

**Ministry of Higher
Education and Scientific Research
University of Baghdad
College of Science
Department of Biology**



Biosystematics

2021-2022

**تصنيف حيوان
المرحلة الثانية**

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IMMATURE STAGE.....(LAB. 1)

Immature stage.....(LAB. 1)

1- Egg

2-Young

3- Naiad (Damsel fly, Dragon fly)

4- Nymph (Cockroach)

5- Larva has three types:

A- Apodous larva (Muscidae, Hymenoptera)

B- Oligopodous has three types:

♣- Campodeiform larva : Larva of Ant lion

♣- Scarabaeiform larva: Family : Scarabaeidae

♣- Elateriform larva:Family : Elateridae

**C- Polypodous larva (Eruciform larva)
(Lepidoptera)**

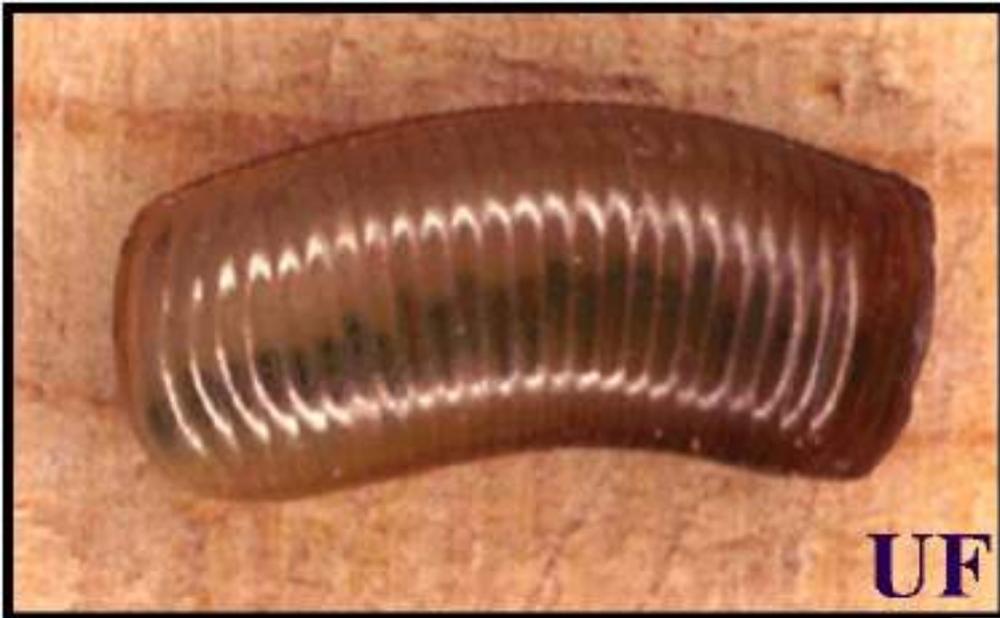
6- pupa has four types:

A- Exarate pupa O: Hymenoptera

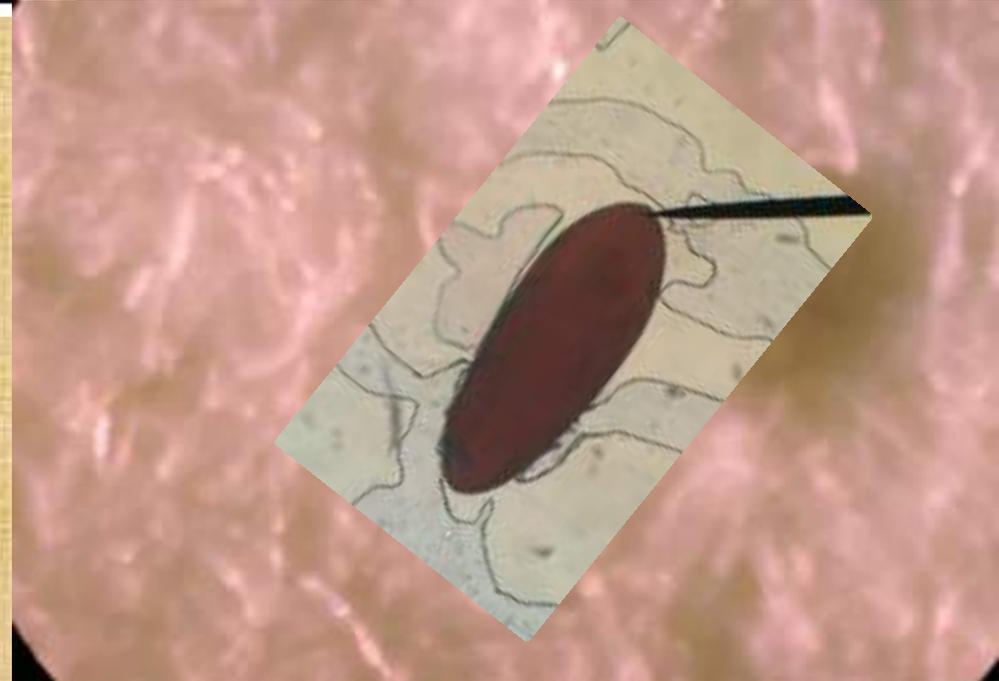
B- Obtect pupa O: Lepidoptera

C- Coarctate pupa F: Muscidae

D- Active pupa F: Culicidae



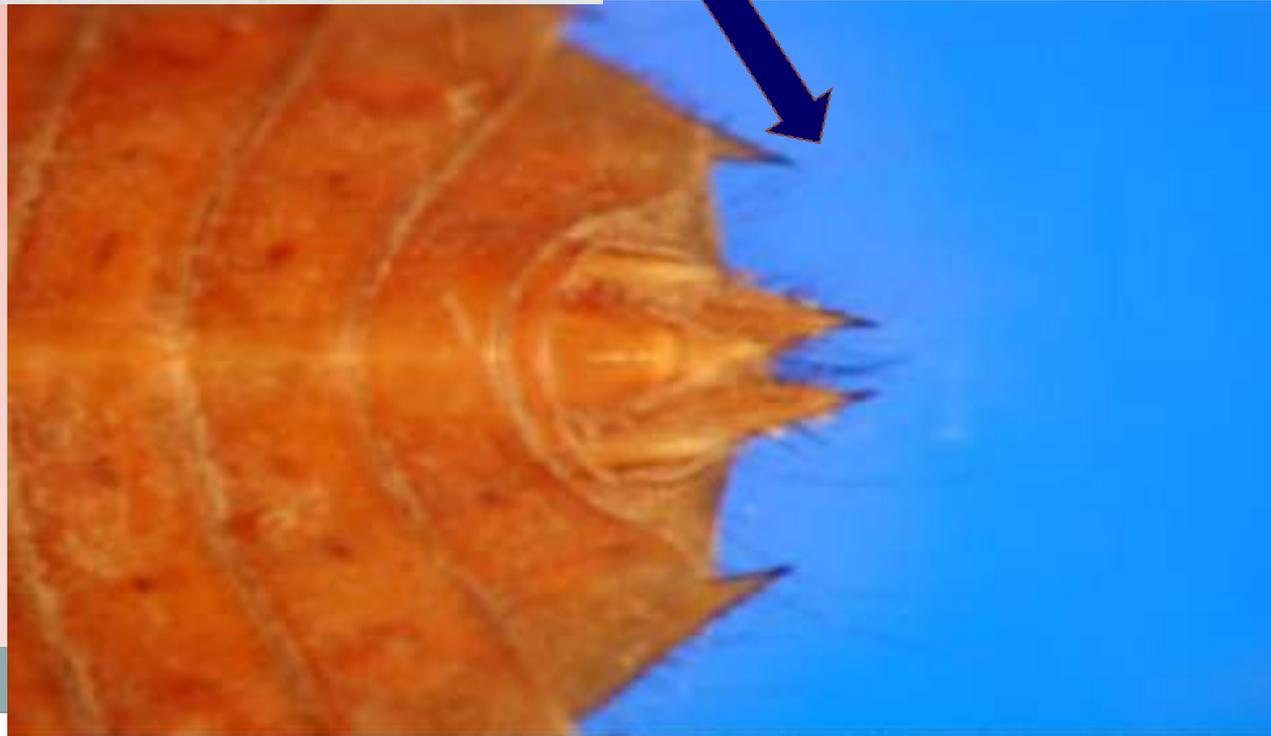
Egg sac of Cockroach

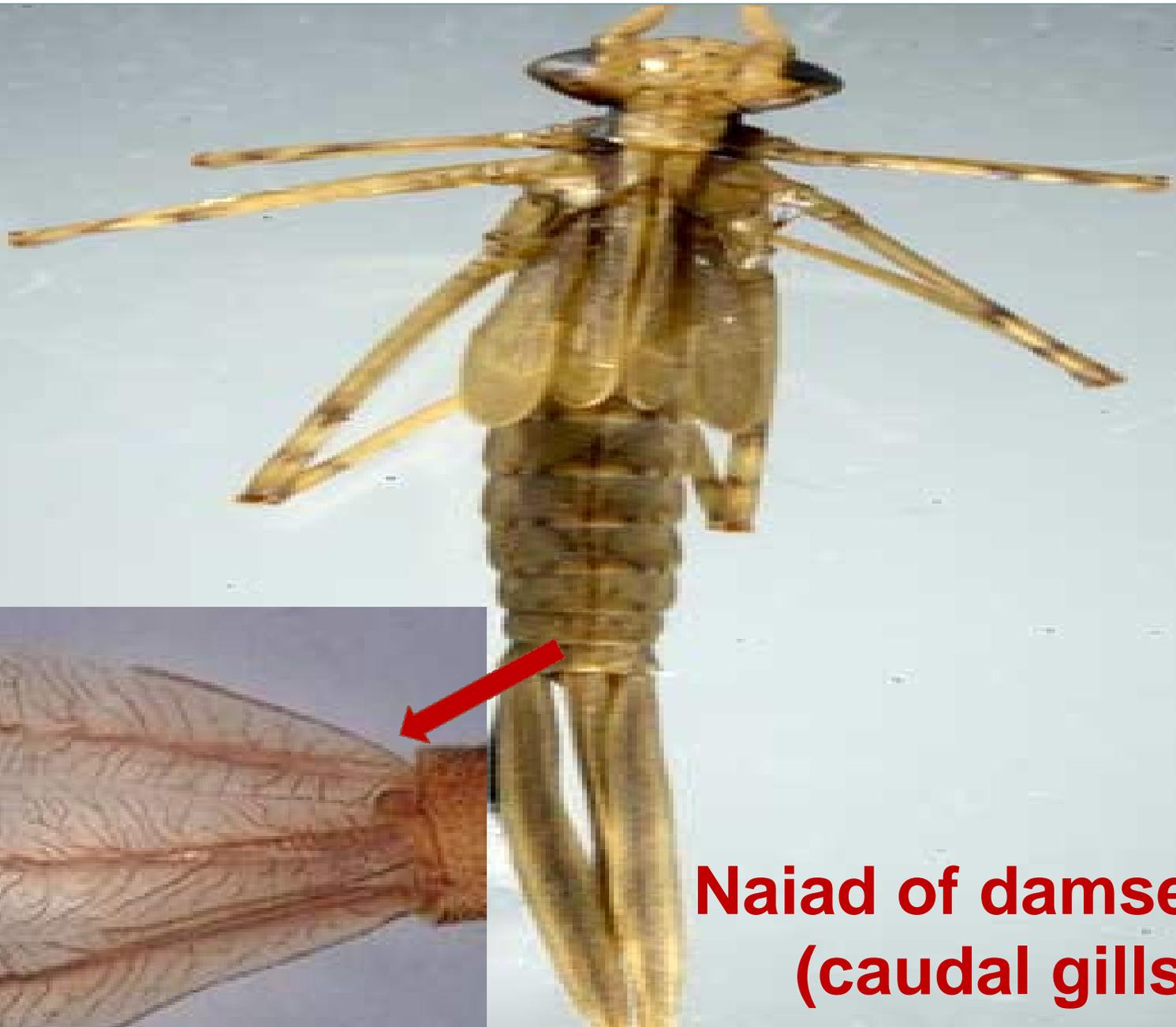


Egg of mosquito



**Naiad of dragon fly
(rectal gills)**





**Naiad of damsel fly
(caudal gills)**



A- Apodous larva (Vermiform larva)



Family: Muscidae

B- Oligopodous larva
1- Campodeiform larva



Larva of Ant lion

2-Scarabaeiform larva



Family : Scarabaeidae

Elateriform larva



Family : Elateridae

C- Polypodous larva (Eruciform larva)



Order: Lepidoptera

5- pupae

A- Exarate pupa



Order: Hymenoptera

5- pupae

B- Obtect pupa



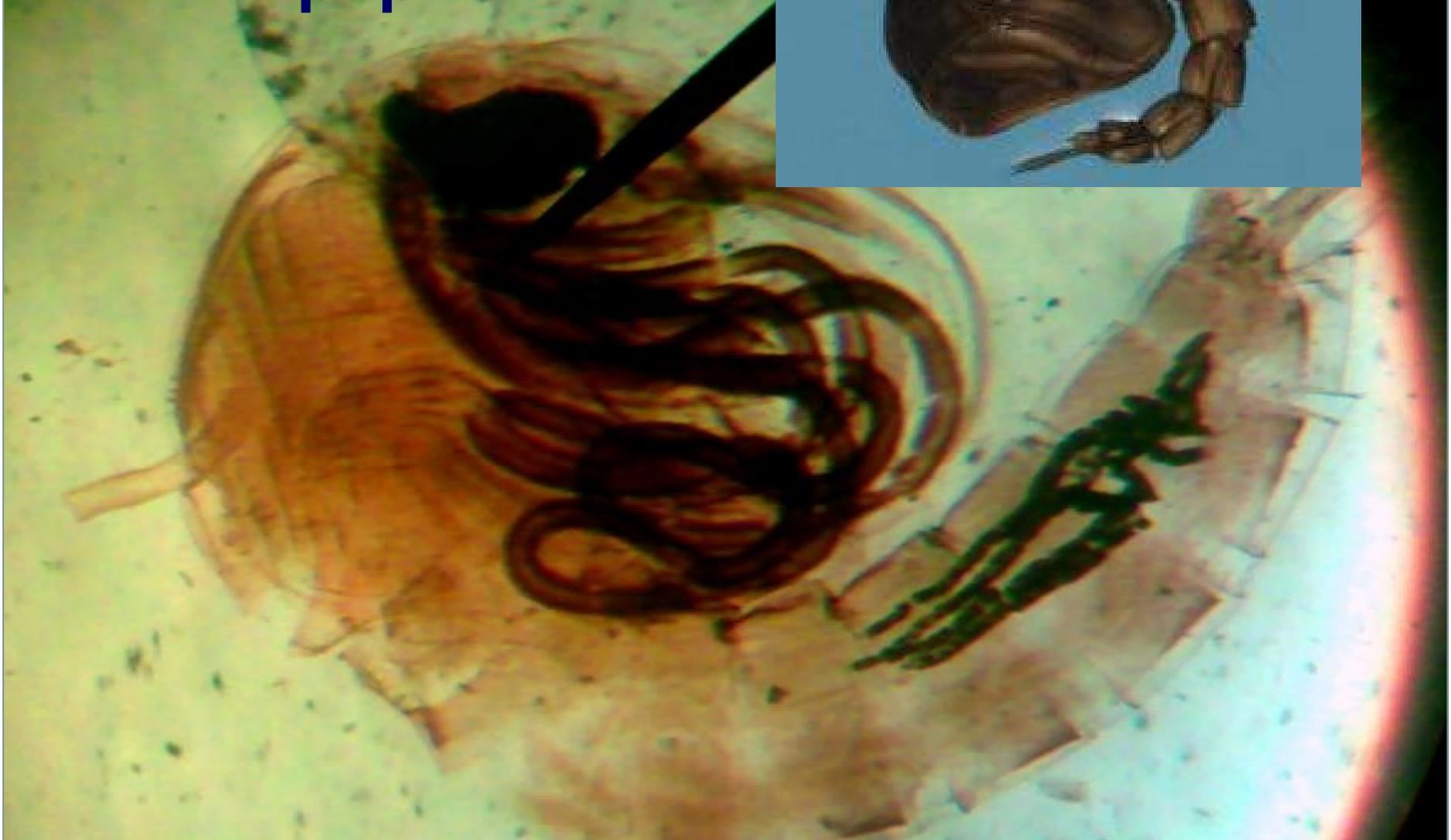
Order: Lepidoptera

5- pupae
C- Coarctate pupa



Family: Muscidae

5- pupae
D- Active pupa



Family: Culicidae

Development and metamorphic LAB. 2

Development and metamorphic

Ametabola

Metabola

O:Thysanura

O:Collembola

Complete metamorphosis

Heterometabola

Gradual metamorphosis

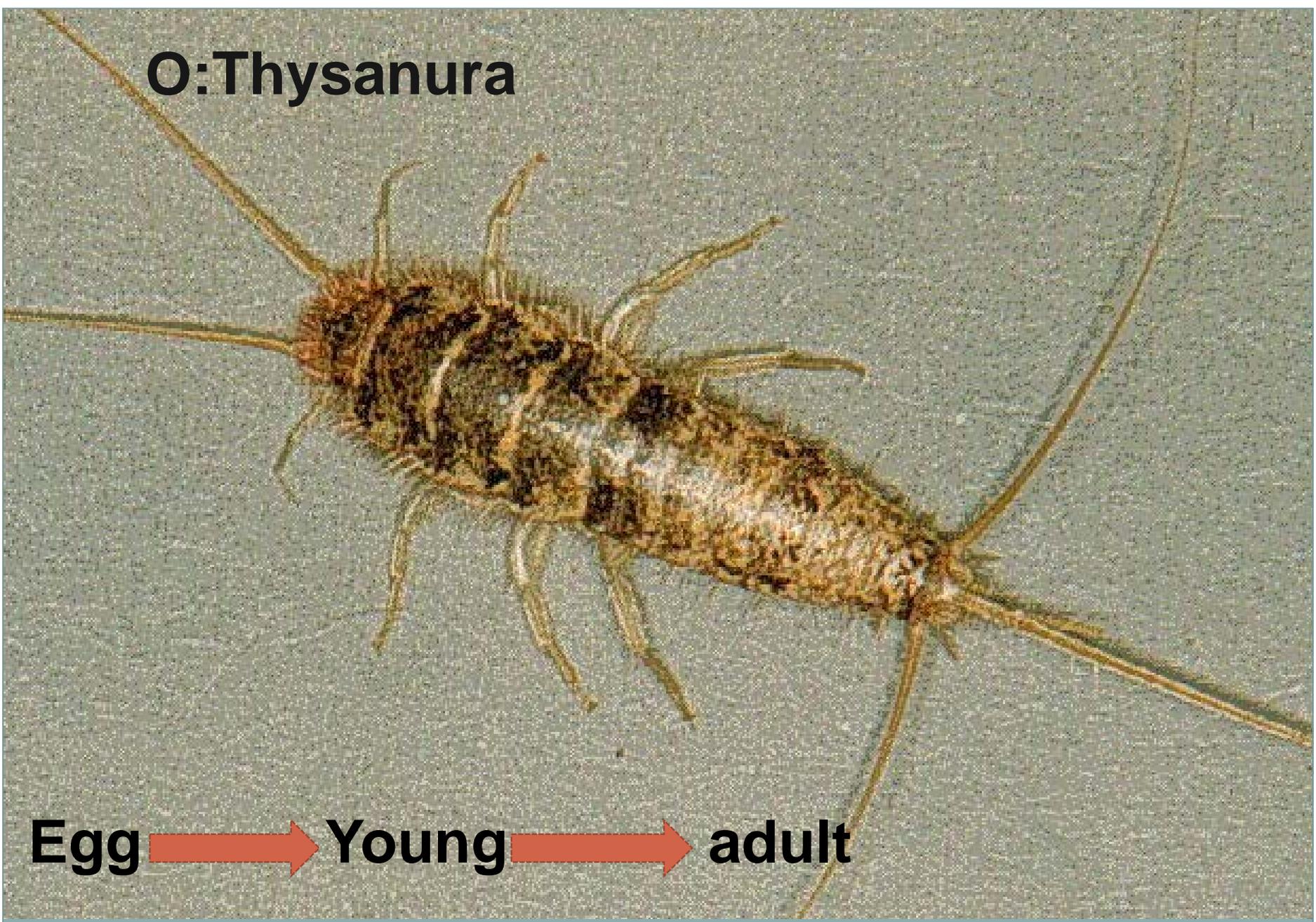
Incomplete metamorphosis

Development and metamorphosis

A- Ametabola Ex. O:Thysanura, O: Collembola



O:Thysanura



Egg → **Young** → **adult**



1

Egg

Young



adult



2

3

Order: Collembola

B- Metabola

1- Heterometabola

▲ Gradual metamorphosis Ex. O: Orthoptera,
O: Hemiptera

Egg  Nymph  Adult

▲ Incomplete metamorphosis Ex. O: Odonata,
O: Ephemeroptera

Egg  Naiad  Adult

▲ Gradual metamorphosis

Egg



Nymph



Adult



Order: Orthoptera

▲ Gradual metamorphosis

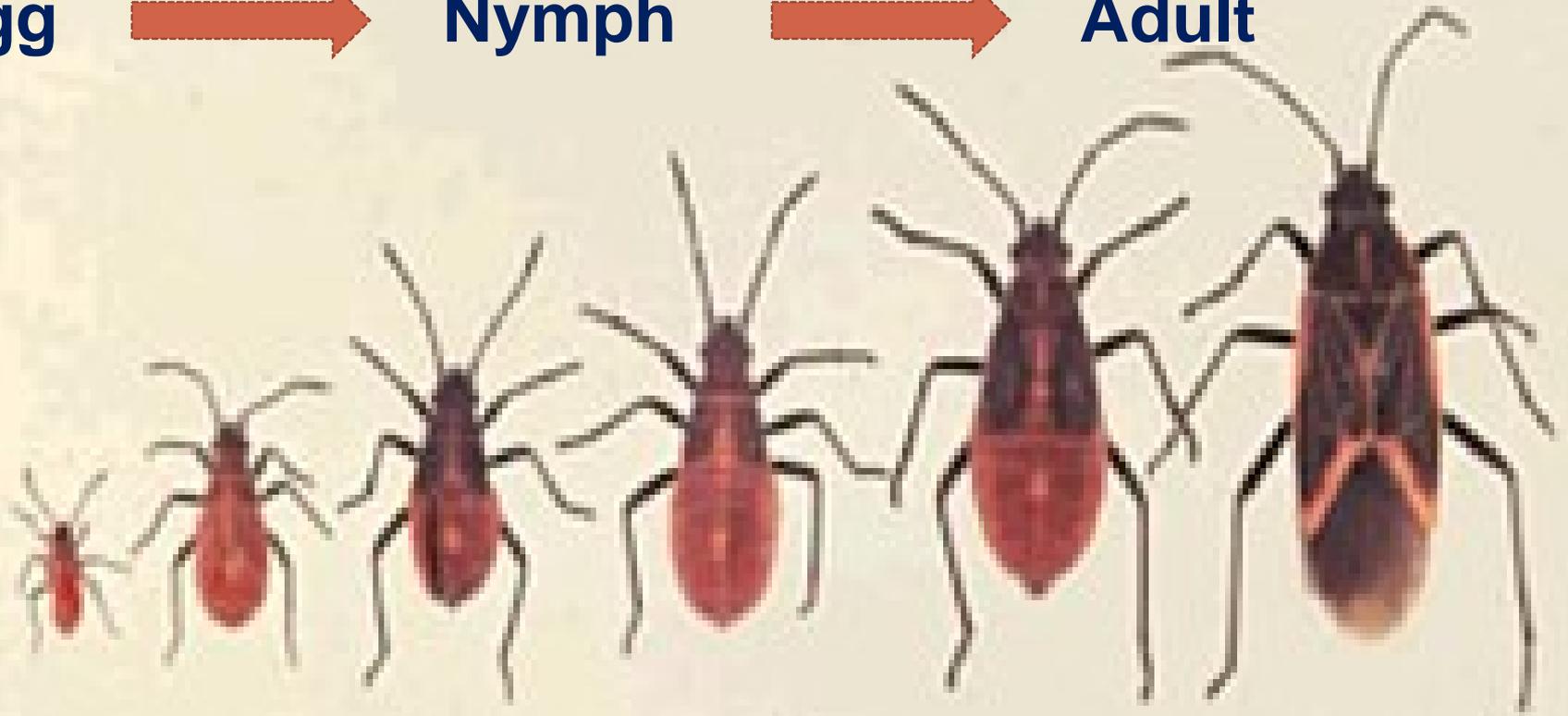
Egg



Nymph



Adult



Order: Hemiptera

▲ Gradual metamorphosis

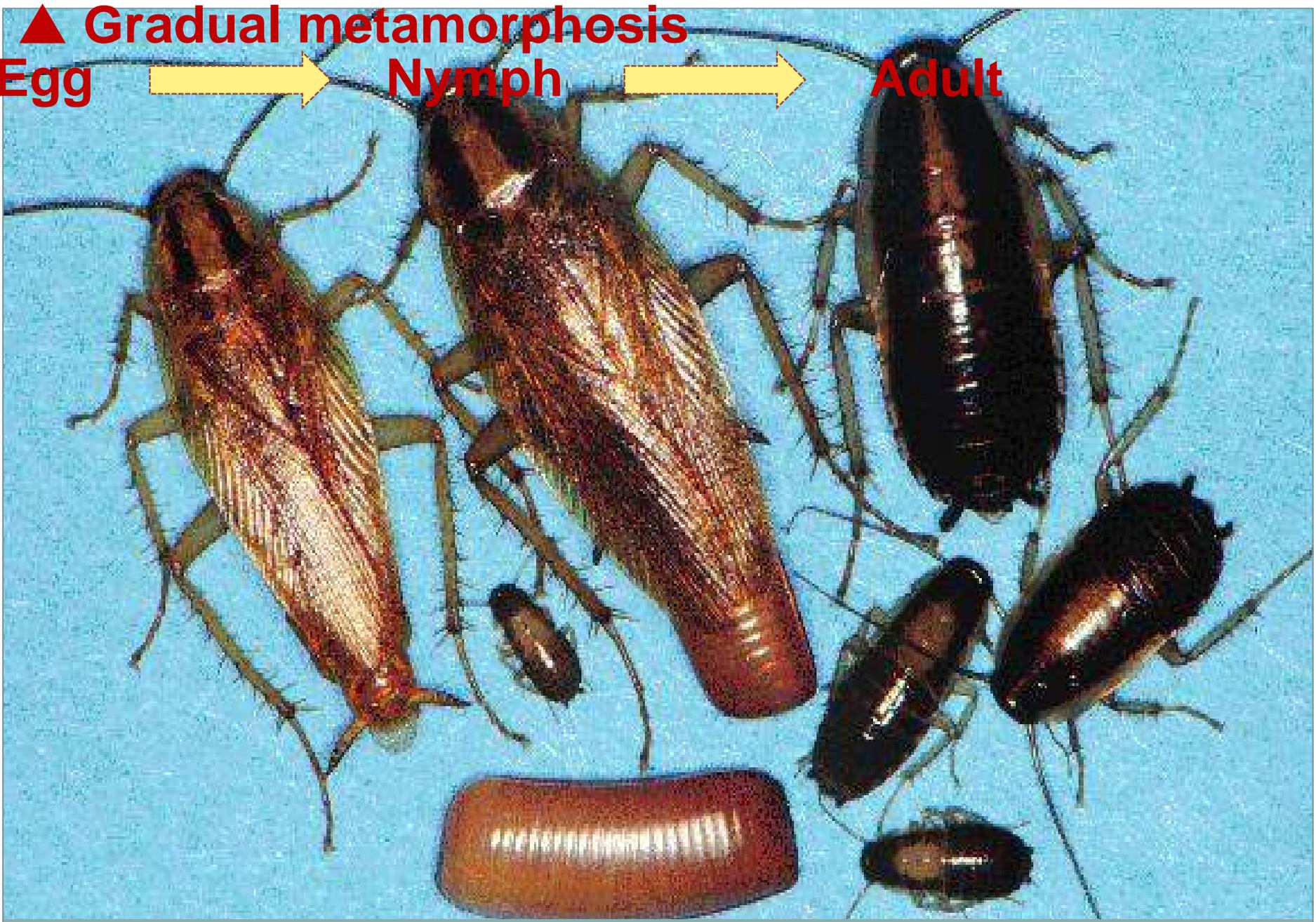
Egg



Nymph



Adult



Order: Dictyoptera

▲ Incomplete metamorphosis



2

University of Florida



1

naiad

Order: Odonata

▲ Incomplete metamorphosis

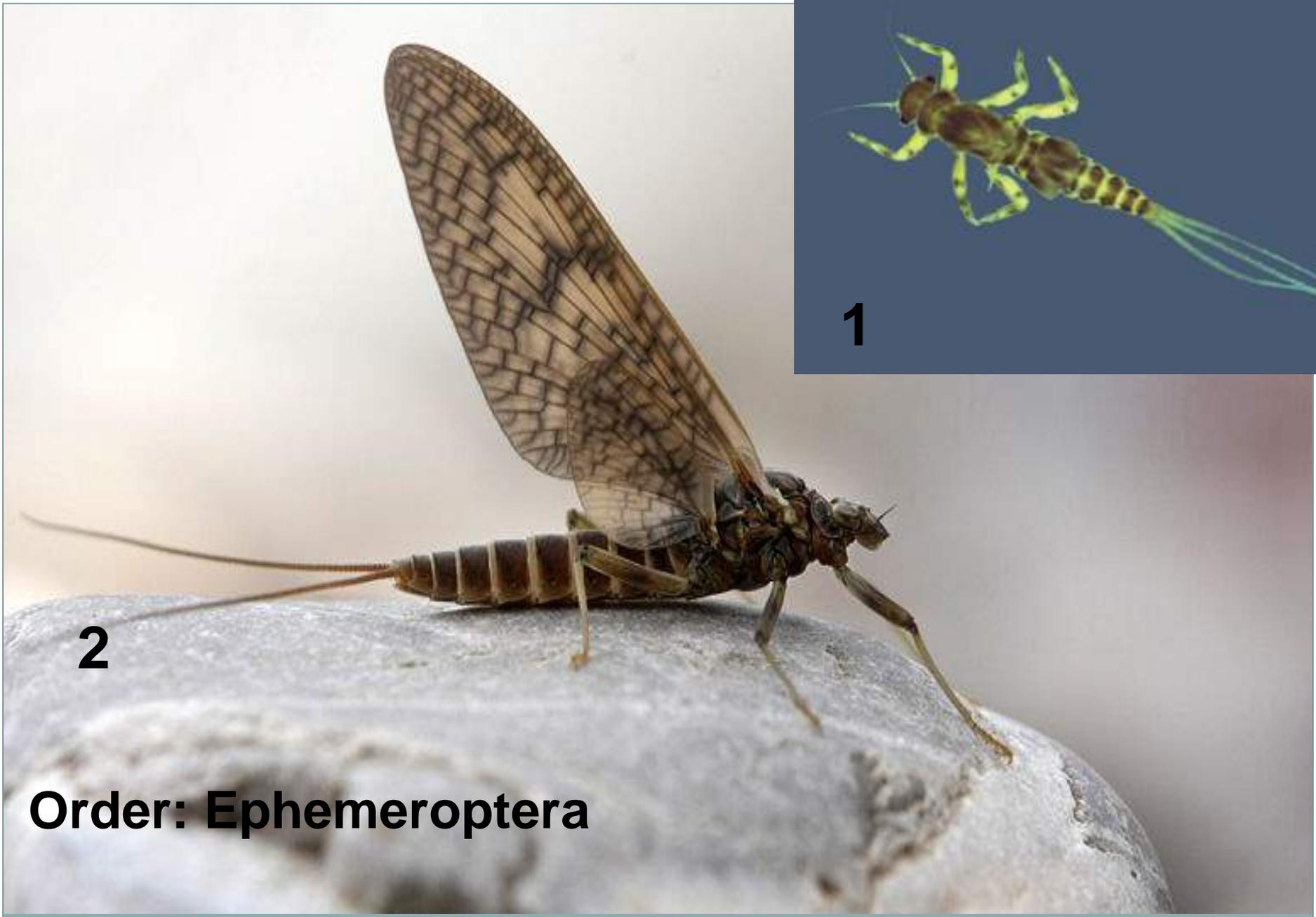
Egg Naiad Adult



Order: Ephemeroptera



1

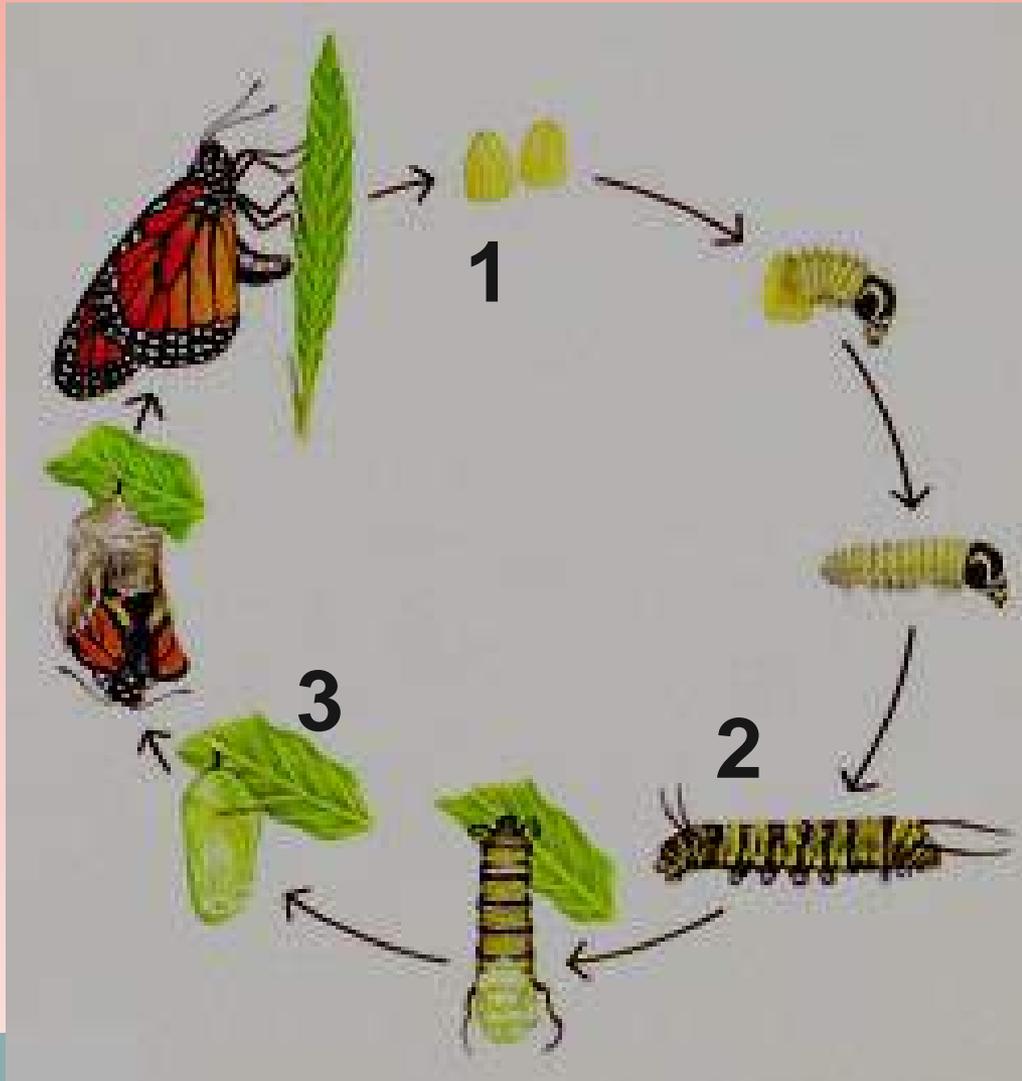


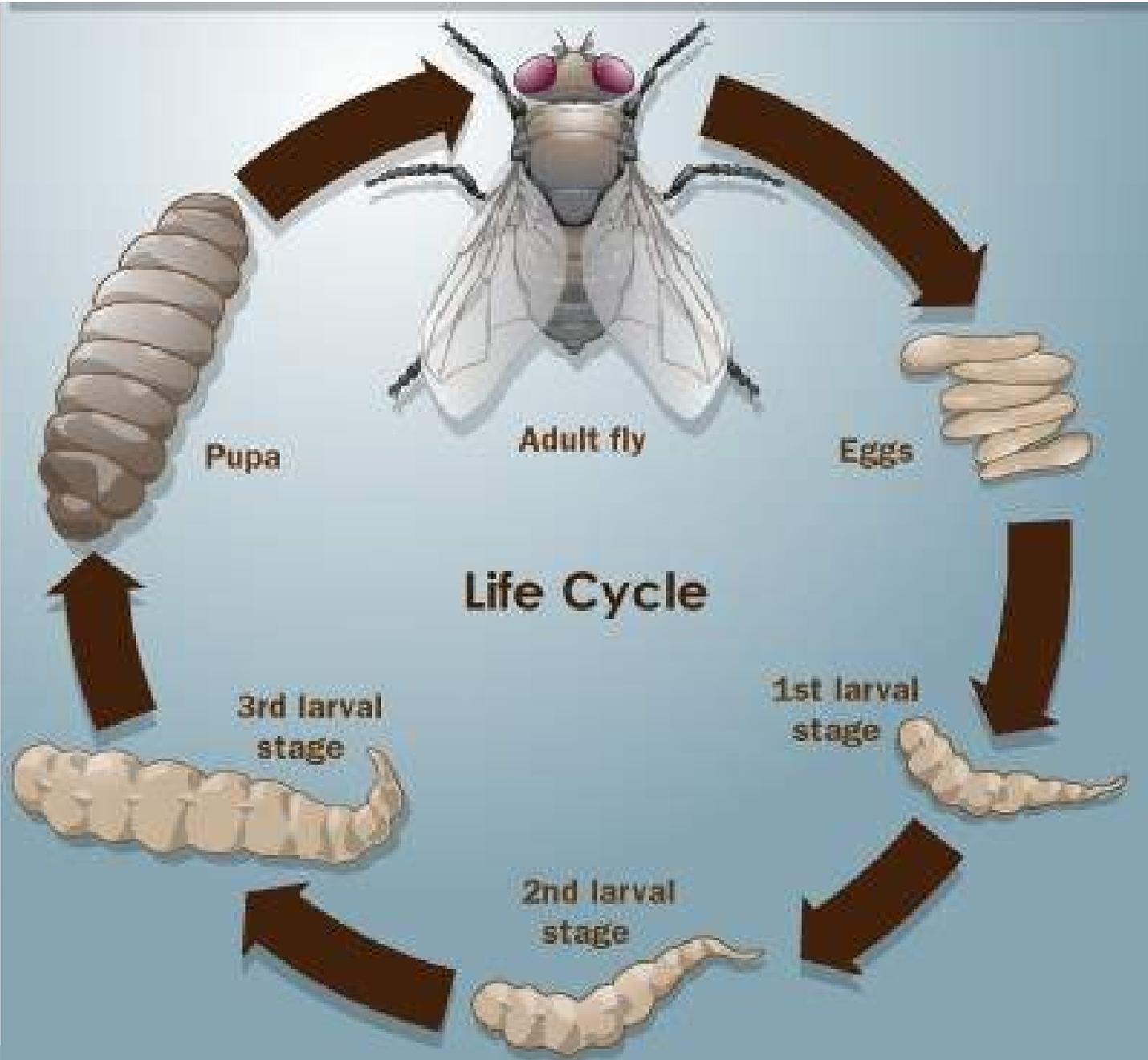
2

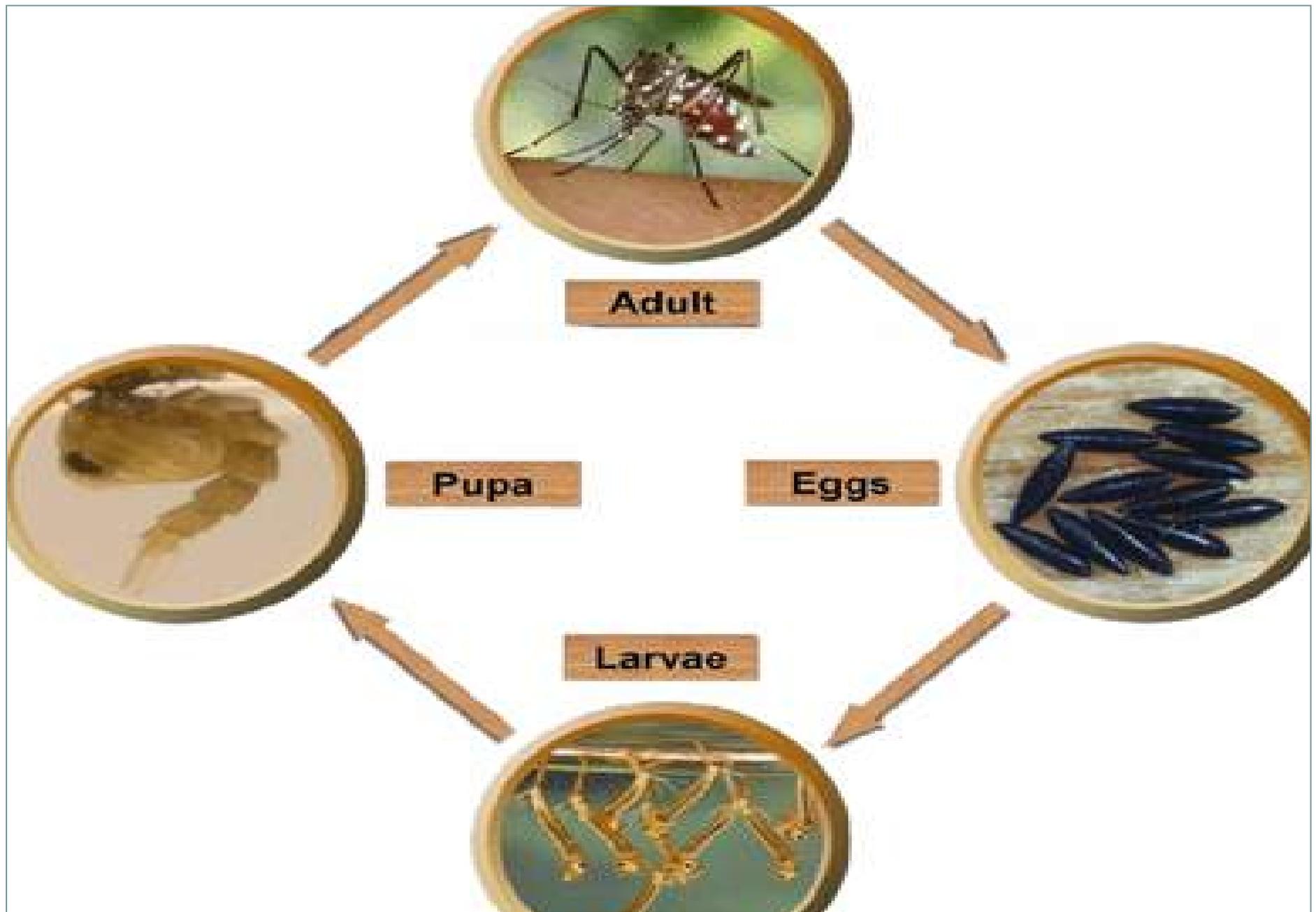
Order: Ephemeroptera

Complete metamorphosis

Egg → Larva → pupae → Adult









Order: Coleoptera

INSECT ORDERS

LAB. 3



Class: Insects

Subclass: Pterygota

Subclass: Apterygota

Division: Exopterygota

Division: Endopterygota

O : Thysanura
O: Collembola

O: Ephemeroptera

O: Odonata

O: Orthoptera

O: Dictyoptera

O: Dermaptera

O: Embioptera

O: Isoptera

O: Homoptera

O: Hemiptera

O: Anoplura

O: Thysanoptera

O: Mallophagaga

O: Neuroptera

O: Lepidoptera

O: Coleoptera

O: Siphonaptera

O: Diptera

O: Hymenoptera

Class: Insects

***Subclass: Apterygota**

1-Order : Thysanura

2-Order: Collembola

***Subclass:Pterygota**

Division: Exopterygota

1-Order: Ephemeroptera

2-Order: Odonata

3-Order: Orthoptera

4-Order: Dictyoptera

5-Order: Dermaptera

6-Order: Embioptera

7-Order: Isoptera

8-Order: Homoptera

9- Order: Hemiptera

10- Mallophagaga

11-Order: Anoplura

12- thysanoptera

Division: Endopterygota:

1- Order: Neuroptera

2-Order: Lepidoptera

3-Order: Coleoptera

4- Order: Siphonaptera

5- Order:Diptera

6- Order: Hymenoptera

Subclass Apterygota

- wingless
- no metamorphosis
- immature individuals are called *youngs*
- litter and soil dwelling
- Order Collembola, Thysanura, Diplura
Protura.

Class: Insects

***Subclass: Apterygota**

1-Order : Thysanura

- **Very delicate insects**
- **chewing mouthparts**
- **Long jointed thread-like tails called (caudal filaments).**
- **Has 11 abdominal segments**
- **(Silverfish, bristle tails).**



Class: Insects

*Subclass: Apterygota

2- Order: Collembola

- Mouth parts for biting and chewing.
- delicate insects with six or fewer abdominal segments. Under side of abdomen has a sucker, and a pair or more or less fused appendages, for jumping (**furculum**). Springtails.





***Subclass: Pterygota**

Division: Exopterygota

1-Order: Ephemeroptera

- Small to medium sized.
- Elongate, very soft bodied insects with two or three long thread tails.
- They are common about ponds or streams.
- The front wings are large and triangular, and the hind wings are small and rounded, in some species the hind wings are vestigial or absent.



***Subclass: Pterygota**
Division: Exopterygota
2- Order: Odonata

- Antennae short and inconspicuous.
- Long slender insects with long and narrow wings. Compound eyes are large and many-faced, the thorax is relatively small and compact.
- The immature stages are aquatic, and adults are usually found near water.



*Subclass: Pterygota

Division: Exopterygota

3-Order: Orthoptera

● The body is elongate.

● two pairs of wings unlike in structure, the first pair long and leathery while the second pair is membranous.

● Hind legs modified for jumping

● Biting or chewing mouth parts.



#1437

5 mm

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Western Australia



***Subclass: Pterygota**
Division: Exopterygota
4-Order: Dictyoptera

- **The body is flattened oval.**
- **The head is under the pronotum.**
- **All legs for walking or running ,antenna is setaceous**





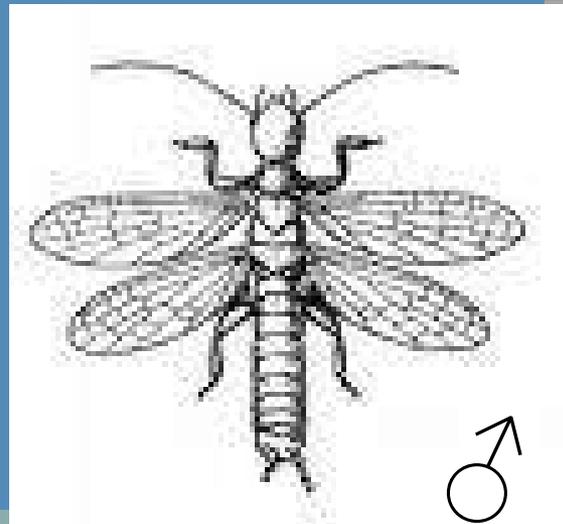
***Subclass: Pterygota**
Division: Exopterygota
5-Order: Dermaptera (Earwing)

- With two pairs of wings, the first pair is leathery and short while the second is membranous folded under the forewing .
- With prominent pair of pincer-like of cerci at tip of abdomen.



***Subclass: Pterygota**
Division: Exopterygota
6-Order: Embioptera

- ▶ **The legs are short and stout, and the hind femora are thickened, the tarsi are 3-segmented, with basal segment of frontal tarsi enlarged and containing silk gland and hollow spinning hairs.**
- ▶ **The male of most species are winged with two pairs of wing similar in size and venation, while the female wingless.**





***Subclass: Pterygota**

Division: Exopterygota

7- Order: Isoptera (Termites or white ants)

*** Many of them wingless, In the insects with wings the two pairs of wings are equal in size and with indistinct veins**

*** prothorax smaller than head.**



Division: Exopterygota

8-Order: Homoptera (Cicadas, Hoppers, Aphids, Whiteflies, and Scales insects)

- **Wingless or with one or two pairs of wings.**
- **The wings at rest are usually held roof-like over the body, with the inner margins overlapping slightly at the apex.**
- **Mouth parts for sucking and opithisognathous in position.**



Subclass: Pterygota

Division: Exopterygota

9- Order: Hemiptera (Bugs)

✦ Front wings are hemelytron, the wing at rest is held flat over the abdomen, with membranous tips of the front wings overlapping.

✦ Aquatic and terrestrial insects with piercing sucking mouth parts.

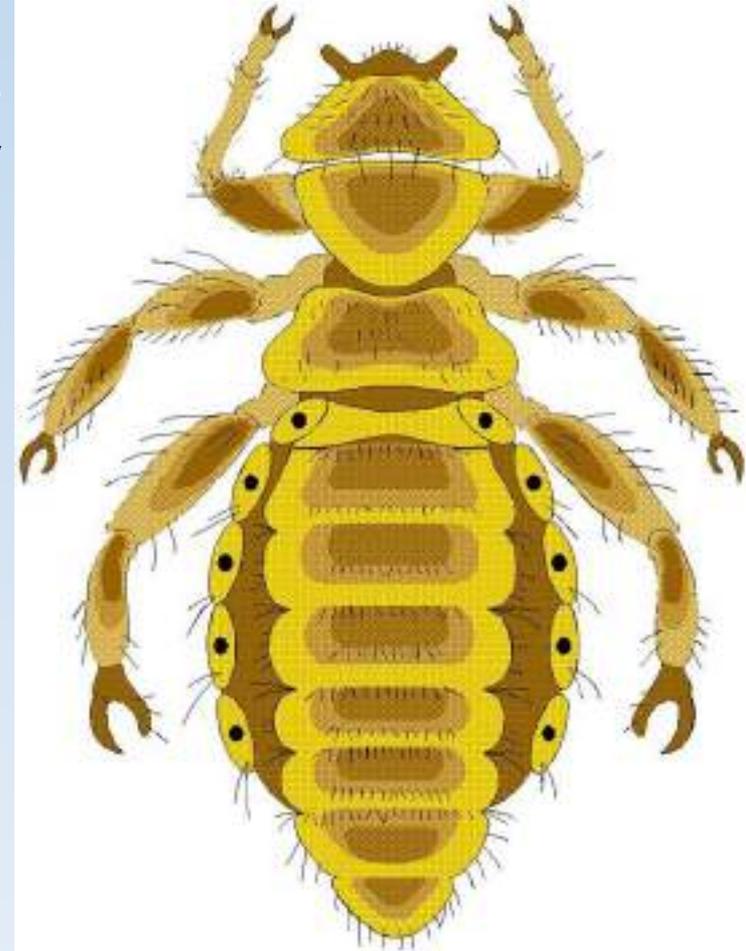


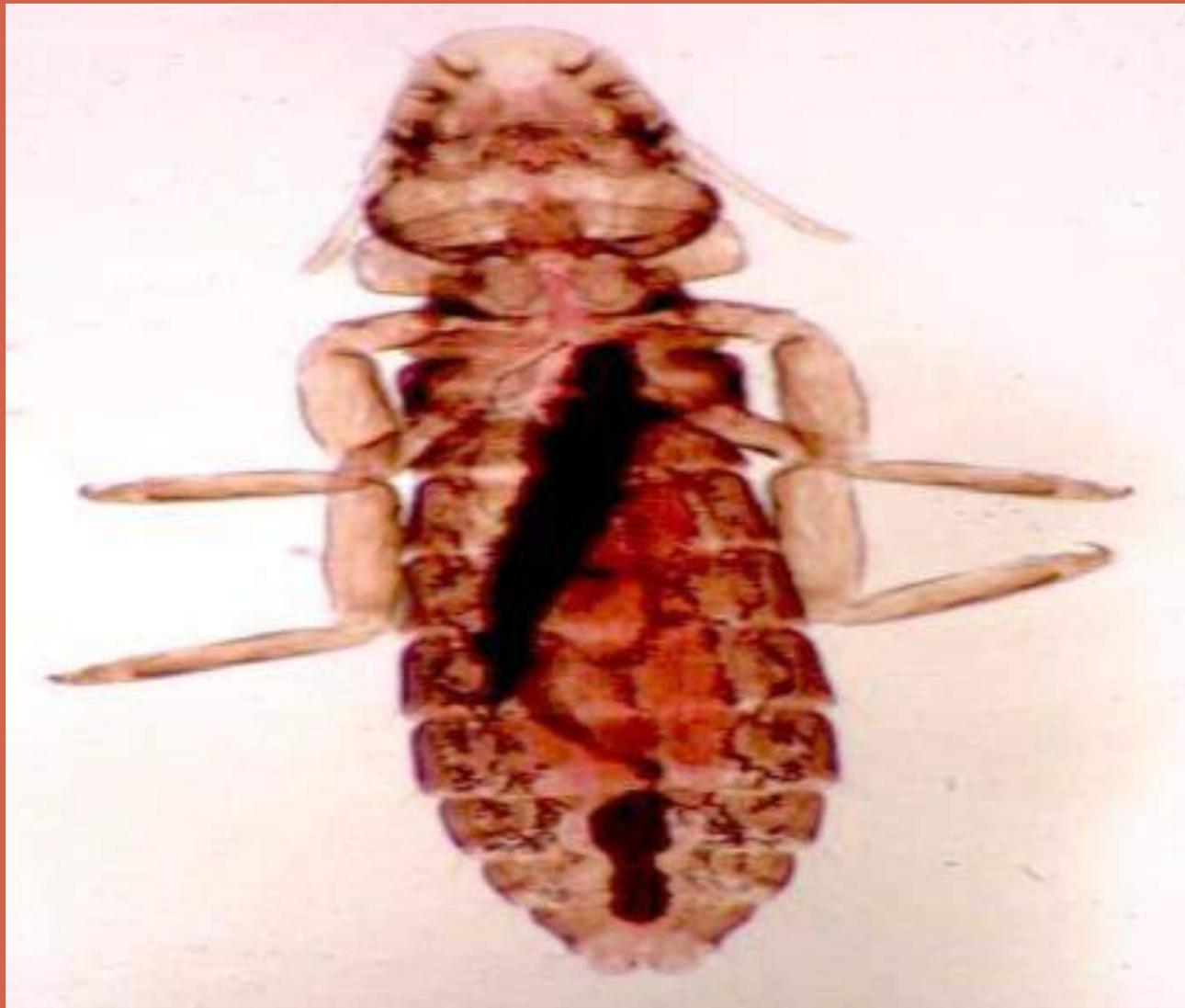




***Subclass: Pterygota**
Division: Exopterygota
10- Mallophagaga

- +Wingless, small, flat bodies insects with head as wide as body or nearly so. chewing mouth parts.**
- +Antennae short, found mostly on birds, a few on mammals.**



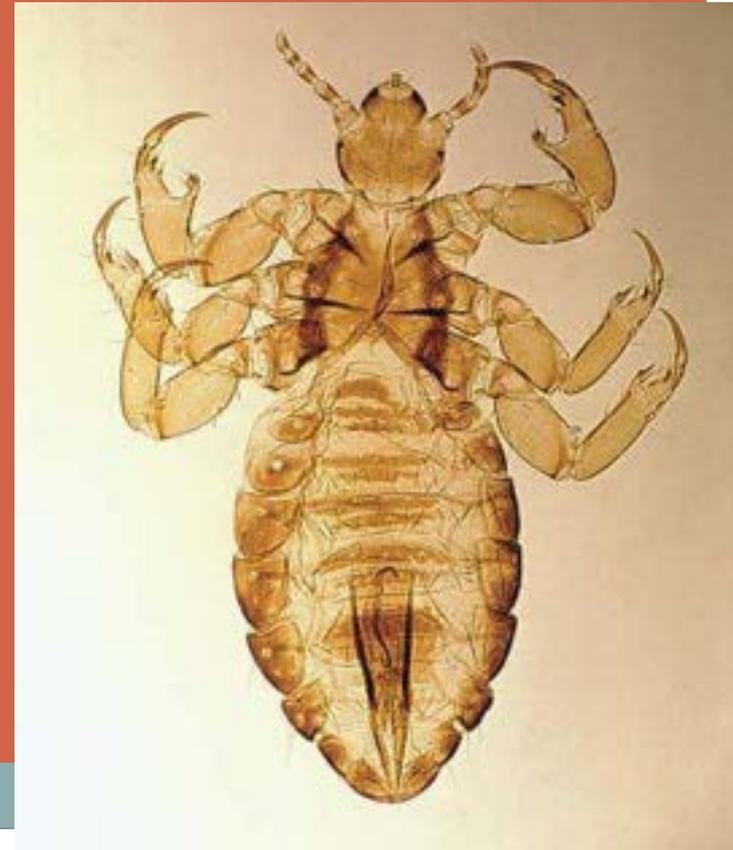


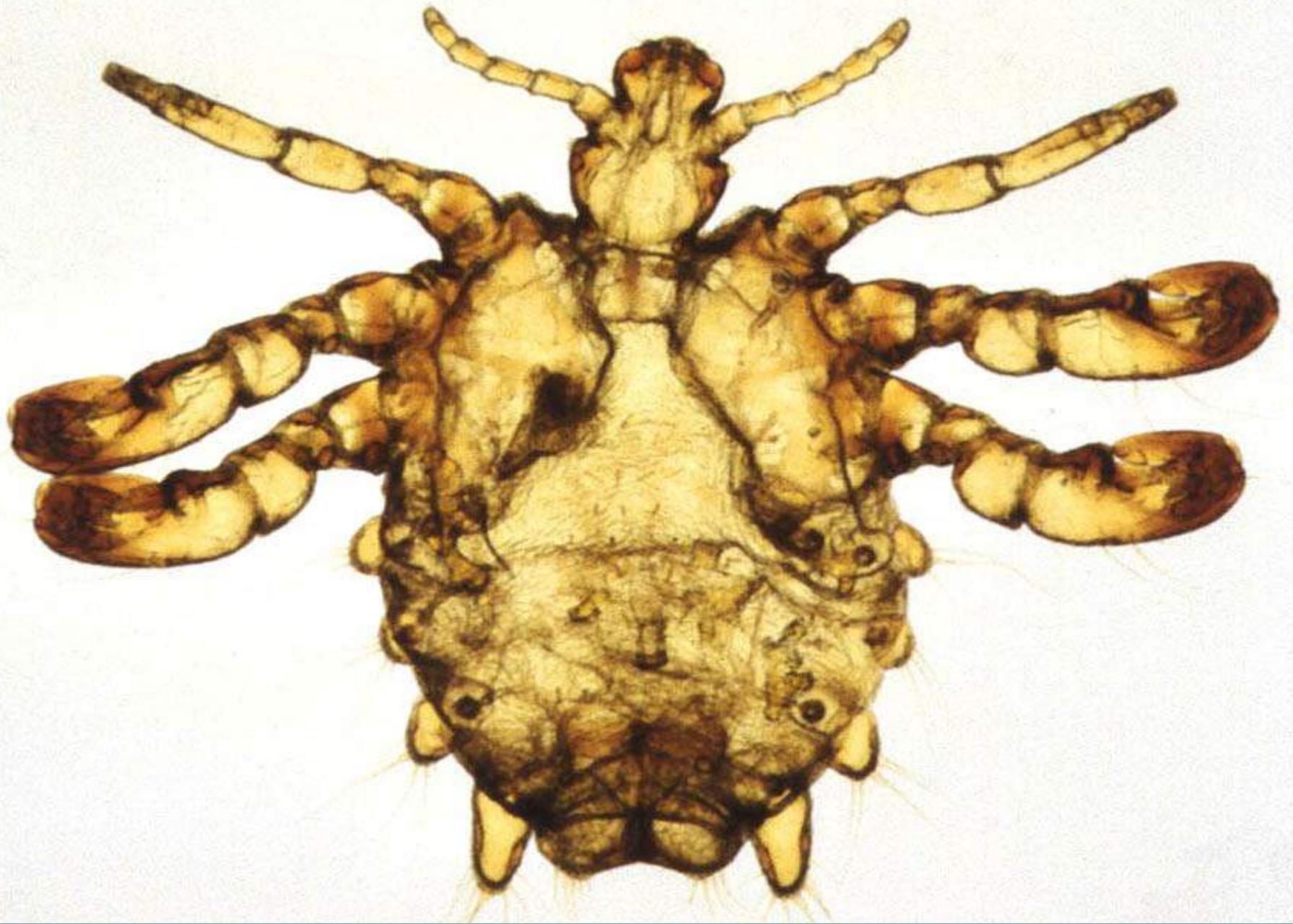
***Subclass: Pterygota**

Division: Exopterygota

11-Order: Anoplura

- **Wingless, small, broad and flat insects fleshy leg, each with single claw for grasping hairs.**
- **Sucking mouth parts, founds on mammals**





***Subclass: Pterygota**
Division: Exopterygota
12- Order: Thysanoptera

- **Very small, slender insects two pairs of hairy wings.**
- **Mouth parts for piercing chaffing.**





Thrips palmi
(Thysanoptera)
Dauerpräparat



Division: Endopterygota
LAB. 4

***Subclass: Pterygota**

Division: Endopterygota

1- Order: Neuroptera

- **The fore and hind wing are similar in shape and venation and are held roof-like over the abdomen when at rest.**
- **The mouthparts are chewing type.**
- **Antennae are generally long and segmented.**
- **The tarsi are 5-segmented.**
- **Anal cerci are absent**





***Subclass: Pterygota**
Division: Endopterygota
2-Order: Lepidoptera

- **Insects with two pairs of scaly wings.**
- **Siphoning mouth parts.**





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***Subclass: Pterygota**
Division: Endopterygota
3-Order: Coleoptera

- **Insects with two pairs of wings, fore wings elytron and meeting in straight line down the back.**
- **Chewing mouth parts.**



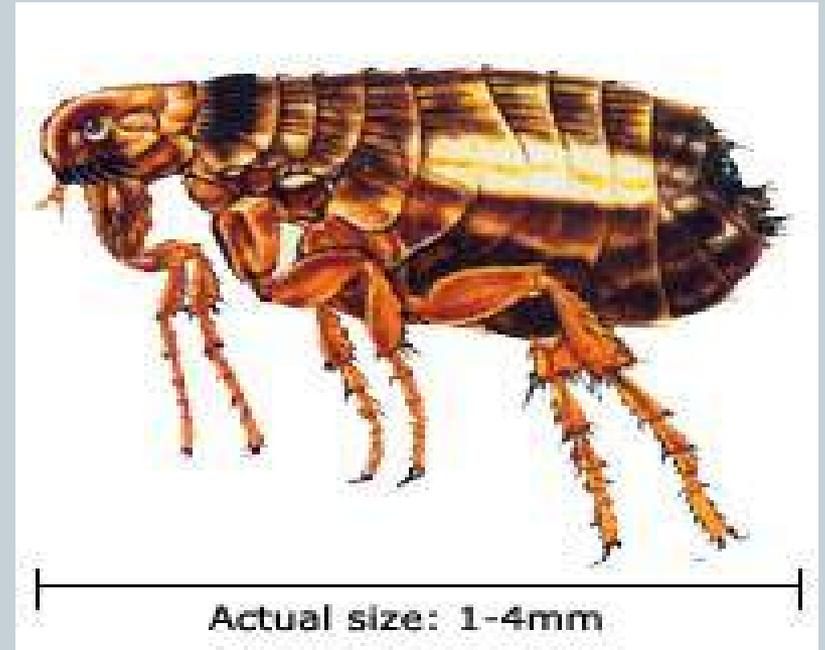


***Subclass: Pterygota**
Division: Endopterygota
4- Order: Siphonaptera



Siphonaptera

- **Fleas**
- **Ectoparasites**
- **Bodies laterally compressed**
- **Enlarged hind jumping legs**
- **Very short antenna**



***Subclass: Pterygota**
Division: Endopterygota
5- Order: Diptera

- Insects with one pair of membranous wings, while the second pair was modified to halteres.
- Mouth parts for sucking, or sponging, or lapping and well developed.



Hymenoptera

Bees, ants, wasps



Carpenter bee

- **Adult are winged or wingless insects.** Winged members have two pairs of membranous wings with relatively few veins
- **Narrow waist connects thorax & abdomen**
- **Abdomen curved downward**
- **May have stinger on end of abdomen**



Red ant

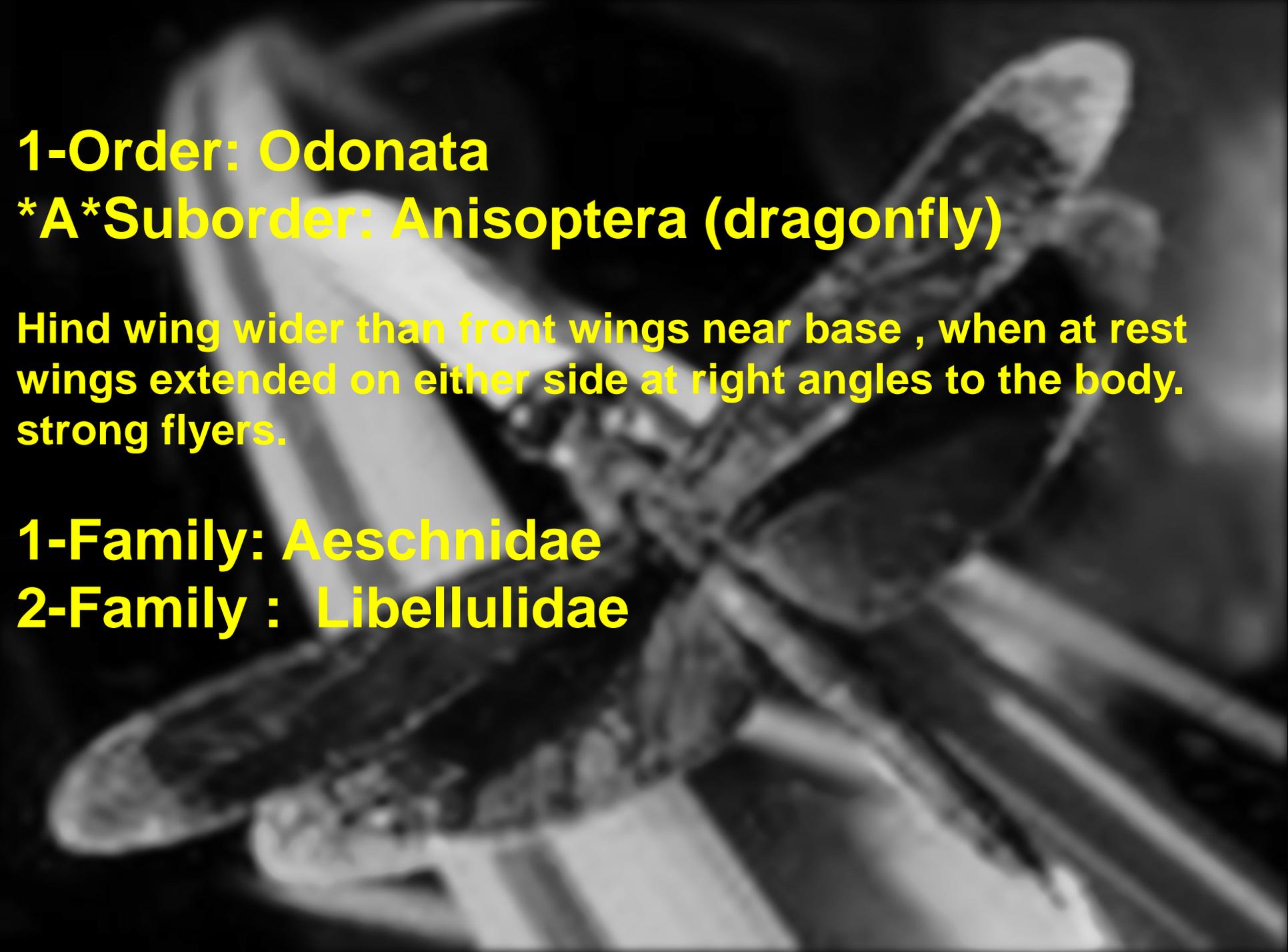


Yellow jacket





ORDER : ODONATA
LAB. 5



1-Order: Odonata

***A*Suborder: Anisoptera (dragonfly)**

Hind wing wider than front wings near base , when at rest wings extended on either side at right angles to the body. strong flyers.

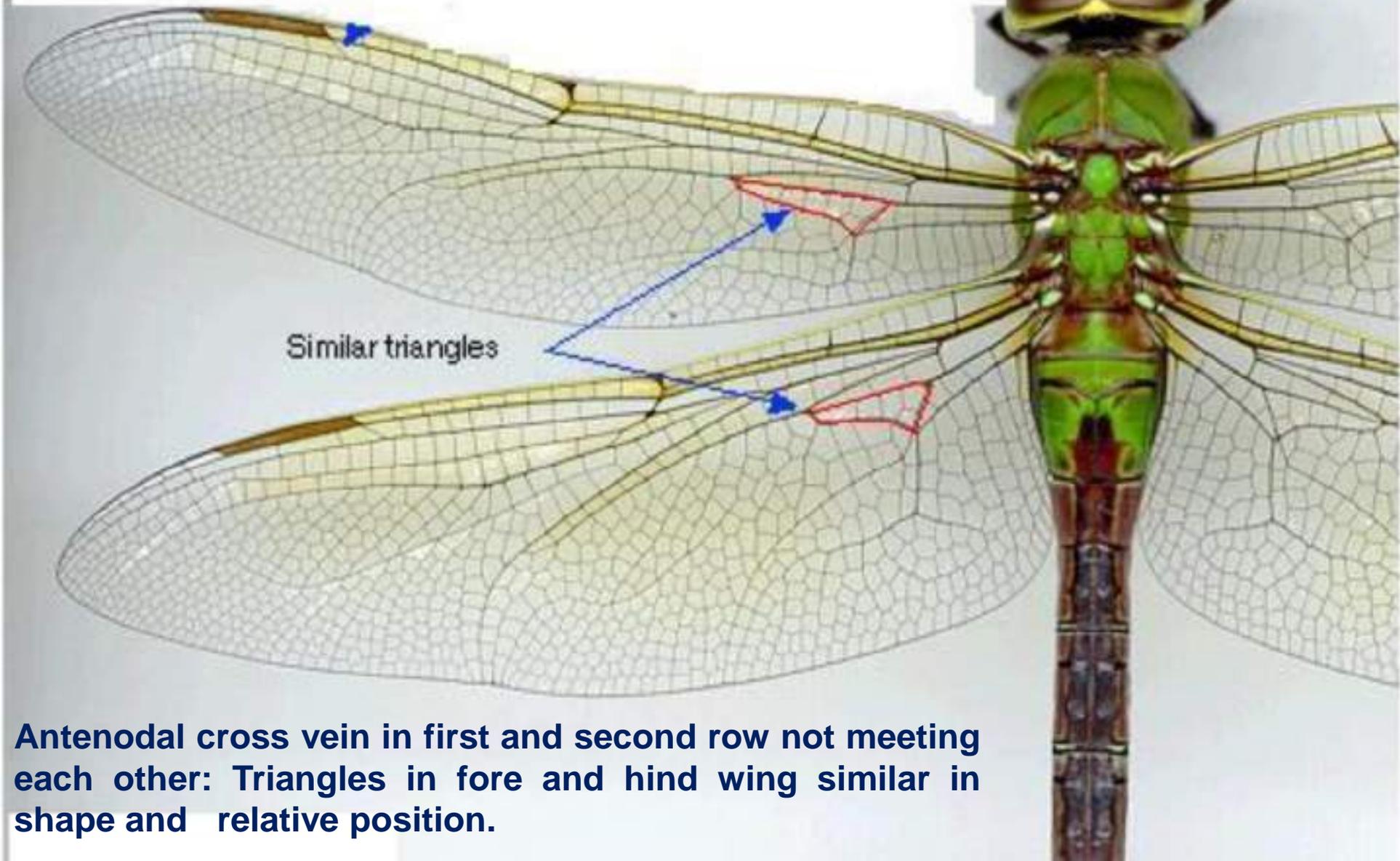
1-Family: Aeschnidae

2-Family : Libellulidae

1-Order: Odonata

***A*Suborder: Anisoptera (Dragonfly)**

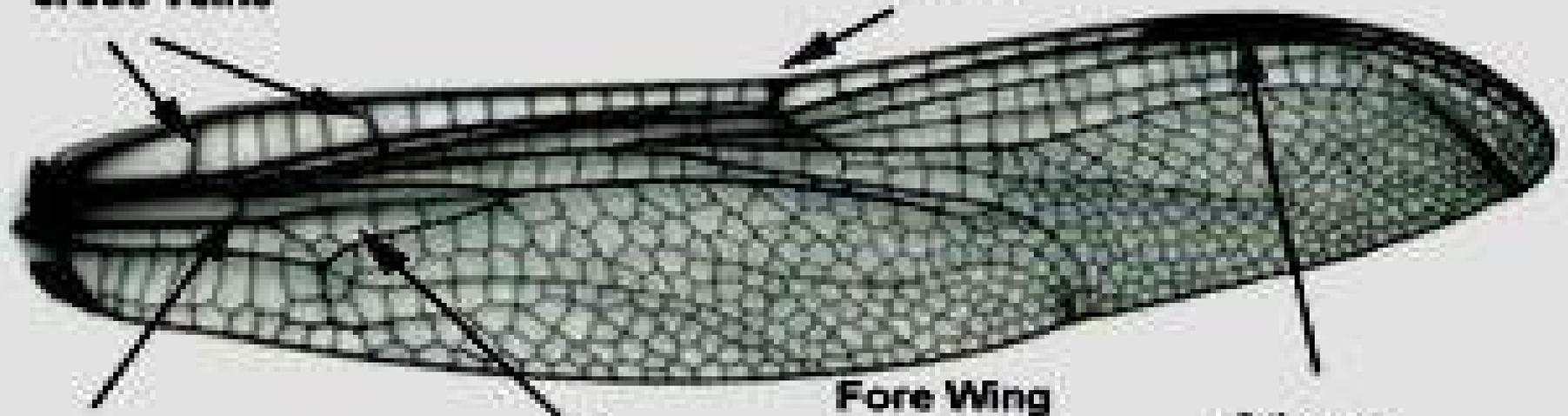
1-Family: Aeschnidae (Darners, Aeshnids)



Antenodal cross vein in first and second row not meeting each other: Triangles in fore and hind wing similar in shape and relative position.

Thickened antenodal cross veins

Nodus

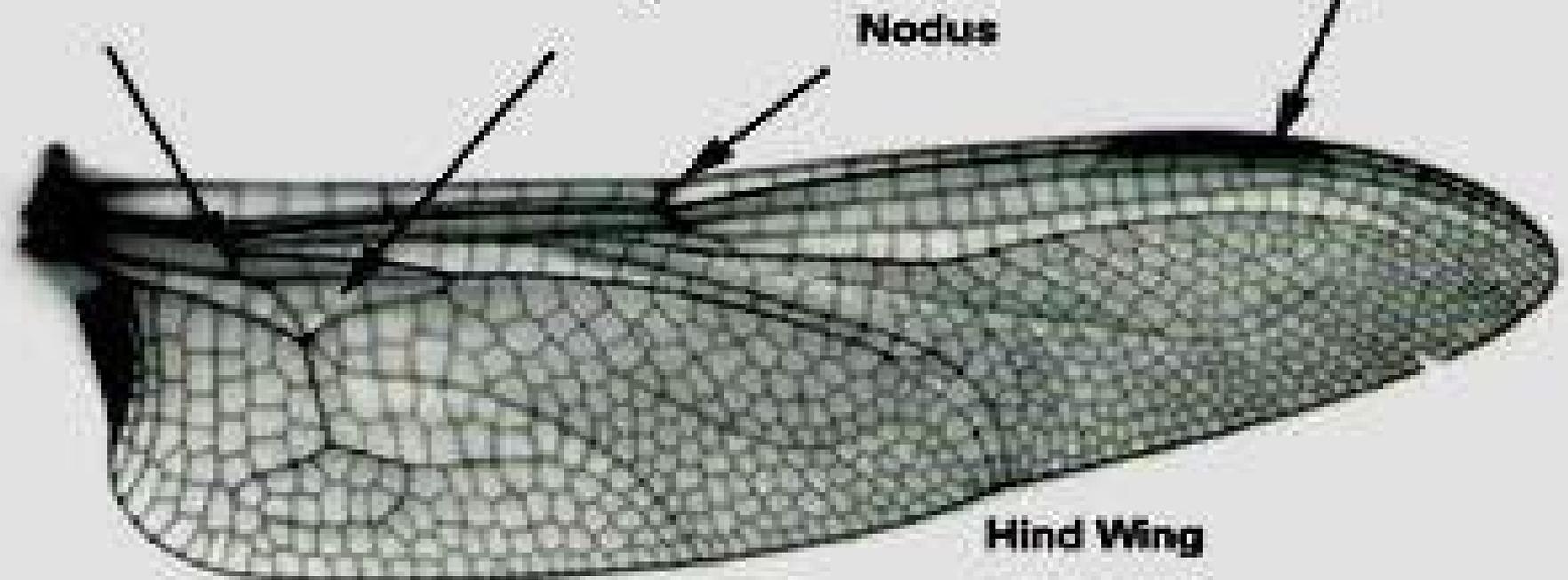


Fore Wing

Stigma

Arculus

Triangle



Nodus

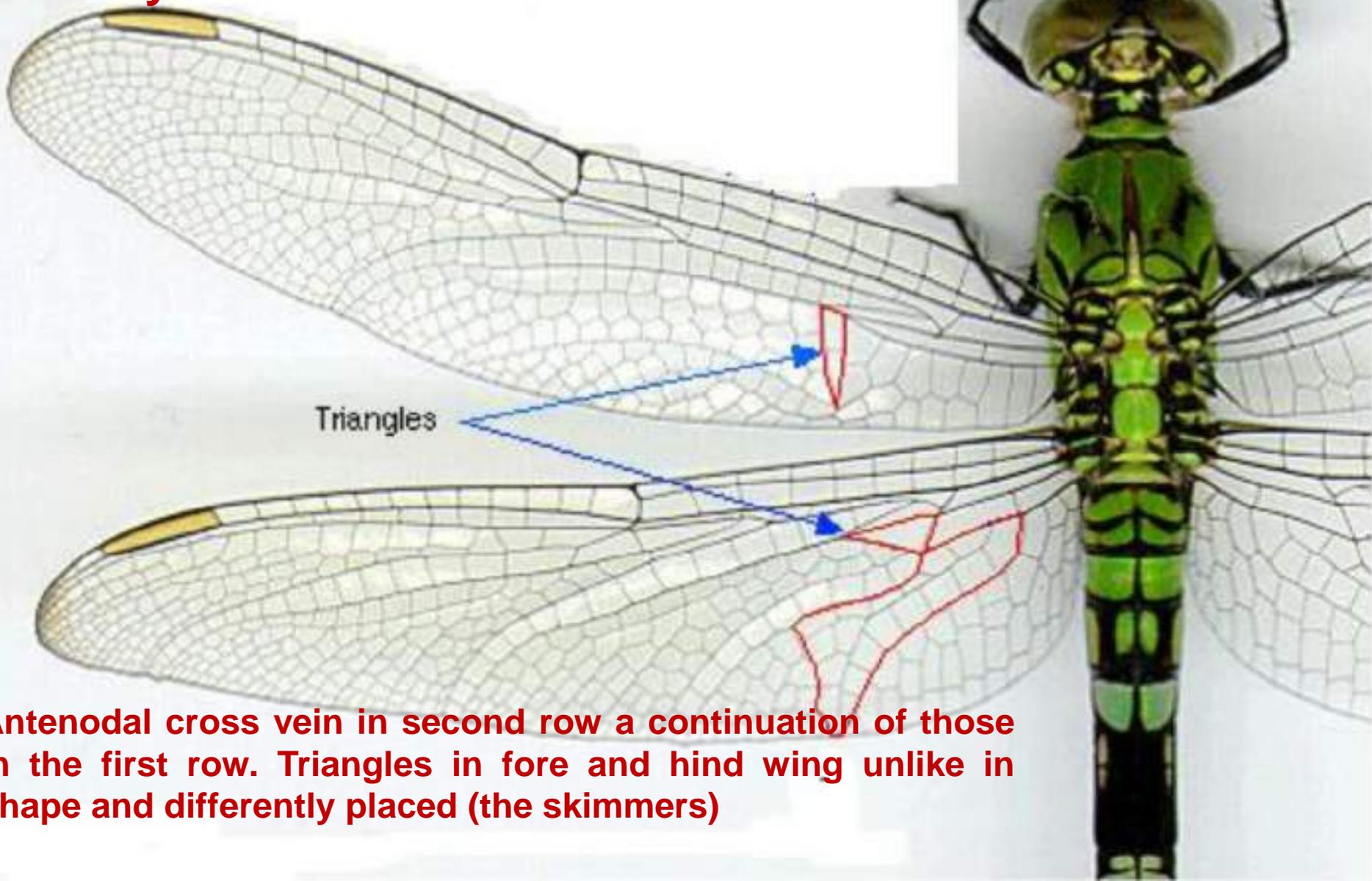
Hind Wing



1-Order: Odonata

***A*Suborder: Anisoptera (dragonfly)**

2-Family : Libellulidae



Antenodal cross vein in second row a continuation of those in the first row. Triangles in fore and hind wing unlike in shape and differently placed (the skimmers)



1-Order: Odonata

***B*Suborder: Zygoptera**

**Front and hind wings similar in size and shape,
When at rest folded together edge up, parallel
to the body. feeble flyer (Damsel flies)**

1-Family: Agrionidae

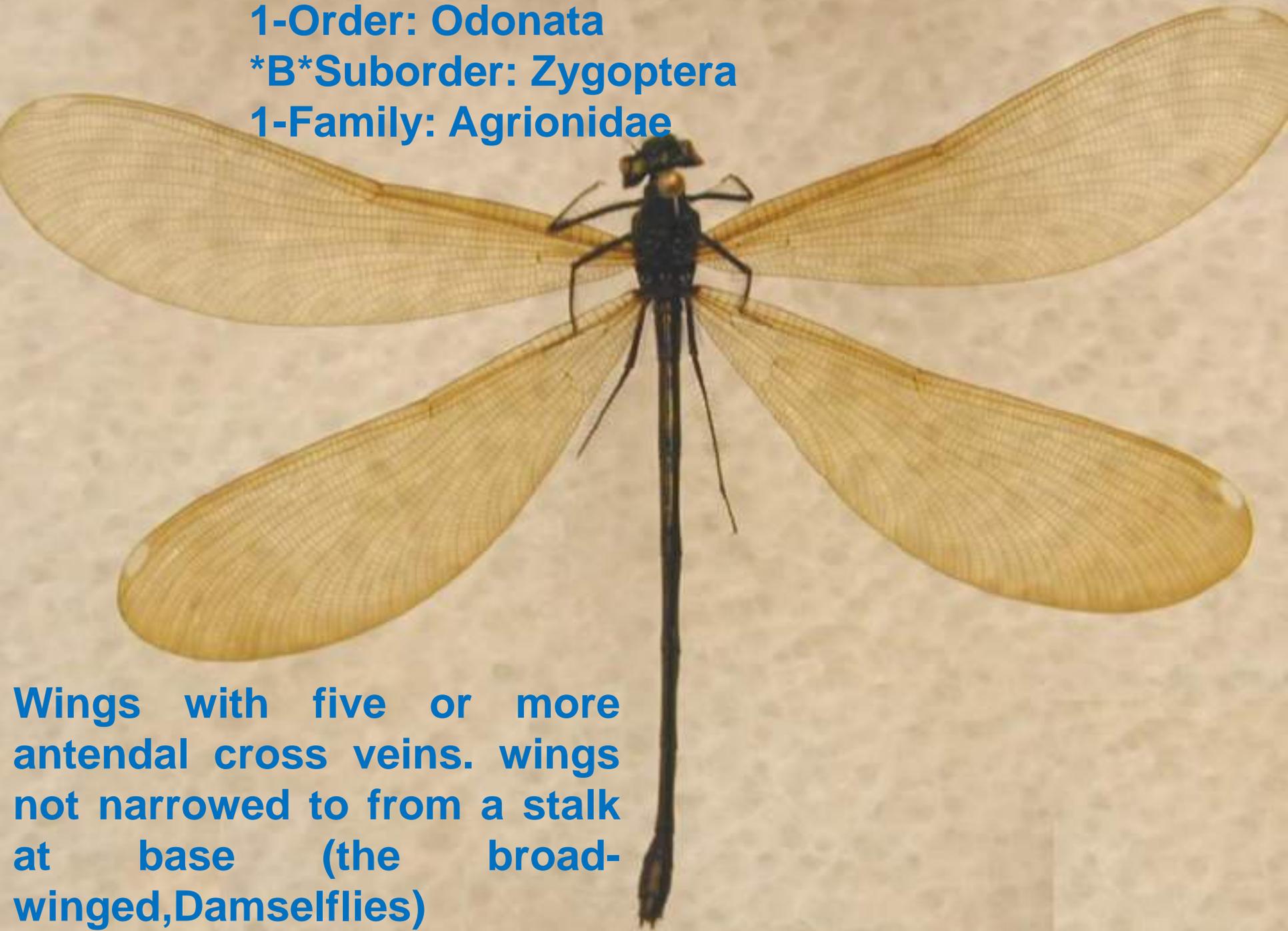
2-Family: Coenagrionidae



1-Order: Odonata

***B*Suborder: Zygoptera**

1-Family: Agrionidae

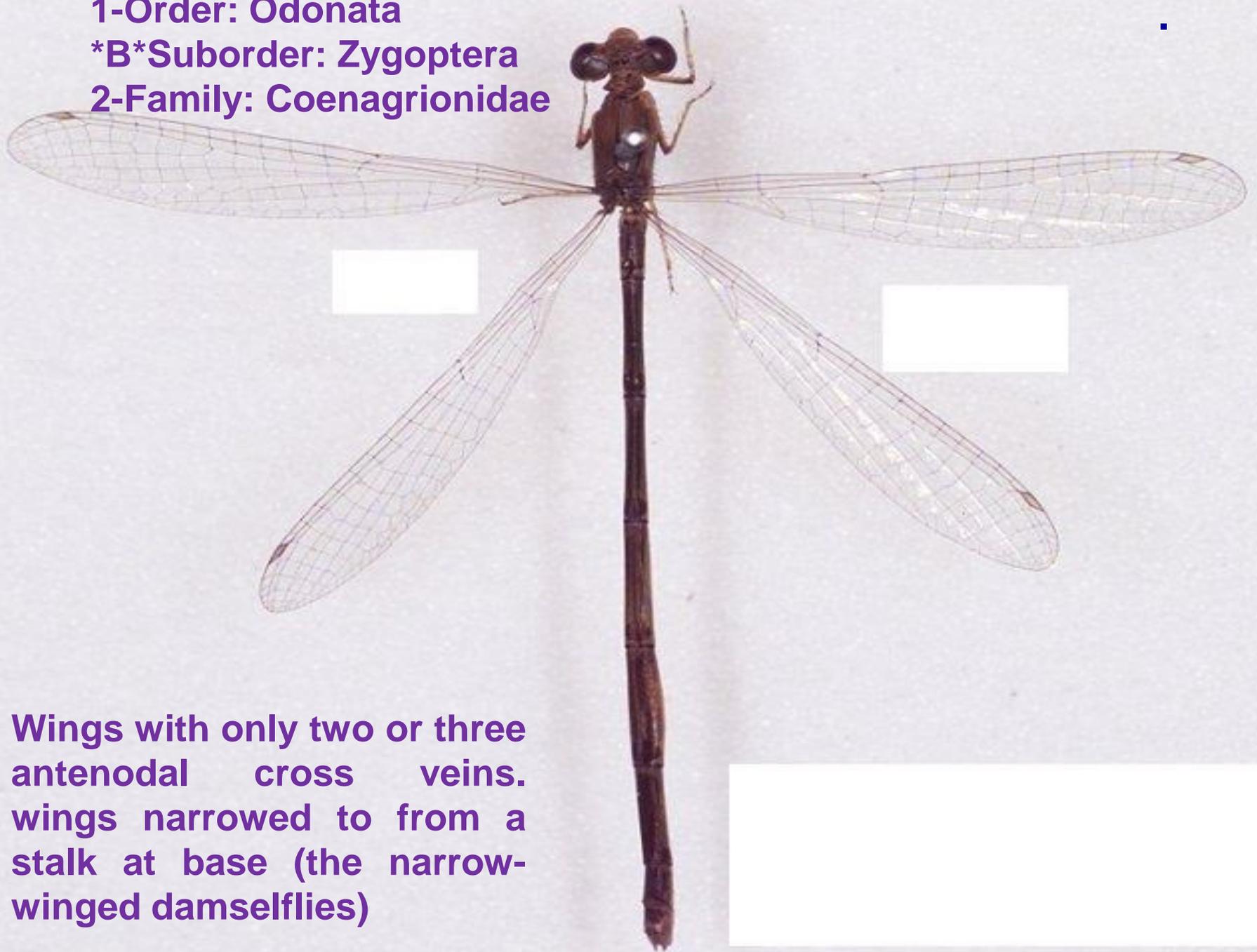


Wings with five or more antenodal cross veins. wings not narrowed to from a stalk at base (the broad-winged, Damselflies)

1-Order: Odonata

***B*Suborder: Zygoptera**

2-Family: Coenagrionidae



**Wings with only two or three
antenodal cross veins.
wings narrowed to from a
stalk at base (the narrow-
winged damselflies)**

ORDER: DICTYPTERA

LAB 6

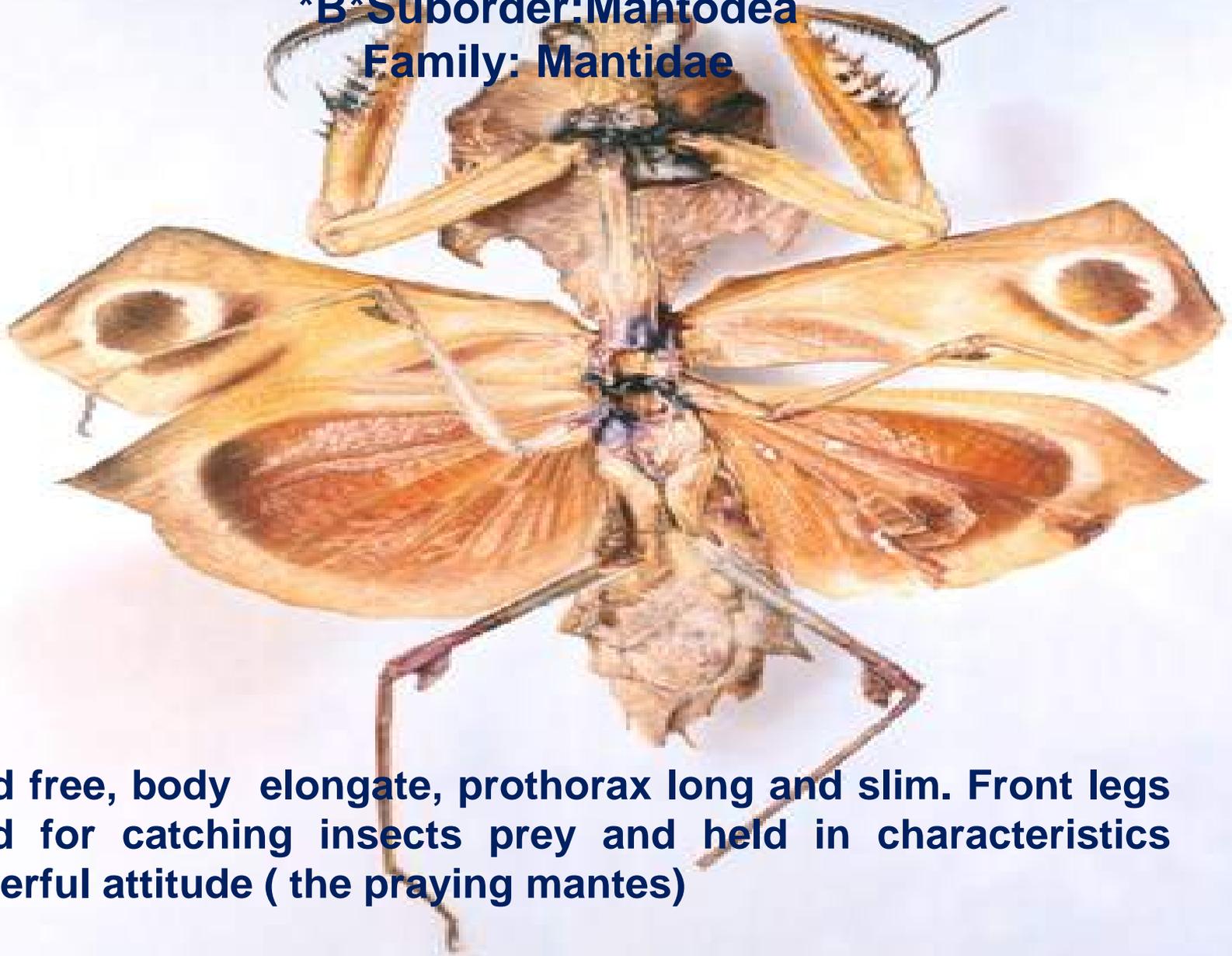
2-Order: Dictyoptera
***A*Suborder: Blattodea**
Family: Blattidae



**Body flattened and oval, head covered with pronotum,
swift on foot(cockroaches).**



2-Order: Dictyoptera
***B*Suborder: Mantodea**
Family: Mantidae



Head free, body elongate, prothorax long and slim. Front legs fitted for catching insects prey and held in characteristics prayerful attitude (the praying mantes)







3-Order: Phasmida

Family: Phasmidae(walking sticks)

Head free, body elongate, prothorax long and slim, front leg normal, narrow, cylindrical, wingless insects, (the walkingsticks).







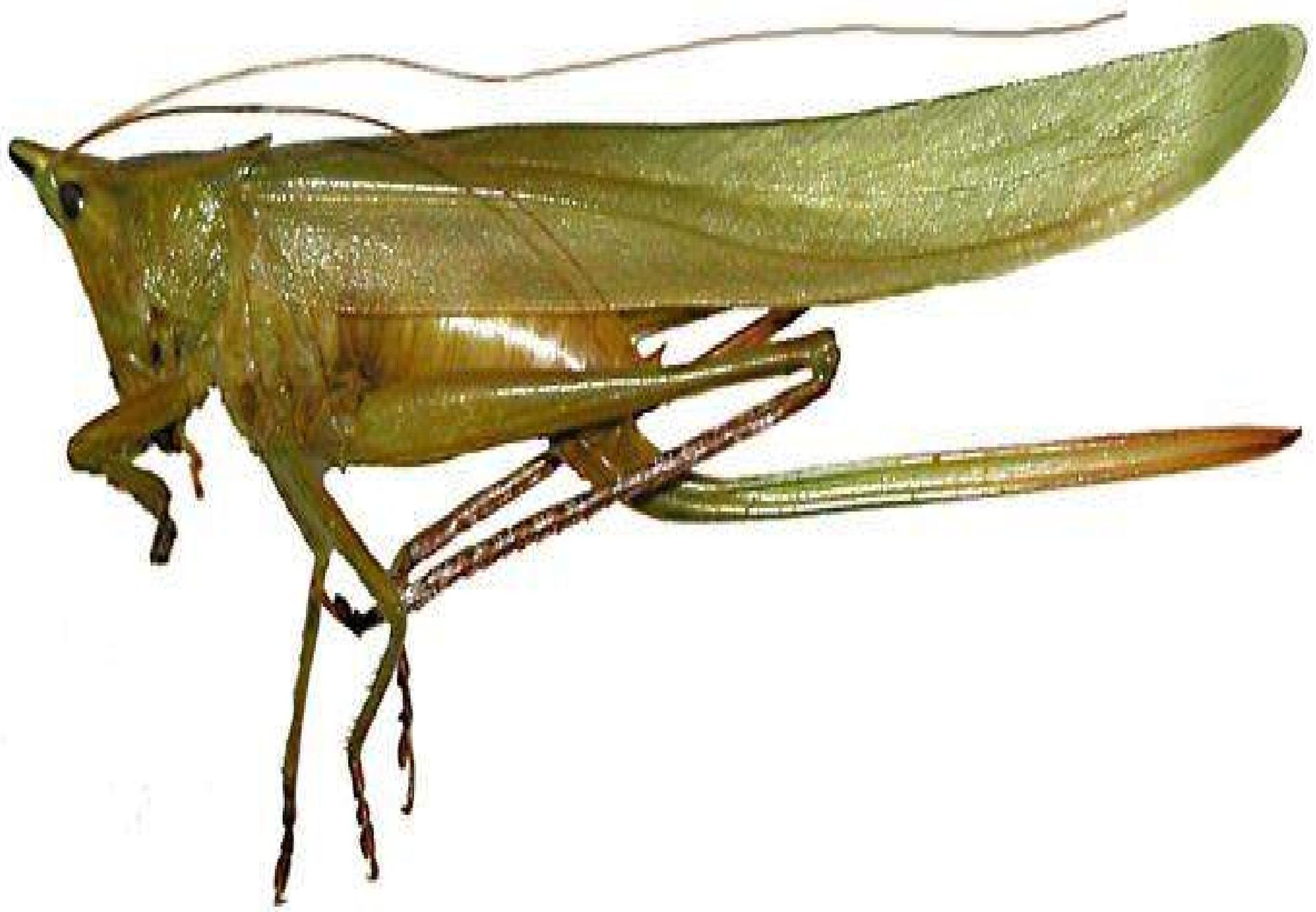
ORDER: ORTHOPTERA
LAB. 7

4-Order :Orthoptera

***A*Family: Tettigoniidae(long-horned grasshopper)**



Hind legs for jumping four tarsal segments (rather rarely less, ovipositor of females usually conspicuous, sword- shapes or sickle-shaped) auditory organ, if possessed near base of front tibia (long horned –grasshopper, katydids, camel crickets).



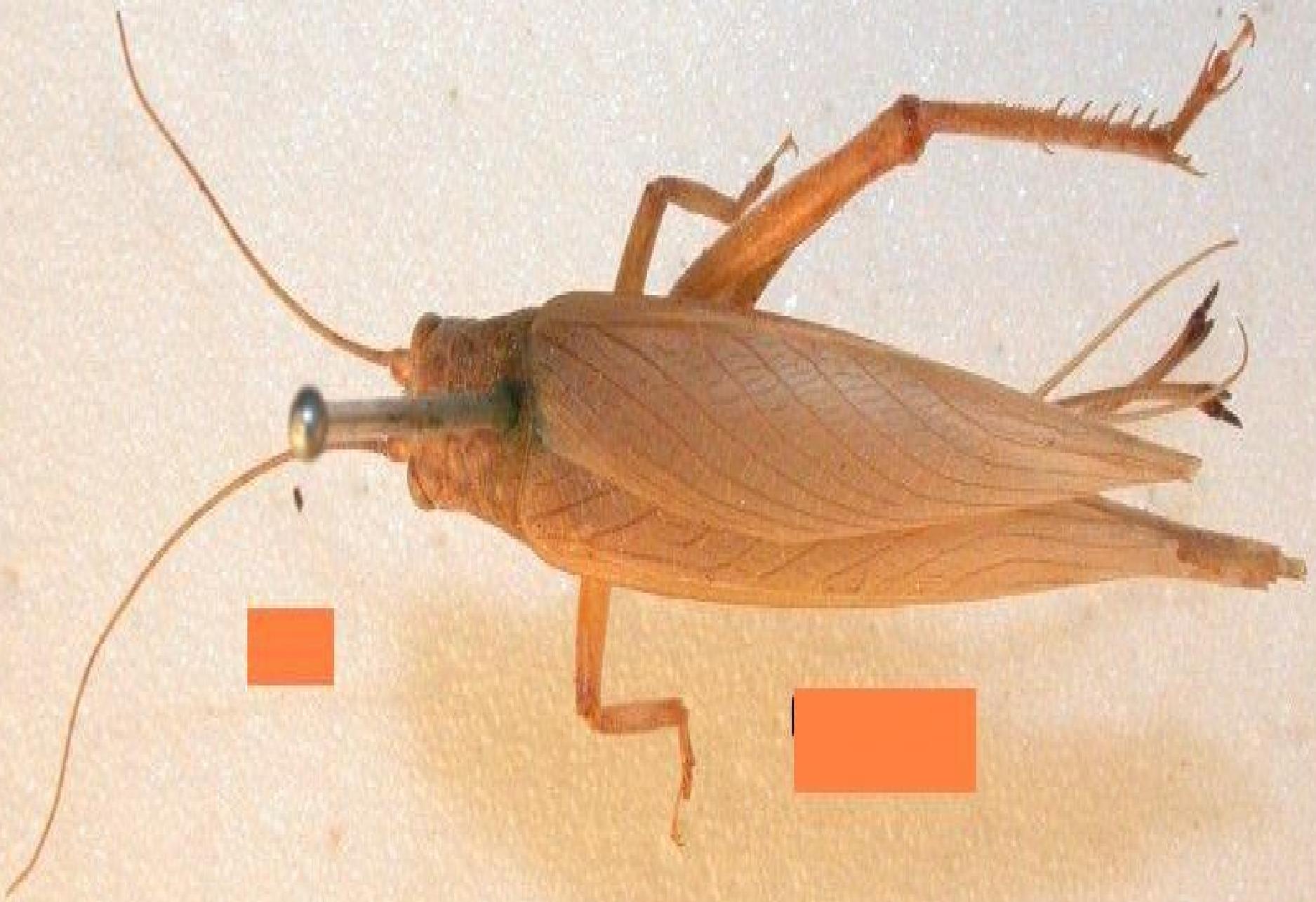
4-Order :Orthoptera

***B*Family: Gryllidae (Field crickets)**



Three tarsal segments(some times apparently on first and second legs. Antenna long and slender ovipositor slender.

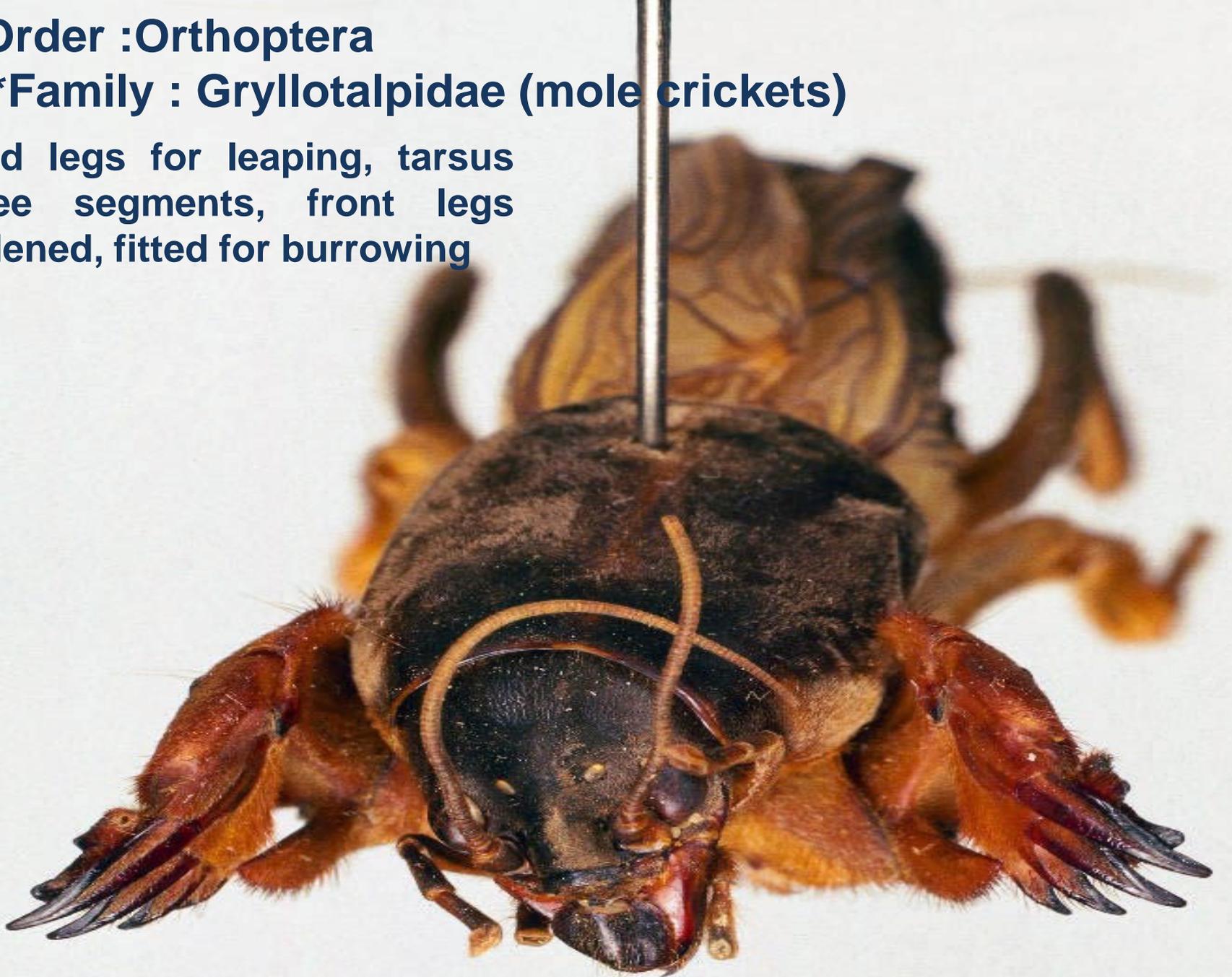




4-Order :Orthoptera

***C*Family : Gryllotalpidae (mole crickets)**

**Hind legs for leaping, tarsus
three segments, front legs
widened, fitted for burrowing**







4-Order :Orthoptera

*D*Family: Tettigidae (Pygmy locusts)

Three tarsal segments(sometimes apparently on first and second legs. Pronotum long often reaching to or beyond tip of abdomen, tarsi of first and second legs with apparently two segments, Pygmy locusts.





4-Order :Orthoptera

***E*Family: Locustidae (Locusts grasshopper)**

Front tarsi with 4three segments, antenna short, organ of hearing on first abdominal segments, ovipositor short.











ORDER: COLEOPTERA
LAB 8 (ADEPHAGA)

°COLEOPTERA°

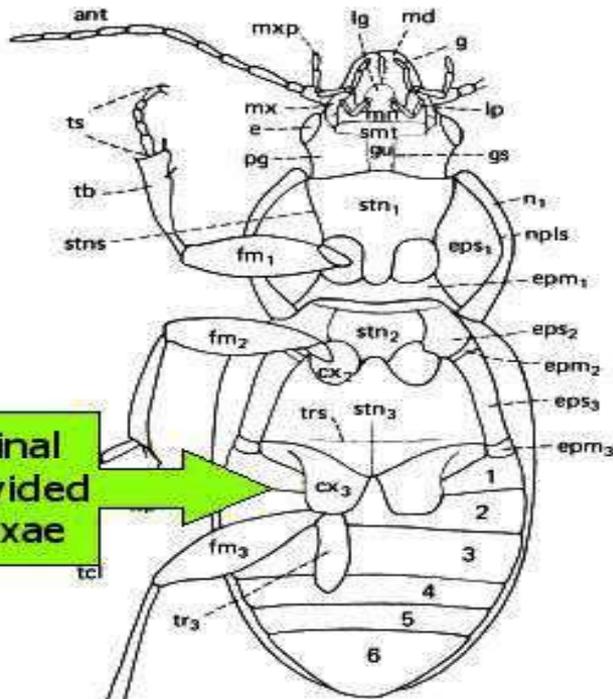
- The largest Order of extant animals (>250,000 species).
- >30,000 of these occur in North America
- Found in just about every habitat
- **Holometabolous** (egg, larva, pupa, and adult)
- Forewings modified into **elytra**
- Mouth parts chewing



Order: Coleoptera

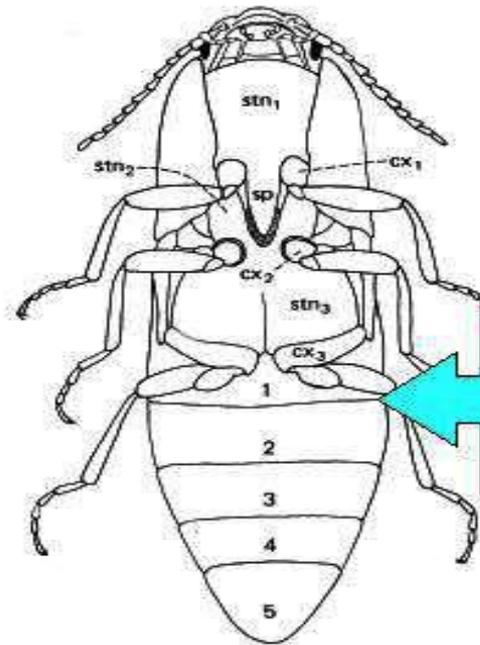
Suborder: Adephaga

Suborder: Polyphaga



1st abdominal segment divided by hind coxae

- Adephaga:**
- Cicindelidae
 - Carabidae
 - Dytiscidae
 - Gyrinidae



posterior margin of 1st ab segment extends completely across abdomen

- Polyphaga:**
- everything else

Order: Coleoptera

Suborder: Adephaga

Family: Carabidae (Ground beetles)

- Usually elongate in form very small to large in size highly variable
- The thorax wider than the head. Prognathous head.
- Terrestrial beetles
- Fast running.



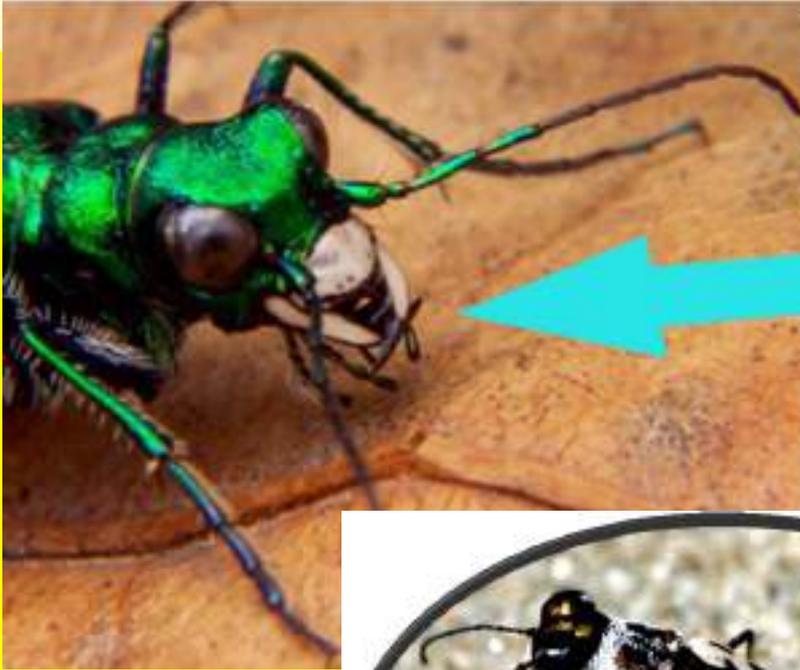
Order: Coleoptera

Suborder: Adephaga

Family: Cicindelidae (Tiger beetles)

✱ **Prominent eyes, head wider than the thorax.**

✱ **Antenna filiform and inserted above base of mandibles.**



Order: Coleoptera

Suborder: Adephaga

Family: Dytiscidae (Diving beetles)

- Hind legs modified to swimming with fringes of long hairs, and long spur,
- fore legs for mating in male.
- Aquatic beetles.



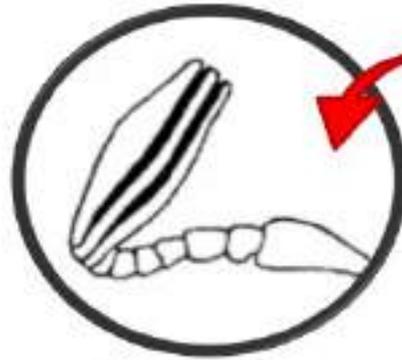
ORDER: COLEOPTERA
LAB 9 (POLYPHAGA(A))

Order: Coleoptera

Suborder: Polyphaga

Family: Scarabaeidae (Scarabaeids or Dung beetles)

- Abdomen with sex visible ventral segments.
- Antenna lamellate.
- fore legs for digging.



Order: Coleoptera

Suborder: Polyphaga

Family: Dermastidae (skin beetles)

- Hind coxae dilated in to plates partly covering base of femora.
- Antennae with large three segmented club at end.
- There body covered with hair or scales.

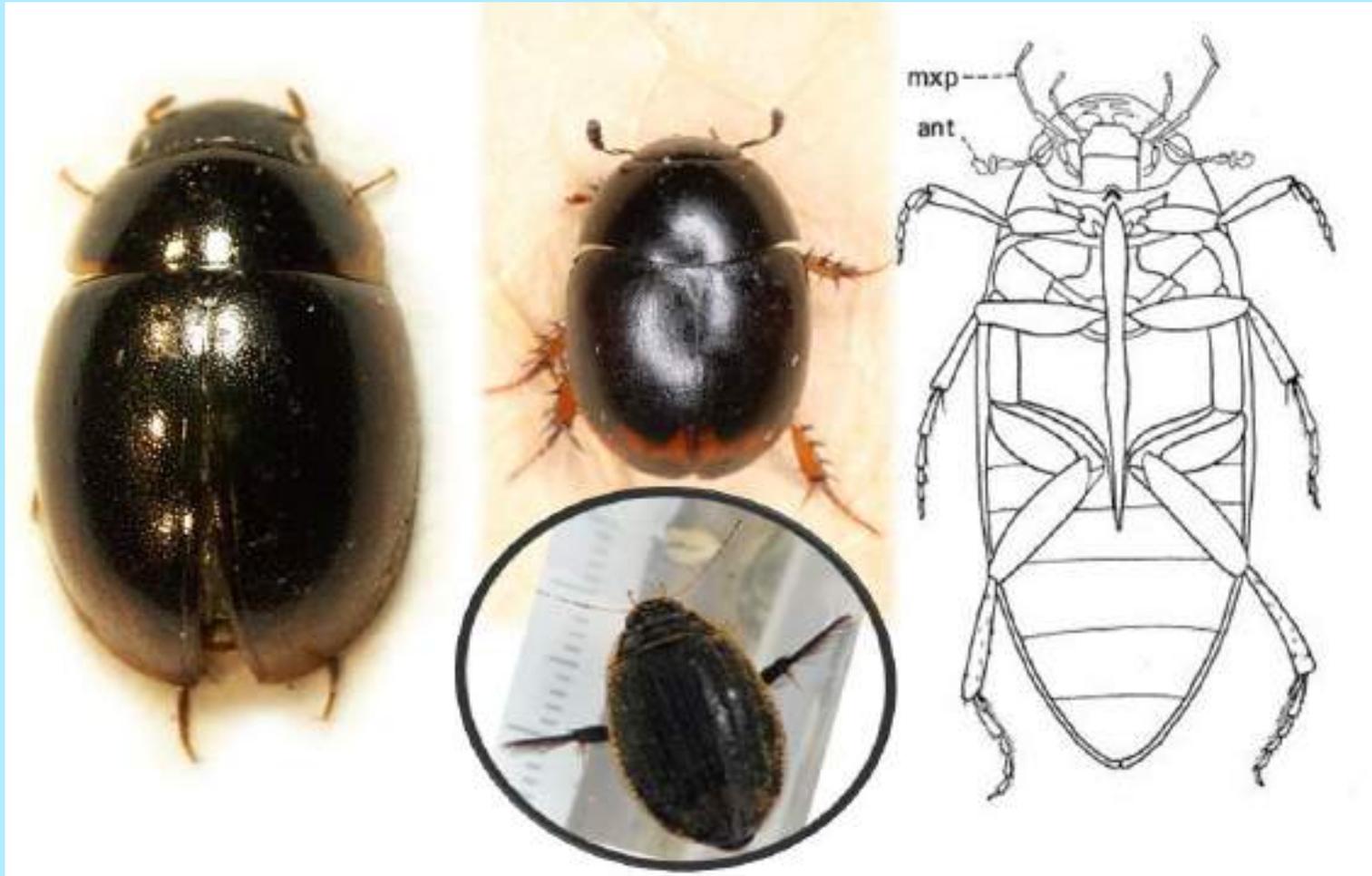


Order: Coleoptera

Suborder: Polyphaga

Family: Hydrophilidae (Water scavenger)

- ☀️ **Oval, convex beetles.**
- ☀️ **aquatic and terrestrial.**
- ☀️ **Metasternum prolonged posteriorly as sharp spin.**



Order: Coleoptera

Suborder: Polyphaga

Family: Buprestidae (Metallic wood borers)

- The first and second abdominal segments fused.
- Prosternum with a spine which fits in to a groove in the mesosternum that made prothorax closely jointed to mesothorax .



Order: Coleoptera

Suborder: Polyphaga

Family: Elateridae (Click beetles)

- Ventral segments not fused.
- Prothorax loosely joined to mesothorax because of prosternum with a movement spine which fits in to a groove in the mesosternum .
- The Click beetles are so named because of their unique scheme for righting themselves when turned on their backs.

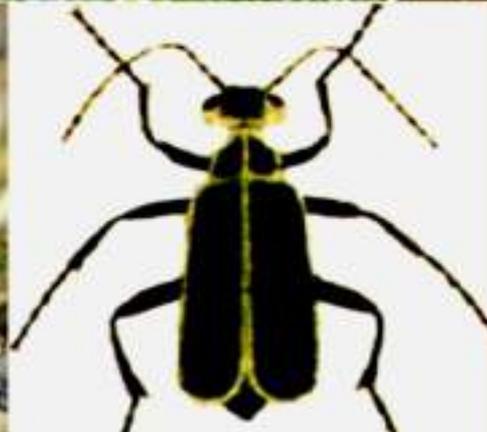


Order: Coleoptera

Suborder: Polyphaga

Family: Meloidae (Blister beetles)

- Hind coxa large and prominent. Front vertical. Claws toothed or cleft.
- Medium sized. Pronotum is narrower than either the head or elytra.
- Contain cantharadin which raises blister when applied human skin.



Order: Coleoptera

Suborder: Polyphaga

Family: Cerambycidae (long horned wood-boring beetles)

- Body elongate, antennae almost always long, often as long as the body or longer.
- Base of antennae usually partly surrounded by eyes.
- Tarsi with five segments.



ORDER: COLEOPTERA
LAB 10 (POLYPHAGA(B))

Order: Coleoptera

Suborder: Polyphaga

Family: Coccinellidae (Ladybird beetles)

- Distinctive shape, convex dorsally and flat ventrally
- Tarsal claws toothed or appendiculate.
- First ventral abdominal segment with distinct curved coxal lines.



Order: Coleoptera

Suborder: Polyphaga

Family: Chrysomelidae (Leaf beetles)

- ✿ Shorter antennae, heavy subcylindrical.
- ✿ Shiny reddish brown with marking on thorax.
- ✿ Front not prolonged into a beak. Abdomen usually wholly covered with elytra.



Order: Coleoptera

Suborder: Polyphaga

Family: Tenebrionidae (Darkling beetles)

- **Front coxal cavities closed behind.**
- **Abdominal with five ventral segments in part grown together.**
- **Next to last segment of tarsi not spongy.**
- **Fore tarsi with five segments while the hind tarsi with only four segments(tarsi 5-5-4).**



Order: Coleoptera

Suborder: Polyphaga

Staphylinidae (Rove beetles)

- Elytra short covering less than half of abdomen, the hind wing folded under them when not in use.
- Abdomen flexible and with 7 or 8 segments visible below.



Order: Coleoptera

Suborder: Polyphaga

Family: Bruchidae (seed weevils)

- **Small front prolonged into a broad quadrate beak.**
- **Elytra exposing tip of abdomen and marked with obscure bands.**



Order: Coleoptera

Suborder: Polyphaga

Family: Curculionidae (Typical snout beetles)

- Snout often long and curved downward. Palpi rigid
- Antennae almost always elbowed (geniculate clavate).

