the same root.

ROOT	MEANING	USED IN	EVERYDAY ECHO
a-, an- (Gk)	without	Siphonaptera, Phthiraptera, Zoraptera	atheist, anaemia
archaios (Gk)	ancient	Archaeognatha	archaeology
blatta (L)	cockroach, “light-shunner”	Blattodea	(Spanish *blata*)
coleos (Gk)	sheath, scabbard	Coleoptera	
derma (Gk)	skin	Dermaptera	dermatologist
di- (Gk)	two	Diptera	dioxide
diplo- (Gk)	double	Diplura	diploma (a doubled-over paper)
embios (Gk)	lively	Embioptera	
entoma (Gk)	insects, “cut into”	Zygentoma	entomology
ephemeros (Gk)	lasting a day	Ephemeroptera	ephemeral
gnathos (Gk)	jaw	Archaeognatha	
gryllos (Gk)	cricket	Grylloblattodea	(*Gryllus*, field crickets)
hemi- (Gk)	half	Hemiptera	hemisphere
hetero- / homo- (Gk)	different / same	Heteroptera, Homoptera	heterosexual / homogenous
hymen (Gk)	membrane	Hymenoptera	
iso- (Gk)	equal	Isoptera	isosceles
lepis, lepido- (Gk)	scale	Lepidoptera	leprosy (scaly skin)
mantis (Gk)	prophet, seer	Mantodea	
mecos (Gk)	length	Mecoptera	
megalo- (Gk)	large	Megaloptera	megalomaniac
neuron (Gk)	sinew, vein, nerve	Neuroptera	neurology
odous, odont- (Gk)	tooth	Odonata	orthodontist
-oeides, -odea (Gk)	like, resembling	Mantodea, Blattodea, Phasmatodea	humanoid, android
ortho- (Gk)	straight	Orthoptera	orthodontist, orthodox

ROOT	MEANING	USED IN	EVERYDAY ECHO
oura (Gk)	tail	Diplura, Protura	(squirrel = “shadow-tail”)
phasma (Gk)	phantom, apparition	Phasmatodea	phantasm
phthir (Gk)	louse	Phthiraptera	
plecos (Gk)	folded, plaited	Plecoptera	
protos (Gk)	first	Protura	prototype
psocos (Gk)	gnawed, rubbed	Psocoptera	
pteron, pteryx (Gk)	wing	all -ptera orders	helicopter, pterodactyl
raphis (Gk)	needle	Raphidioptera	
siphon (Gk)	tube	Siphonaptera	siphon
strepsis (Gk)	twisted	Strepsiptera	streptococcus (twisted chain)
thysanos (Gk)	fringe, tassel	Thysanoptera, Thysanura	
trichos (Gk)	hair	Trichoptera	trichology
zoros (Gk)	pure	Zoraptera	
zygon (Gk)	yoke, bridge	Zygentoma	zygote

COMMON MIX-UPS

- **Lepidoptera** comes from Greek *lepis*, scale — not Latin *lepus*, which means hare.
- In **Diptera** it is the *hind* pair of wings that has become the halteres; the front pair does the flying.
- **Siphonaptera** is *siphon* (tube) + *a-pteron* (wingless): “wingless tube”, not just “tube”.
- **Dermaptera**, “skin wing”: the short front wings are leathery, skin-like flaps covering the folded hindwings.
- **Thysanura** and **Homoptera** are older names: silverfish are now **Zygentoma**, and the “Homoptera” have been split up within Hemiptera.

04 Meet the orders, one by one

The 29 orders below follow the traditional list still used in most field guides and guide exams, grouped by life cycle. Where modern DNA work has merged orders, that is noted.

GROUP 1 · APTERYGOTA

Wingless, no metamorphosis

Archaeognatha ar-kee-OG-na-tha *jumping bristletails*

NAME *archaios* (ancient) + *gnathos* (jaw). Their jaw has a single hinge, the oldest jaw design in insects.

ID Humped back, big eyes that meet on top, three tails; jump by flicking the abdomen.

REMEMBER *“Archaeology jaw”: a fossil-style mouth on a living insect.*

Zygentoma zy-gen-TOH-ma *silverfish and firebrats*

NAME *zygon* (yoke) + *entoma* (insects). Older name Thysanura = *thysanos* (fringe) + *oura* (tail), for the three fringed tails.

ID Flattened, silvery scales, carrot-shaped, three tails, no hump.

REMEMBER *"Thysan-URA = tassel-tail." Silverfish in the camp bookshelf.*

GROUP 2 · EXOPTERYGOTA

Incomplete metamorphosis

Egg, then nymph (looks like a small wingless adult), then adult. No pupa.

Ephemeroptera ef-EM-er-OP-ter-a *mayflies*

NAME *ephemeros* (lasting a day) + *pteron*. Adults live hours to a day or two and cannot feed.

ID Wings held upright like a butterfly; large triangular forewings, tiny hindwings; two or three long tails.

ODD FACT The only insects that moult again after getting wings (subimago to imago).

REMEMBER *"Ephemeral wings": here today, gone tomorrow.*

Odonata oh-doh-NAH-ta *dragonflies and damselflies*

NAME *odous, odont-* (tooth). Fabricius named them for their strong toothed mandibles. No -ptera.

SUBORDERS **Anisoptera** (an-iso-, unequal wings: dragonflies, hindwings broader, held flat) and **Zygoptera** (*zygon*, yoke: damselflies, wings held together over the back).

ID Huge eyes, long thin abdomen, tiny bristle antennae. Nymphs live in water and shoot out a hinged lower lip (the "mask") to grab prey.

LOCAL Abundant around Hwange's pans and pumped waterholes.

REMEMBER *"Orth-ODONT-ist": Odonata have the teeth.*

DID YOU KNOW?

Dragonflies catch most of the prey they chase, with success rates in studies above 90%. A hunting lion manages roughly one in four.

THE GLOBETROTTER

The globe skimmer (*Pantala flavescens*), also called the wandering glider, is a dragonfly of about 300 mg that crosses some **2,000 km of open Indian Ocean** between India, the Maldives and East Africa. That crossing is thought to be one leg of a multi-generation circuit of about **14,000–18,000 km**.

Orthoptera or-THOP-ter-a *grasshoppers, locusts, crickets, katydids*

NAME *orthos* (straight) + *pteron*. Narrow, straight, leathery forewings.

SUBORDERS **Caelifera** (L. *caelum*, chisel: short antennae, grasshoppers and locusts) and **Ensifera** (L. *ensis*, sword: long antennae and a sword-like egg-layer, crickets and katydids).

ID Big jumping hind legs; most sing by rubbing body parts together.

LOCAL Elegant grasshopper (*Zonocerus elegans*, warning colours), armoured ground crickets (*Acanthoplus*), brown and red locusts.

REMEMBER *"Orthodox = straight." Straight wings, straight-legged jumper.*

DID YOU KNOW?

A locust is just a grasshopper that has been crowded. Pack enough together and they change colour, shape and behaviour, then march and swarm.

Phasmatodea faz-ma-TOH-dee-a *stick and leaf insects*

NAME *phasma* (phantom) + *-oeides* (like). They vanish into the vegetation like ghosts.

ID Very long, twig- or leaf-shaped, slow, plant feeders.

REMEMBER *"Phantasm": now you see it, now you don't.*

Mantodea man-TOH-dee-a *mantids*

NAME *mantis* (prophet, seer) + *-oeides*. The folded forelegs look like a prophet at prayer.

ID Triangular swivelling head, long neck (prothorax), spiny grasping forelegs.

LOCAL Flower mantids, the common green *Sphodromantis*.

REMEMBER *"Praying prophet."*

Blattodea bla-TOH-dee-a *cockroaches and termites*

NAME L. *blatta* (cockroach, "one that shuns light") + *-oeides*.

MODERN CHANGE Termites used to be their own order, **Isoptera** (*isos*, equal: four equal wings). DNA shows termites are social cockroaches, so they now sit inside Blattodea. Many exams still accept Isoptera.

ID **Cockroach:** flat, shield over the head, long antennae, fast. **Termite:** pale soft body, straight antennae like a string of beads, thick waist (ants have a pinched waist).

LOCAL *Macrotermes* builds the large mounds across Hwange and farms fungus inside. Winged termites (*ishwa*) swarm after the first rains.

REMEMBER *"Blatta = light-shunner." Termites: "Iso = equal" wings, shed after one flight.*

DID YOU KNOW?

A *Macrotermes* mound is a giant lung. Air moves through its walls and tunnels, keeping the fungus garden inside at a steady temperature while the Hwange sun bakes the outside.

Mantophasmatodea man-toh-faz-ma-TOH-dee-a *heelwalkers, gladiators*

NAME *mantis* + *phasma* + *-oeides*. They look like a cross between a mantid and a stick insect.

WHY IT MATTERS Described in 2002 from Namibian and South African specimens — the first new insect order since 1914. A genuinely southern African story.

ID Wingless; walk with the tips of their feet held up (on their "heels").

REMEMBER *"Mantis + phantom = a gladiator on tiptoe."*

Grylloblattodea gril-oh-bla-TOH-dee-a *ice crawlers*

NAME *gryllos* (cricket) + *blatta* (cockroach). They look half cricket, half cockroach.

RANGE Cold mountains of North America and Asia only — not in Africa. Some schemes now join them with heelwalkers as Notoptera.

REMEMBER *"Cricket-roach on the ice."*

Dermaptera der-MAP-ter-a *earwigs*

NAME *derma* (skin) + *pteron*. Short, leathery, skin-like forewings cover hindwings folded like a fan.

ID Pincers (cerci) at the tail end. They do not crawl into ears; that is folklore.

REMEMBER *"Dermatologist wings": skin-covered.*

Plecoptera pleh-KOP-ter-a *stoneflies*

NAME *plecos* (folded, plaited) + *pteron*. Wings fold flat and pleated over the back.

ID Two tails; nymphs live under stones in cold, clean, fast water. A pollution indicator.

REMEMBER *"Pleated wings, under stones."*

Embioptera em-bee-OP-ter-a *webspinners*

NAME *embios* (lively) + *pteron*. They dart backwards and forwards very fast.

ID Swollen front feet that spin silk — the only insects that spin from their feet. Live in silk tunnels on bark and rocks. Only males have wings.

REMEMBER *"Lively silk-spinners with silk slippers."*

Zoraptera zor-AP-ter-a *angel insects*

NAME *zoros* (pure) + *a-pteron* (wingless). Named when only wingless forms were known; winged forms were found later.

ID Tiny (about 3 mm), under bark in rotting wood, tropical. Rarely seen.

REMEMBER *"Pure and wingless, until proven wrong."*

Psocoptera so-KOP-ter-a *booklice and barklice*

NAME *psocos* (gnawed, rubbed) + *pteron*. They nibble mould, algae and the paste in old books.

MODERN CHANGE Now merged with lice in **Psocodea**.

REMEMBER *Silent P, like psychology: "booklice gnaw your psych textbooks."*

Phthiraptera thir-AP-ter-a *lice*

NAME *phthir* (louse) + *a-pteron* (wingless).

ID Flattened top to bottom, claws for gripping hair or feathers, live permanently on the host. Now inside Psocodea.

REMEMBER *Silent PH, and "a-ptera = no wings". Lice never fly.*

Hemiptera heh-MIP-ter-a *true bugs*

NAME *hemi* (half) + *pteron*. In many bugs the forewing (hemelytron) is half leathery, half clear membrane.

SUBGROUPS **Heteroptera** (*heteros*, different: two-textured wings, e.g. shield/stink bugs, assassin bugs, water striders, giant water bugs) and the old **Homoptera** (*homos*, same: one-textured wings), now split into cicadas/leafhoppers and aphids/scale insects/psyllids.

ID The key is the jointed piercing-sucking beak (rostrum). Only Hemiptera are true "bugs".

LOCAL Mopane cicadas (the summer noise), mopane psyllids (their sugary "lerps" on leaves), stink bugs.

REMEMBER *"Hemisphere = half." Half a wing, and a straw for a mouth.*

Thysanoptera thy-san-OP-ter-a *thrips*

NAME *thysanos* (fringe) + *pteron*. Narrow wings edged with long hairs like a feather.

ID Tiny (1–2 mm), slender, found in flowers. "Thrips" is both singular and plural.

REMEMBER *"Tassel wings."*

GROUP 3 · ENDOPTERYGOTA

Complete metamorphosis

Egg, larva (grub, caterpillar or maggot), pupa, adult.

Coleoptera koh-lee-OP-ter-a *beetles*

NAME *coleos* (sheath) + *pteron*. Hard forewings (elytra) sheath the flying hindwings.

ID Wing cases meet in a straight line down the back; chewing mouthparts.

SIZE The largest order on Earth: roughly 400,000 described species (approximate).

LOCAL Dung beetles (Scarabaeidae), tok-tokkies (Tenebrionidae, which tap the ground to call mates), CMR and other blister beetles (Meloidae), ground beetles.

REMEMBER *"Coleo = coat." Beetles wear a coat over their wings.*

> **DID YOU KNOW?**
> Roughly one in every four named animal species is a beetle. The biologist J.B.S. Haldane is said to have joked that the Creator must be inordinately fond of them.

Strepsiptera strep-SIP-ter-a *twisted-wing parasites*

NAME *strepsis* (twisted) + *pteron*. The male's forewings are reduced to twisted knobs.

ID Females are larva-like and live their whole lives inside a bee, wasp or bug; only males fly. Rarely seen.

REMEMBER *"Streptococcus = twisted."*

Neuroptera new-ROP-ter-a *antlions, lacewings, owlflies*

NAME *neuron* (sinew, vein) + *pteron*. Wings covered in a dense net of veins.

ID Four similar, net-veined wings held roof-like over the body.

LOCAL Antlion pits in Hwange's Kalahari sand (family Myrmeleontidae: *myrmex* ant + *leon* lion), green lacewings, owlflies, and the thread-winged lacewings (Nemopteridae), a southern African speciality.

REMEMBER *"A nervous system printed on the wings."*

> **DID YOU KNOW?**
> An antlion larva has no working back end. It stores its waste for its whole larval life and only gets rid of it after it turns into an adult.

Megaloptera meg-a-LOP-ter-a *dobsonflies, fishflies, alderflies*

NAME *megalos* (large) + *pteron*. Big wings on a big insect.

ID Larvae are fierce aquatic predators with gill filaments. Uncommon here.

REMEMBER *"Megalo = mega."*

Raphidioptera raf-id-ee-OP-ter-a *snakeflies*

NAME *raphis* (needle) + *pteron*, for the female's long needle-like egg-layer.

ID Long "neck" raised like a snake about to strike.

RANGE Northern Hemisphere only; not found in southern Africa.

REMEMBER *"Needle and a snake's neck."*

Hymenoptera hy-men-OP-ter-a *ants, bees, wasps, sawflies*

NAME *hymen* (membrane) + *pteron*. Clear membranous wings. Bonus hook: Hymen was the Greek god of marriage, and the fore and hind wings are "married" by a row of tiny hooks (hamuli).

ID Four clear wings (fewer veins than Neuroptera), most with a pinched "wasp waist"; many females sting.

LOCAL Matabele ants (*Megaponera analis*, which raid termite nests in columns, hence the name), African honeybee, carpenter bees, velvet ants (wingless female wasps).

REMEMBER *"Membrane wings, married together."*

> **WASPS WITHOUT WINGS**
>
> Ants are highly modified wasps. In most species the new **queens and males still have wings** and fly out of the nest to mate; queens then chew off their own wings and found a new colony, while the workers you see every day are wingless females.

> **DID YOU KNOW?**
>
> Matabele ants run their own ambulance service. After a termite raid they carry injured nestmates home, and researchers have watched them clean the wounds.

Trichoptera try-KOP-ter-a *caddisflies*

NAME *trichos* (hair) + *pteron*. Wings covered in hairs, not scales.

ID Look like dull moths but hold their hairy wings roof-like; larvae build portable cases of sand, twigs or leaves in water.

REMEMBER *"Trichologist = hair doctor." Hairy-winged moth-lookalikes.*

Lepidoptera lep-id-OP-ter-a *butterflies and moths*

NAME *lepis* (scale) + *pteron*. The "dust" that rubs off a wing is thousands of tiny scales.

ID Scaly wings, coiled sucking tube (proboscis), caterpillar larvae.

LOCAL Mopane worm (*Gonimbrasia belina*, an emperor moth), African monarch (*Danaus chrysippus*), hawk moths.

REMEMBER *"Leprosy = scaly skin." Scale wings.*

Mecoptera meh-KOP-ter-a *scorpionflies, hangingflies*

NAME *mecos* (length) + *pteron*. Long narrow wings, and a long beak-like face.

ID In scorpionflies the male's tail curls up like a scorpion (harmless). Hangingflies (Bittacidae) hang from one pair of legs and catch prey with the others; they occur in southern Africa.

REMEMBER *"Long-wing, long-face."*

Diptera DIP-ter-a *true flies*

NAME *di* (two) + *pteron*. Only the front pair of wings works; the hindwings are tiny drumstick knobs called **halteres**, used as balance gyroscopes.

ID Two wings, big eyes, sucking or sponging mouthparts, maggot larvae.

LOCAL Tsetse (*Glossina*), mosquitoes including *Anopheles* (malaria), horse flies, robber flies, hover flies.

REMEMBER *"Dioxide = two." Two wings only.*

> **DID YOU KNOW?**
> A fly's halteres buzz in time with its wings and sense every twist of its body, like a built-in gyroscope. That is part of why flies can make such sudden turns.

Siphonaptera sy-fon-AP-ter-a *fleas*

NAME *siphon* (tube) + *a-pteron* (wingless). A sucking tube and no wings.

ID Squashed side to side, huge jumping legs, backward-pointing spines.

REMEMBER *"Siphon, no wings." A wingless blood-straw that jumps.*

NOT INSECTS ANY MORE: THE ENTOGNATHA

These six-legged animals used to be insect orders. They hide their mouthparts inside the head (*entos*, inside + *gnathos*, jaw), so they are now a separate class.

- **Collembola** — springtails. *kolla* (glue) + *embolon* (peg), for the tube under the belly once thought to glue them on.
- **Protura** — coneheads. *protos* (first) + *oura* (tail). No antennae; they hold their front legs up as feelers.
- **Diplura** — two-pronged bristletails. *diplo* (double) + *oura*: two tails.

05 Cheat sheet: all 29 orders

One line per order. Life cycle: N none I incomplete C complete.

ORDER	LITERAL MEANING	COMMON NAME	CYCLE
Archaeognatha	ancient jaw	jumping bristletails	N
Zygentoma (Thysanura)	yoked insects (fringe tail)	silverfish	N
Ephemeroptera	day-lasting wing	mayflies	I
Odonata	toothed ones	dragonflies, damselflies	I
Orthoptera	straight wing	grasshoppers, crickets, locusts	I
Phasmatodea	phantom-like	stick and leaf insects	I
Mantodea	prophet-like	mantids	I
Blattodea (incl. Isoptera)	cockroach-like (equal wing)	cockroaches, termites	I
Mantophasmatodea	mantis-phantom-like	heelwalkers	I
Grylloblattodea	cricket-cockroach-like	ice crawlers	I

ORDER	LITERAL MEANING	COMMON NAME	CYCLE
Dermaptera	skin wing	earwigs	I
Plecoptera	folded wing	stoneflies	I
Embioptera	lively wing	webspinners	I
Zoraptera	pure, wingless	angel insects	I
Psocoptera	gnawing wing	booklice, barklice	I
Phthiraptera	louse, wingless	lice	I
Hemiptera	half wing	true bugs, cicadas, aphids	I
Thysanoptera	fringe wing	thrips	I
Coleoptera	sheath wing	beetles	C
Strepsiptera	twisted wing	twisted-wing parasites	C
Neuroptera	vein wing	antlions, lacewings	C
Megaloptera	large wing	dobsonflies, alderflies	C
Raphidioptera	needle wing	snakeflies	C
Hymenoptera	membrane wing	ants, bees, wasps	C
Trichoptera	hair wing	caddisflies	C
Lepidoptera	scale wing	butterflies, moths	C
Mecoptera	long wing	scorpionflies, hangingflies	C
Diptera	two wing	true flies	C
Siphonaptera	tube, wingless	fleas	C

06 Never forget: memory tricks

The fastest method is to stop memorising names and start translating them. Then use the clubs and mnemonics below to hold the whole list in your head.

1 · TRANSLATE, THEN PICTURE THE WING

Say the name, split off -ptera, translate the front half, and picture it: **Coleo** = a beetle in a coat. **Lepido** = scales dusting your fingers. **Di** = two wings and two knobs. Twenty of the 29 orders work this way.

2 · THE ODD ONES OUT (NO -PTERA)

- **-odea** = "looks like a…": Mantodea, Blattodea, Phasmatodea, Mantophasmatodea, Grylloblattodea. All five are in the cockroach–mantis–stick insect family circle.
- **Odonata**: the only "toothed" order.
- The two wingless primitives: **Archaeognatha** (ancient jaw) and **Zygentoma** (silverfish).

3 · THE THREE "NO WINGS" ORDERS

Siph-**a**-ptera, Phthir-**a**-ptera, Zor-**a**-ptera: the little *a-* means "without". Mnemonic: **"Some Parasites Zip about wingless"** (fleas, lice, angel insects).

4 · THE BIG FOUR

Complete metamorphosis, most species: **"Can Lions Devour Hyenas?"** = Coleoptera, Lepidoptera, Diptera, Hymenoptera. Together they hold the large majority of all named insect species, with beetles far in front.

THE INSECT FAMILY TREE · 29 ORDERS IN 9 CLUBS

Remember three life cycles, then nine clubs, then the orders inside each club. Small piles are far easier to recall than one long list of 29.

No wings

No metamorphosis · 2 orders

Wingless primitives — *never had wings*

Archaeognatha, Zygentoma

Incomplete

Egg, nymph, adult · 16 orders

Old wings — *cannot fold wings flat*

Ephemeroptera, Odonata

Chewers with fan wings — *chewing jaws*

Orthoptera, Phasmatodea, Mantodea, Blattodea, Dermaptera, Plecoptera, Embioptera, Zoraptera, Mantophasmatodea, Grylloblattodea

Suckers and nibblers — *beaks and nibbling jaws*

Psocoptera, Phthiraptera, Hemiptera, Thysanoptera

Complete

Egg, larva, pupa, adult · 11 orders

Beetle club — *closest cousins*

Coleoptera, Strepsiptera

Net-wing club — *veiny wings*

Neuroptera, Megaloptera, Raphidioptera

Wasp club — *married membranes*

Hymenoptera

Moth club — *hairs became scales*

Trichoptera, Lepidoptera

Pump club — *sucking-pump mouths*

Mecoptera, Diptera, Siphonaptera

5 · COMPLETE METAMORPHOSIS IN FIVE CLUBS (11 ORDERS)

CLUB	ORDERS	THE HOOK
Beetle club	Coleoptera, Strepsiptera	Twisted-wings are the beetles' closest relatives
Net-wing club	Neuroptera, Megaloptera, Raphidioptera	Three veiny cousins: nerve, mega and needle wings
Wasp club	Hymenoptera	Stands alone: the married membranes
Moth club	Trichoptera, Lepidoptera	Hairs flattened over time into scales: caddisflies are hairy moths
Pump club	Mecoptera, Diptera, Siphonaptera	Scorpionflies are cousins of flies and fleas; all three share a sucking-pump design (Antliophora, "pump-bearers")

Mnemonic for the clubs in order: **“Big Nets Wait, Moths Pump”** (Beetle, Net-wing, Wasp, Moth, Pump).

6 · INCOMPLETE METAMORPHOSIS IN THREE CLUBS (16 ORDERS)

CLUB	ORDERS	THE HOOK
Old wings (Palaeoptera)	Ephemeroptera, Odonata	Cannot fold their wings flat over the back
Chewers with fan wings (Polyneoptera)	Orthoptera, Phasmatodea, Mantodea, Blattodea, Dermaptera, Plecoptera, Embioptera, Zoraptera, Mantophasmatodea, Grylloblattodea	Chewing mouths, big pleated hindwings
Suckers and nibblers (Paraneoptera)	Psocoptera, Phthiraptera, Hemiptera, Thysanoptera	Mouthparts shift from gnawing to piercing-sucking

MNEMONICS

- **Old wings:** “May Dragons” (mayflies, dragonflies).
- **Chewers:** “Our Pet Mantis Bit Daddy’s Pinkie, Even Zebras Moved Gingerly” = Orthoptera, Phasmatodea, Mantodea, Blattodea, Dermaptera, Plecoptera, Embioptera, Zoraptera, Mantophasmatodea, Grylloblattodea.
- **Suckers and nibblers:** “Please Pass Hot Tea” = Psocoptera, Phthiraptera, Hemiptera, Thysanoptera.

7 · A CAMP MEMORY WALK

Place each order somewhere you know well, then walk the route in your head:

1. **Tent bookshelf:** silverfish (Zygentoma) and booklice (Psocoptera).
2. **Camp lights at night:** moths (Lepidoptera), antlions and lacewings (Neuroptera), mayflies (Ephemeroptera).
3. **Kitchen:** cockroaches (Blattodea), house flies (Diptera).
4. **Waterhole:** dragonflies (Odonata), mosquitoes (Diptera), caddis cases (Trichoptera).
5. **Termite mound:** termites (Blattodea), matabele ants raiding them (Hymenoptera).
6. **Elephant dung on the road:** dung beetles (Coleoptera).
7. **Mopane woodland:** cicadas and psyllids (Hemiptera), mopane worms (Lepidoptera).
8. **Long grass:** grasshoppers (Orthoptera), mantids (Mantodea), stick insects (Phasmatodea).
9. **The camp dogs:** fleas (Siphonaptera) and lice (Phthiraptera).
10. **Sandy path:** antlion pits (Neuroptera).

8 · PRONUNCIATION SHORTCUTS

- Stress usually falls on the syllable just before -ptera: lep-i-**DOP**-ter-a, hy-men-**OP**-ter-a.
- **Ps-** and **Phth-** start silently: Psocoptera = “so-KOP-ter-a”, Phthiraptera = “thir-AP-ter-a”.

07 Name that bug: field ID shortcuts

In the field, check four things in this order: **legs, wings, mouthparts, then shape**.

IS IT AN INSECT AT ALL?

Three body parts (head, thorax, abdomen), six legs, one pair of antennae, usually two pairs of wings. Spiders, scorpions, ticks and sun spiders (solifuges) have **eight legs** and are arachnids. Millipedes and centipedes have many legs.

COMMON CONFUSIONS

LOOKS LIKE…	COULD BE…	HOW TO TELL THEM APART
Beetle	True bug (Hemiptera)	Beetle wing cases meet in a straight line down the back; a bug's overlap at the tips, making an X or triangle. Bugs have a beak, beetles have jaws.
Ant	Termite (Blattodea)	Ant: pinched waist, elbowed antennae, unequal wings. Termite: thick waist, straight bead-like antennae, four equal wings.
Wasp or bee	Hover fly (Diptera)	Count wings: flies have two. Flies have very short antennae and huge eyes; they hover dead still.
Moth	Caddisfly (Trichoptera)	Moth wings have scales that rub off as dust and a coiled tongue. Caddisflies have hairy wings, no tongue, and very long antennae.
Butterfly	Moth (both Lepidoptera)	Butterflies usually have clubbed antennae and fly by day. Moths have feathery or thread-like antennae and often rest with wings flat or tented.
Dragonfly	Damselfly (both Odonata)	At rest, dragonflies hold wings out flat; damselflies fold them together over the back. Damselfly eyes are widely separated.
Dragonfly or damselfly	Antlion adult (Neuroptera)	Antlions have clubbed antennae, flutter weakly, and come to lights at night.
Grasshopper	Cricket or katydid (Orthoptera)	Grasshoppers have short antennae; crickets and katydids have antennae longer than the body.
Cockroach	Ground beetle (Coleoptera)	Cockroach: long whip antennae, head hidden under a shield, soft wings. Beetle: hard wing cases.
Cicada	Large fly or moth	Cicadas are bugs: beak under the head, clear tented wings, singing from tree trunks.

WING COUNT AT A GLANCE

NONE

Silverfish, bristletails, fleas, lice, worker ants and termites, heelwalkers.

ONE WORKING PAIR

True flies (Diptera); male twisted-wing parasites; some mayflies.

TWO HARD + TWO SOFT

Beetles (hard cases), earwigs (short skin flaps), grasshoppers (leathery), bugs (half and half).

FOUR CLEAR OR SCALY

Dragonflies, lacewings, wasps and bees, termites (alates), butterflies and moths, caddisflies.

08 Pop quiz: test yourself

Cover the answers and see how many you get.

1. What does -ptera mean, and which language is it from?
2. Translate: Coleoptera, Diptera, Lepidoptera, Hymenoptera, Hemiptera.
3. Which order name means “toothed ones”, and what are the teeth?
4. Which two orders share the root a-pteron (wingless) inside their name?
5. Name the four orders with the most species.
6. Termites used to be Isoptera. What order are they in now, and why?
7. Name the African order described in 2002 and its common name.
8. Moth or caddisfly? Wings covered in hairs. Which order, and what does the name mean?
9. Wasp or fly? Four wings, chewing jaws, narrow waist.
10. What is a hemelytron, and which order has it?
11. Complete or incomplete metamorphosis: dragonfly, antlion, termite, flea, mantis, caddisfly?
12. What do Orthoptera and orthodontist have in common?
13. Why is the matabele ant called that?
14. What is a haltere, and which order has them?
15. True bug test: what mouthpart proves an insect is in Hemiptera?

Answers

1. Wing; Greek *pteron*.
2. Sheath wing, two wings, scale wing, membrane wing, half wing.
3. Odonata; the toothed mandibles.
4. Siphonaptera (fleas) and Phthiraptera (lice).
5. Coleoptera, Lepidoptera, Diptera, Hymenoptera.
6. Blattodea; DNA shows they are social cockroaches.
7. Mantophasmatodea, heelwalkers (gladiators).
8. Trichoptera, “hair wing”.
9. Wasp (Hymenoptera). Flies have only two wings.
10. A forewing that is half leathery, half membrane; Hemiptera (Heteroptera).
11. Incomplete, complete, incomplete, complete, incomplete, complete.
12. Both use *orthos*, “straight”.
13. It raids termite nests in columns, named after Ndebele (Matabele) war parties.
14. A drumstick-shaped knob that replaced the hindwing, used for balance; Diptera.
15. A jointed, piercing-sucking beak (rostrum).

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