



# MEDICAL AND VETERINARY ENTOMOLOGY

## INTRODUCTION

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- **SUBJECT CONTENT**

- **Medical and Veterinary important groups of Arthropoda:**

- **Class Myriapoda:** Chilopoda
- **Class Arachnida:** Acari  
Araneae  
Scorpionida  
Solifugae
- **Class Insecta:** Blattodea  
Psocodea (Phthiraptera)  
Siphonaptera  
Hemiptera  
Diptera  
Lepidoptera  
Coleoptera  
Hymenoptera

- **Basics of Forensic Entomology**

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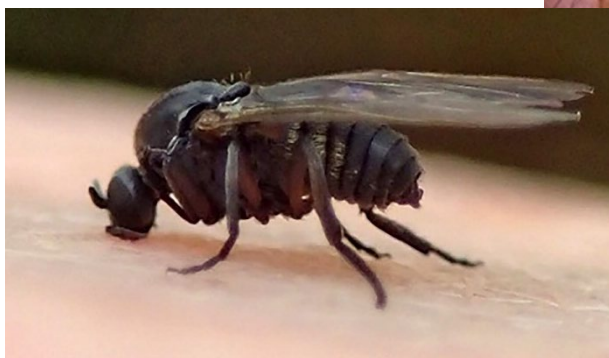
# Arthropoda

- ~ 1 200 000 of described species, possibly up to 30 million species
- They come in all habitats, terrestrial, aquatic (fresh and sea water), even in the air (given they have wings)
- Present in the largest number of various ecological niches and habitats compared to all other groups of animals



# Arthropoda and Health

- Medically important arthropods
- Veterinary important arthropods



# Arthropoda and Health

- Impact on human and animal health:
  - DIRECT (e.g. bee sting, dust mite allergy)
  - INDIRECT as carriers of pathogens (e.g. the virus that causes yellow fever or the bacterium that causes Borreliosis)





- **Vectors: Organisms that transmit diseases from one host to another organism**

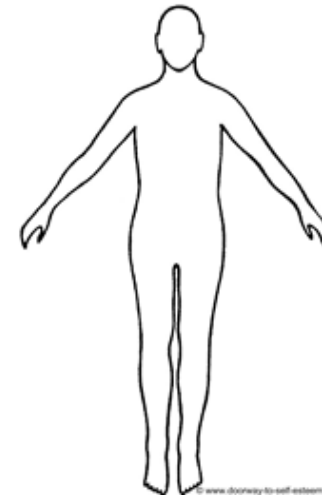
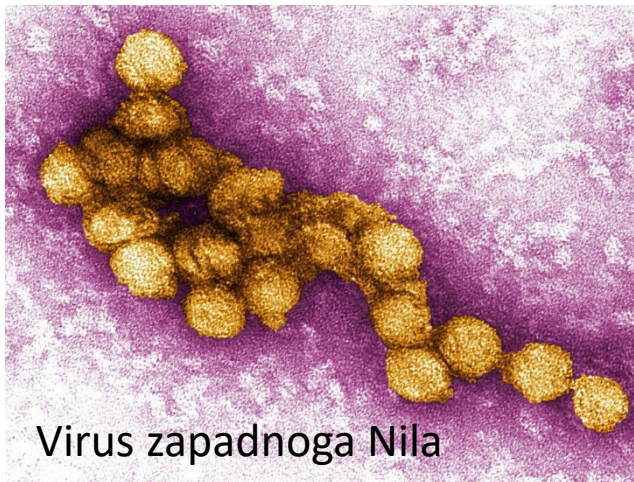


- **Vector-borne diseases: Diseases caused by pathogens that usually require a vector for transmission**

# Arthropoda and Health

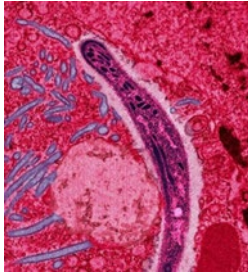


- Arboviruses: comes from "**arthropod-borne virus**", it is a virus that reproduces in arthropods that suck blood and is most often transmitted by a sting or bite





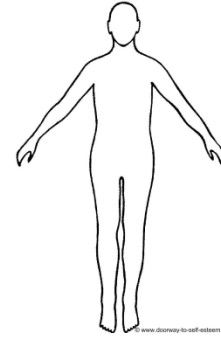
- **Anthroponosis:** A pathogen transmitted mostly or exclusively between humans



Malaria sporozoite



Vector



- **Zoonosis:** The pathogen is transmitted between vertebrate hosts and humans

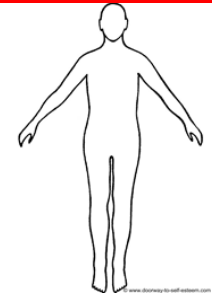
**Some pathogens can belong to both groups, eg. Zika virus**



West Nile virus



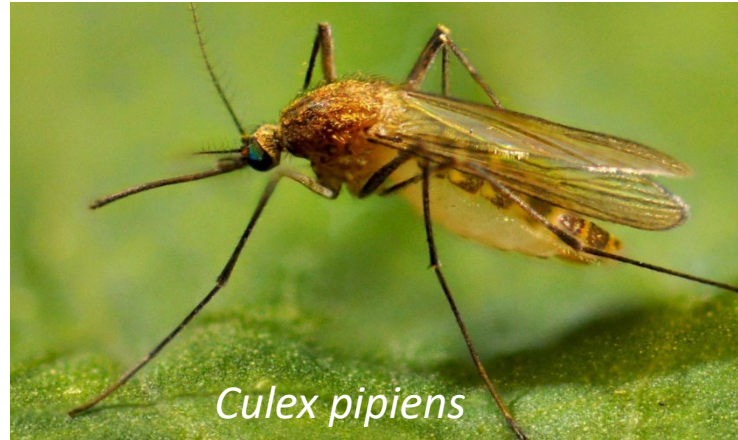
*Culex pipiens*







- **Biological transmission:** is transmission that involves multiplication and/or change of form of the pathogen in the vector



- **Mechanical transmission:** transmission without change or multiplication, the pathogen is passively transmitted via a vector



# Arthropoda and Health

- What do they cause?

NUISANCE

**PROTOZOAN INFECTIONS**

**BACTERIAL INFECTIONS**

**VIRAL INFECTIONS**

**TISSUE INVASION**

**PAIN**

**ENVENOMATION**

**ALLERGIC REACTIONS**

PSYCHOLOGICAL DISORDERS:

ENTOMOPHOBIA,

ARACHNOPHOBIA, AKAROPHOBIA

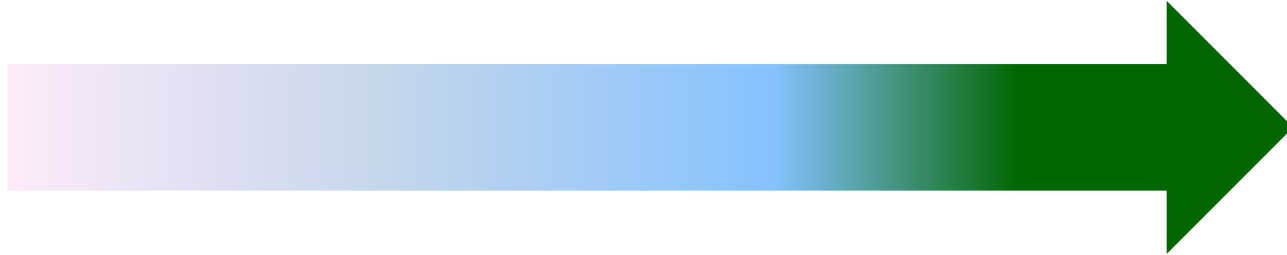
**FUNGAL INFECTIONS**

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## Psychological disorders

**PHOBIA**

**DELUSIONAL  
PARASITOSIS**



**FLASHLIGHTS AND  
TEMPORARY  
HALLUCINATIONS**

# Arthropoda and Health

## Psychological disorders

### PHOBIA



# Arthropoda and Health

## Psychological disorders

### PHOBIA

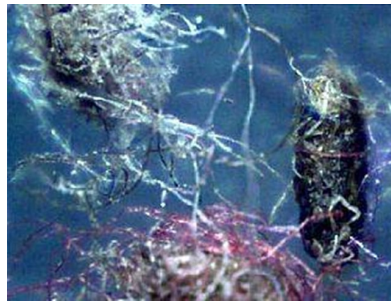




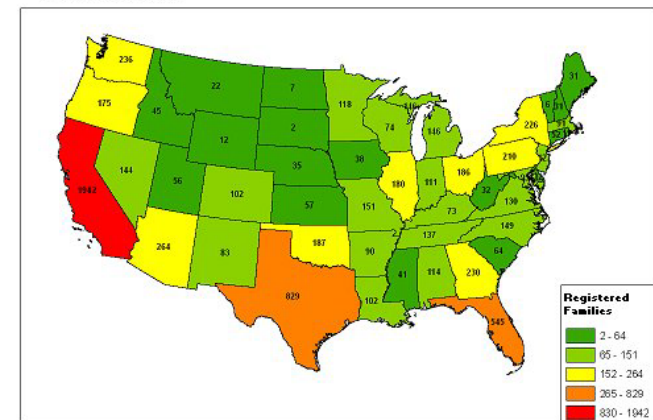
# Arthropoda and Health

## Psychological disorders - DELUSIONAL PARASITOSIS (ECBOM SYNDROME OR ELLIOT'S DISEASE)

- Serious psychological disorder
- More common in women in middle or late years
- Imaginary and real symptoms (caused by other diseases - e.g. psoriasis)
- **MORGELLON'S DISEASE** - some consider it a delusional parasitosis, but today there is more and more evidence that it is a real disease whose cause is still unknown



U.S. Families Registered with the Morgellons Research Foundation  
February 2, 2007



# Arthropoda and Health

## Psychological disorders - DELUSIONAL PARASITOSIS (ECBOM SYNDROME OR ELLIOT'S DISEASE)

- Delusional parasitosis caused by the use of amphetamines, cocaine and alcohol...



# Arthropoda and Health

Most (though not all) are acquired through a sting or bite

- What do they cause?

NUISANCE

**PROTOZOAN INFECTIONS**

**BACTERIAL INFECTIONS**

**VIRAL INFECTIONS**

**TISSUE INVASION**

**PAIN**

**ENVENOMATION**

**ALLERGIC REACTIONS**

PSYCHOLOGICAL DISORDERS:

ENTOMOPHOBIA,

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**FUNGAL INFECTIONS**

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# Arthropoda and Health

- Stings and bites





## Stings and bites

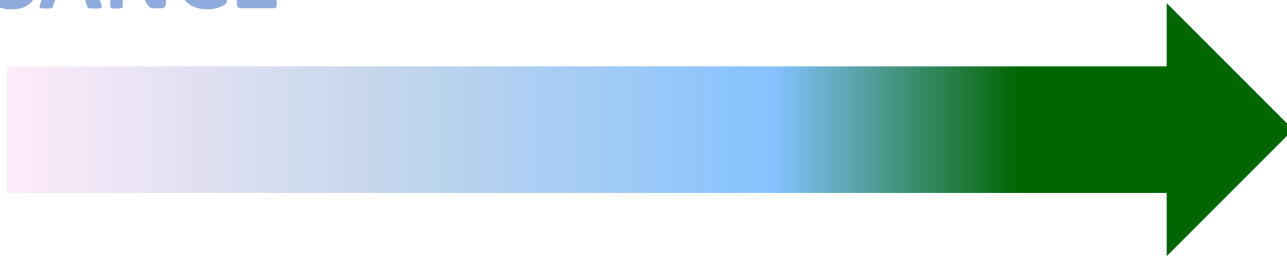
- Pain, disturbances, inflammation, allergies, anaphylaxis, envenomation, ulceration, necrosis, secondary infection, gangrene, pathogen transmission, etc...



## Stings and bites

**NUISANCE**

**ENVENOMATION,  
ANAPHYLACTIC SHOCK**



**PAIN AND ALLERGIC  
REACTION**

# Arthropoda and Health

## ANAPHYLAXIS

- Anaphylaxis is an acute, life-threatening, allergic reaction mediated by IgE antibodies that occurs in previously sensitized individuals when they come into contact with the sensitizing antigen.
- Symptoms: drop in blood pressure, rash, swelling, bronchospasm, etc. May lead to anaphylactic shock (fatal if epinephrine (adrenaline) is not administered)



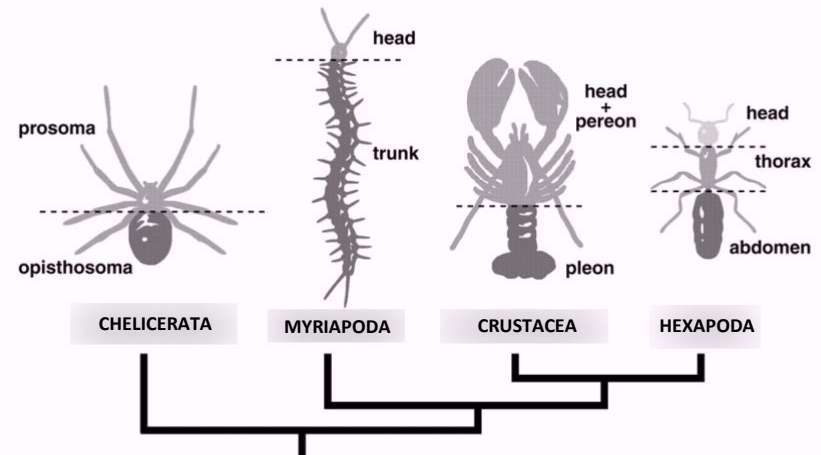
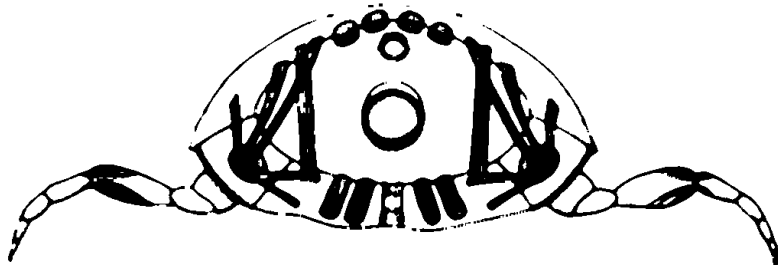
"Are you allergic to anything? I mean, aside from whatever it was that bit you?"

CARTOON  
COLLECTIONS  
.com

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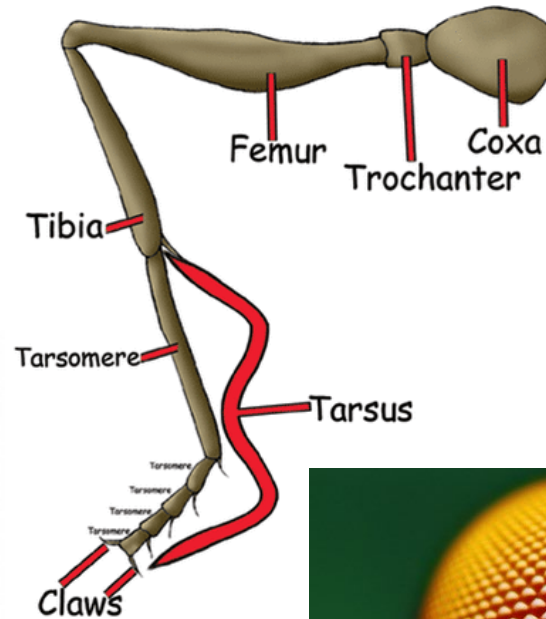
# Arthropoda

- The most important characteristic of Arthropods is the organization of the body into tagmes or a set of segments specialized into functional parts
- Tagmatization allowed arthropods to have a variety of body designs
- External and internal segmentation or tagmatization
- Hardened exoskeleton composed of cuticle (hardened by calcification or scleratization)



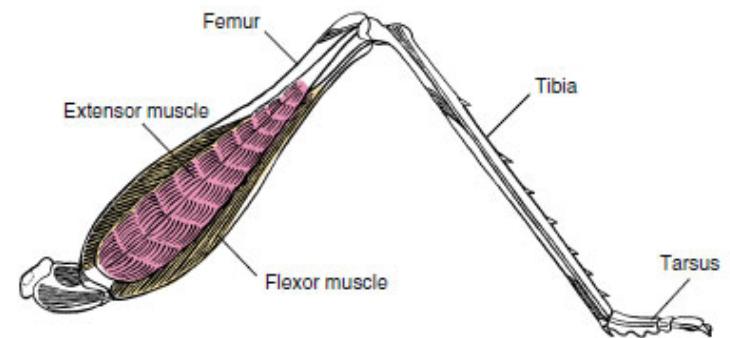
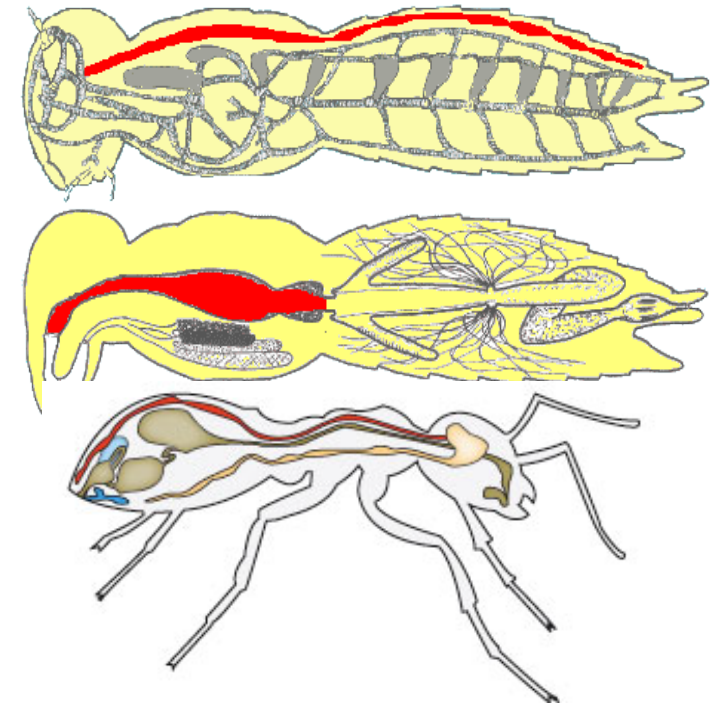
# Arthropoda

- Exoskeleton composed of articulated parts
- Articulated body appendages (where the name Arthropoda comes from)
- Compound eyes
- Reduced coelom



# Arthropoda

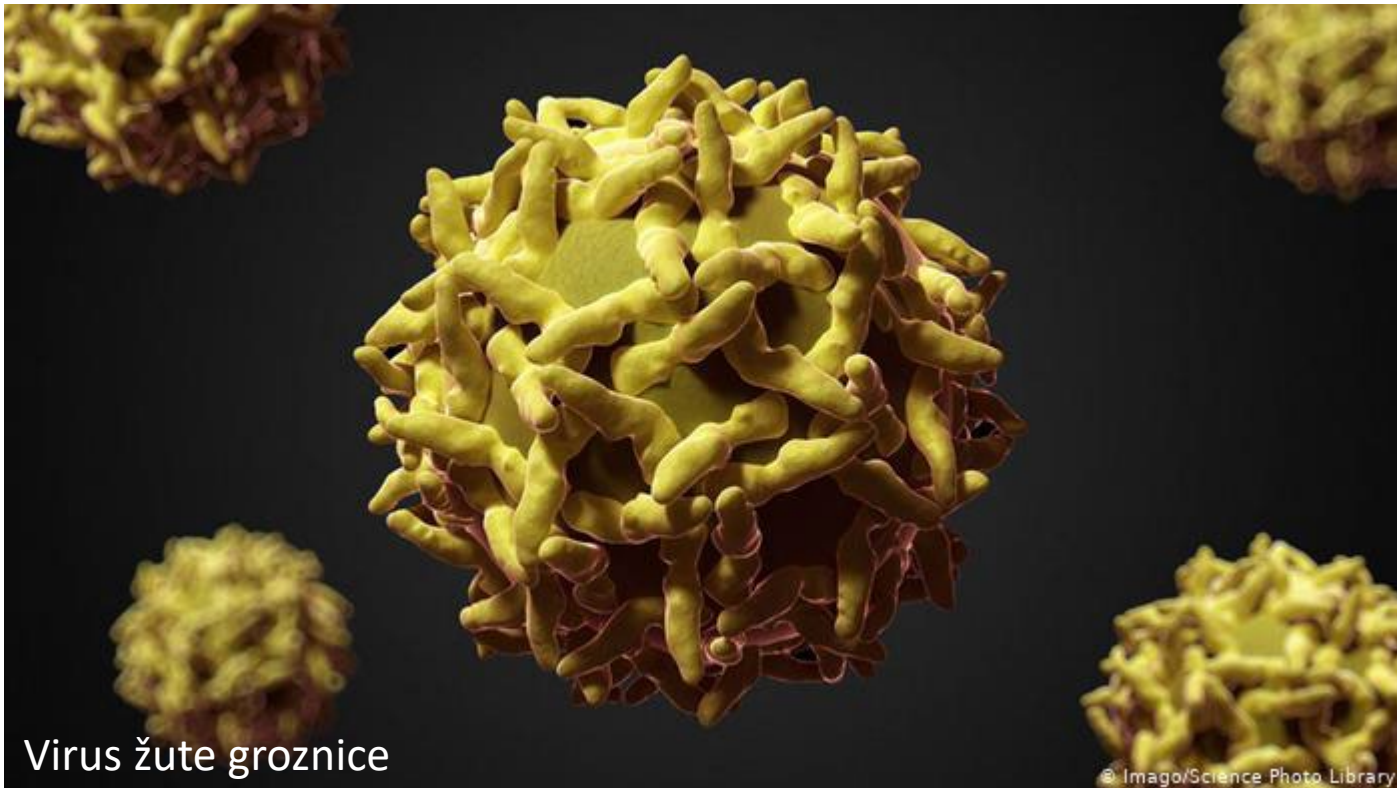
- Open circulatory system with a dorsal heart
- Complete digestive system
- Ventral nerve cord
- Growth with casting off the outer cuticle
- Cross-striated muscles (flexor and extensor)





# Arthropoda and pathogens

- A pathogen or germ is a biological agent that causes an organism's disease - greek "one who causes suffering"
- **VIRUSES** - need a host cell to replicate (yellow fever virus, West Nile virus, Zika virus, ...)



Virus žute groznice





# Arthropoda and pathogens

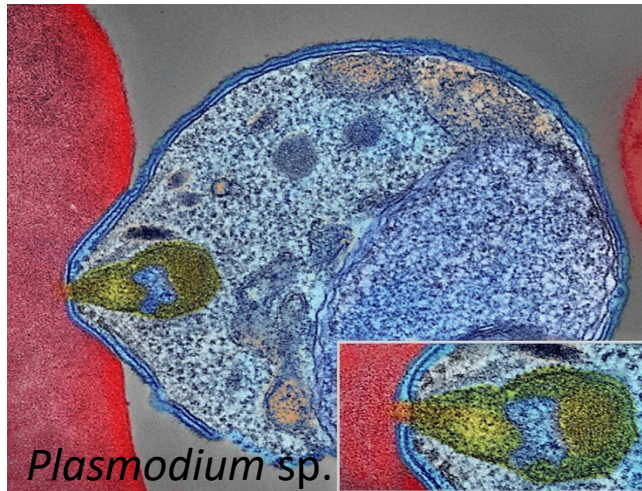
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- **BACTERIA** - prokaryotic, single-celled organisms (e.g. *Yersinia pestis* - the causative agent of the plague, *Borrelia burgdorferi* - the causative agent of Lyme disease)





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- **PHAGOTROPHIC PROTISTS** - eukaryotic unicellular organisms (e.g. *Plasmodium* spp. (causing agents of malaria), *Trypanosoma cruzi* (causing agent of Chagas disease),...





# Arthropoda and pathogens

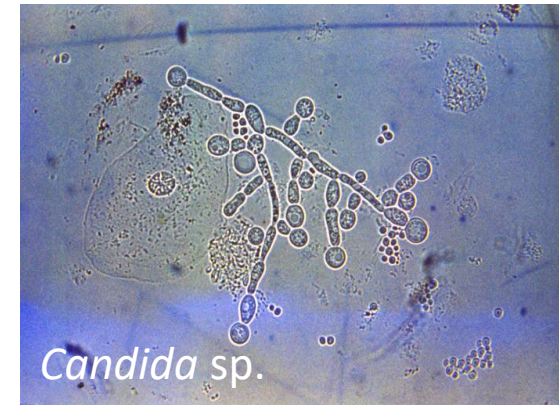
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- **PARASITIC METAZOA** - animals that live inside hosts (e.g. nematode *Onchocerca volvulus* - the cause of river blindness),...





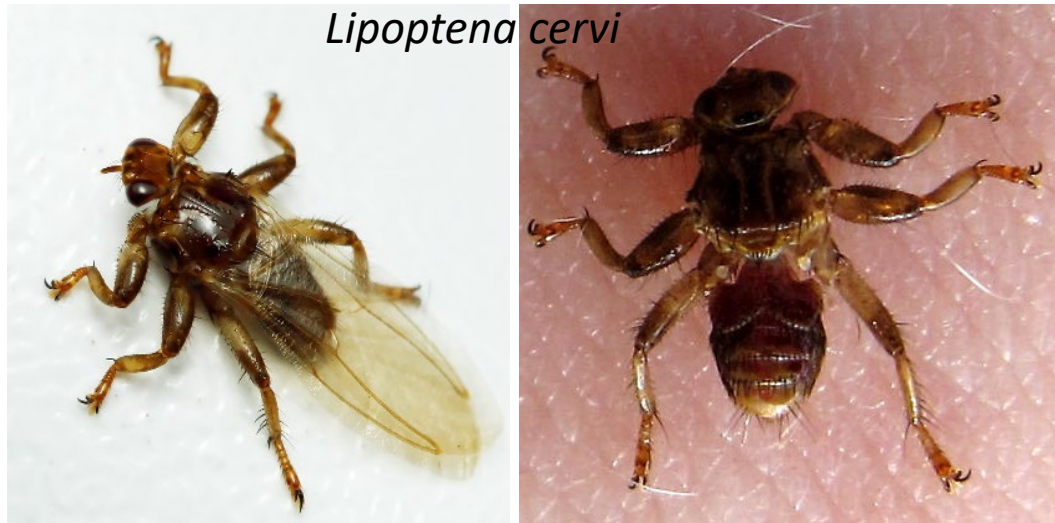
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- PARASITIC METAZOA - animals that live inside hosts (e.g. nematode *Onchocerca volvulus* - the cause of river blindness),...
- **FUNGI** - usually mechanical transmission of yeasts and molds (e.g. *Candida* spp., *Aspergillus* spp.)



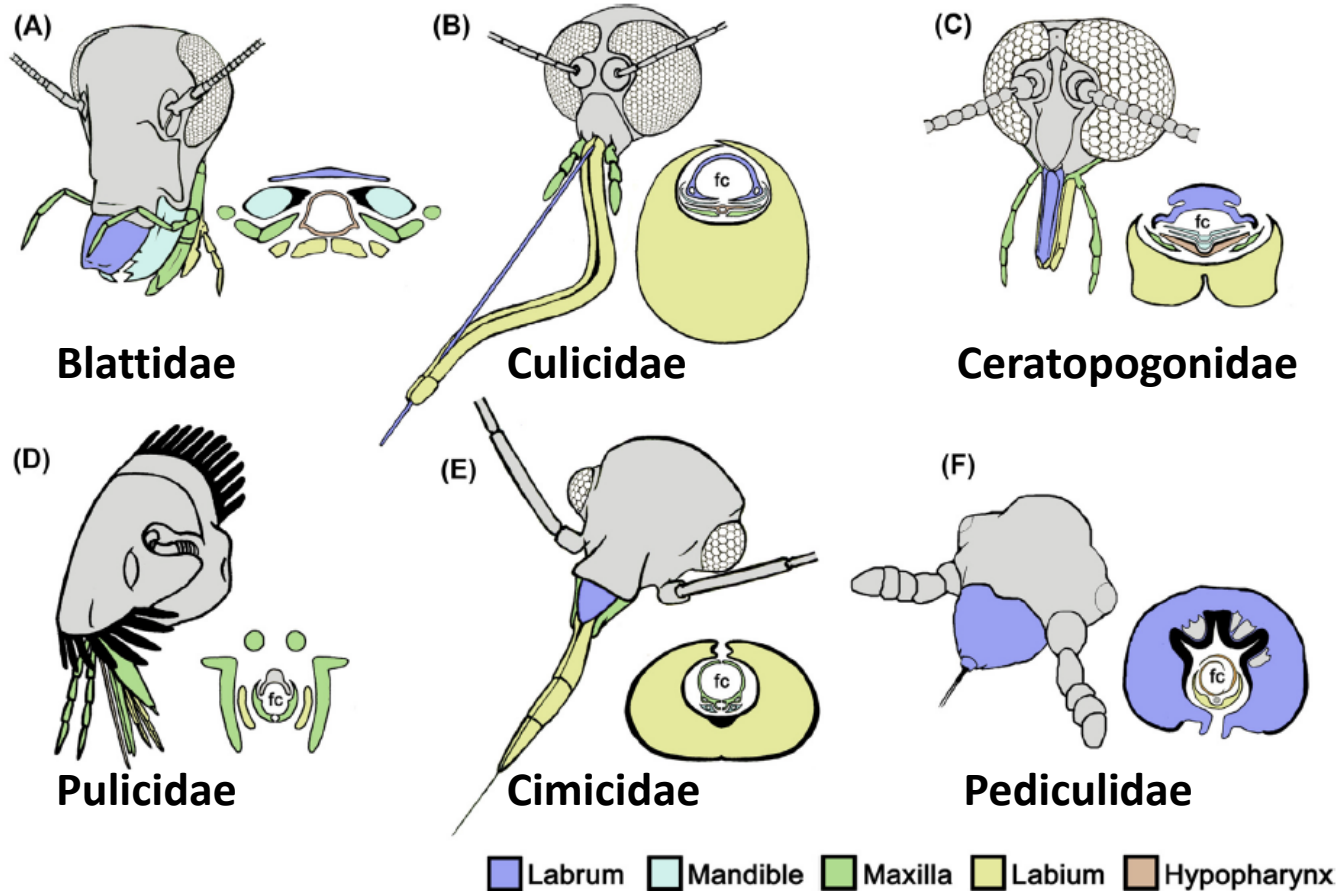
# Arthropoda and morphological adaptations

- **Body shape** - often present dorsoventrally (bedbugs, lice, ticks,...) and laterally (fleas) flattened body - species that only spend a short time on the host do not have body shape changes (e.g. mosquitoes, deerflies and horseflies,...)
- **Wings** - very important for finding hosts, but also completely lost in some (fleas, lice, bedbugs) or they can be discarded when they find hosts (Hippoboscidae: *Lipoptena* spp.)



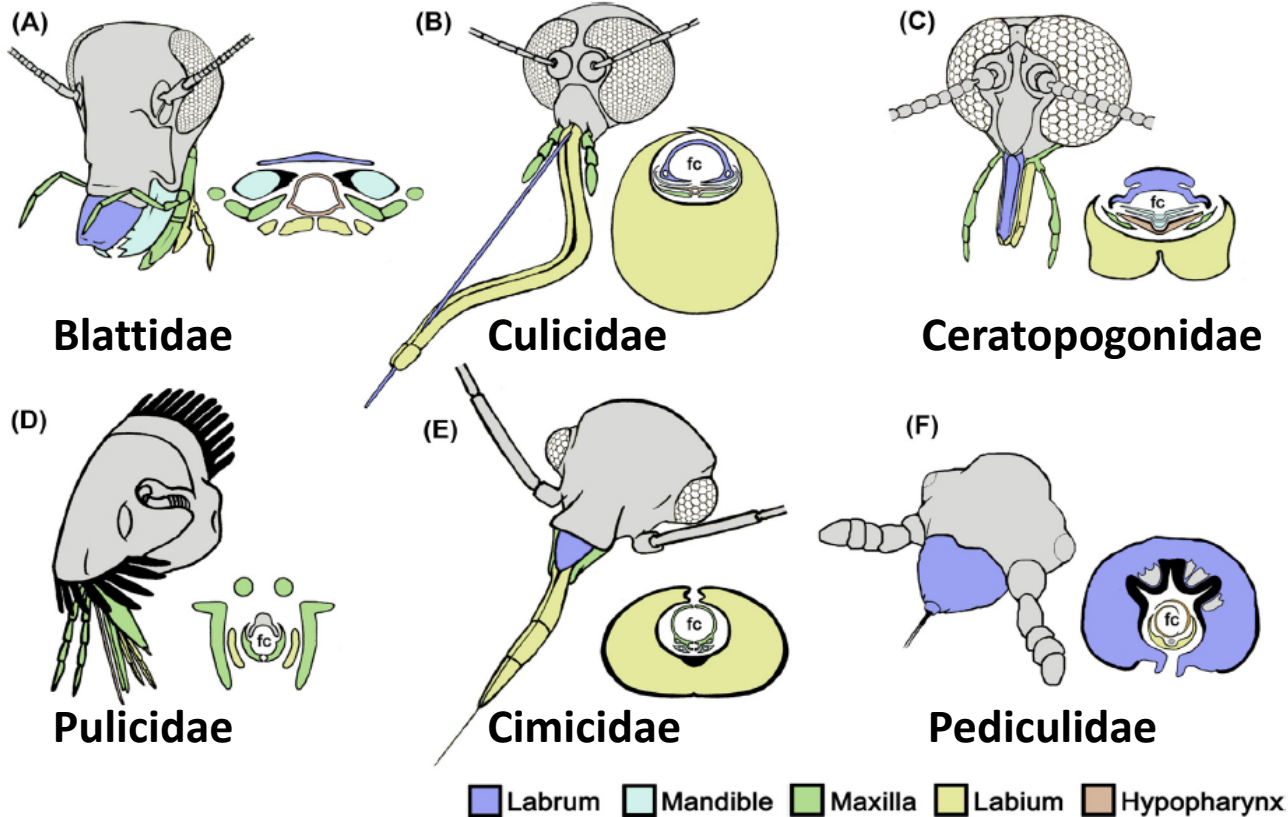
# Arthropoda and morphological adaptations

- Oral organs - adapted for feeding with body fluids - most often blood, but also lymph, skin secretions and tears (stinging and sucking organs) or feeding outside on the skin - pieces of discarded skin, hair or feathers (biting organs)



# Arthropoda and morphological adaptations

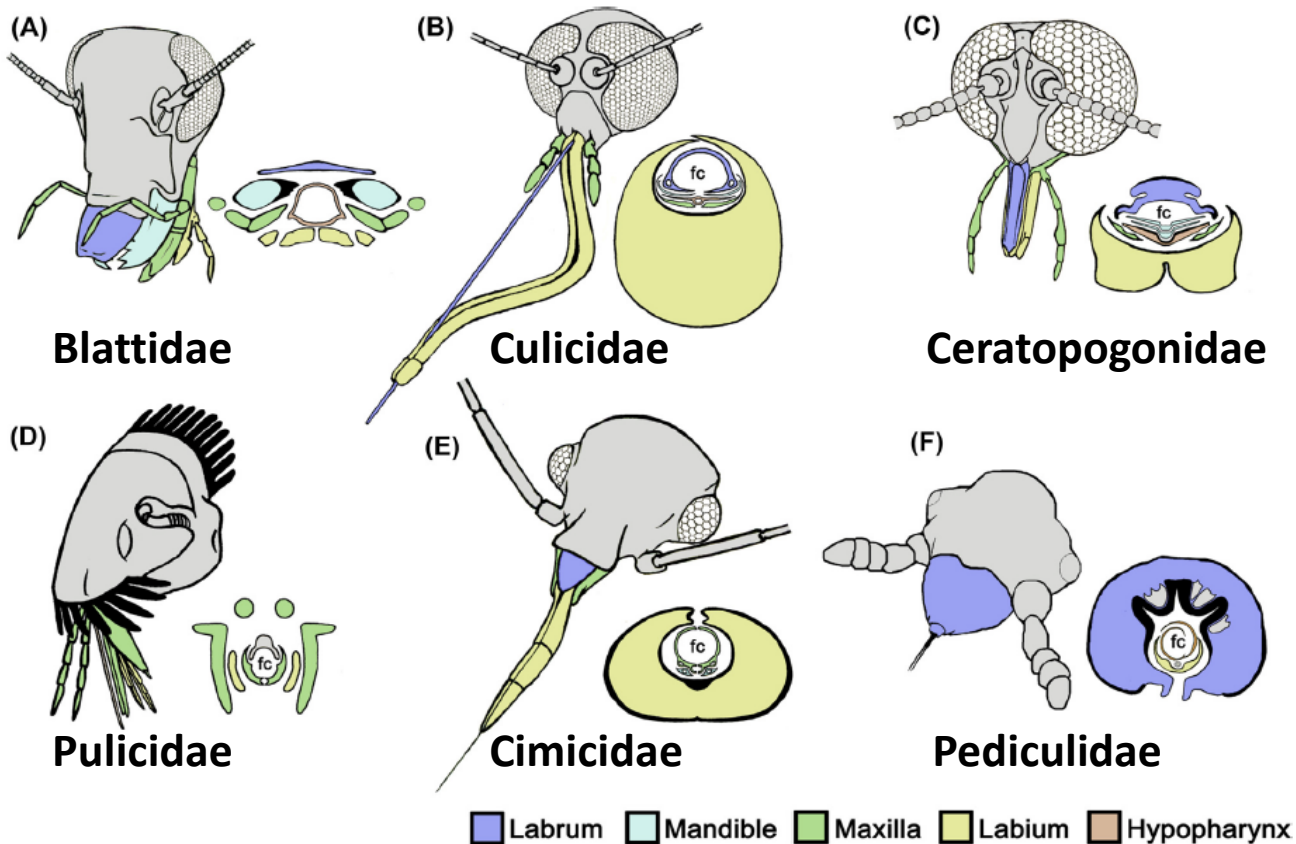
- Mouth Organs – Stinging Organs – **TELMOPHAGY** – cutting the host's skin and feeding in the pool of blood created as a result of damage to all the capillaries at the site of the sting (skin incision) – Simuliidae (scaly flies), Tabanidae (horseflies and deerflies), Ceratopogonidae (biting midges) – lots more painful stings and a greater possibility of secondary infection



# Arthropoda and morphological adaptations



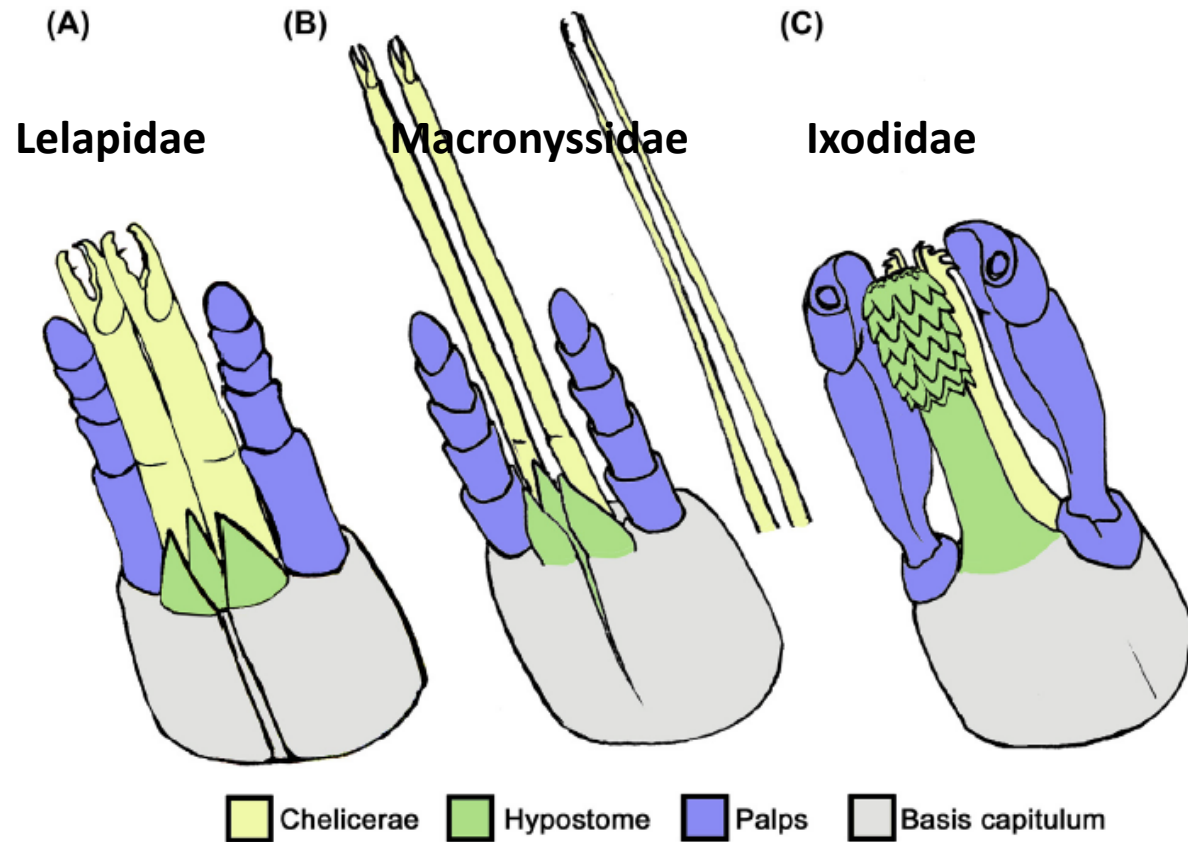
- Oral organs - Stinging organs - **SOLENOPHAGY** - piercing the host's skin in an individual capillary and feeding directly from the capillary itself - Culicidae (mosquitoes), Cimicidae (bedbugs), Pediculidae (lice) - a more advanced way of feeding, stings are not painful





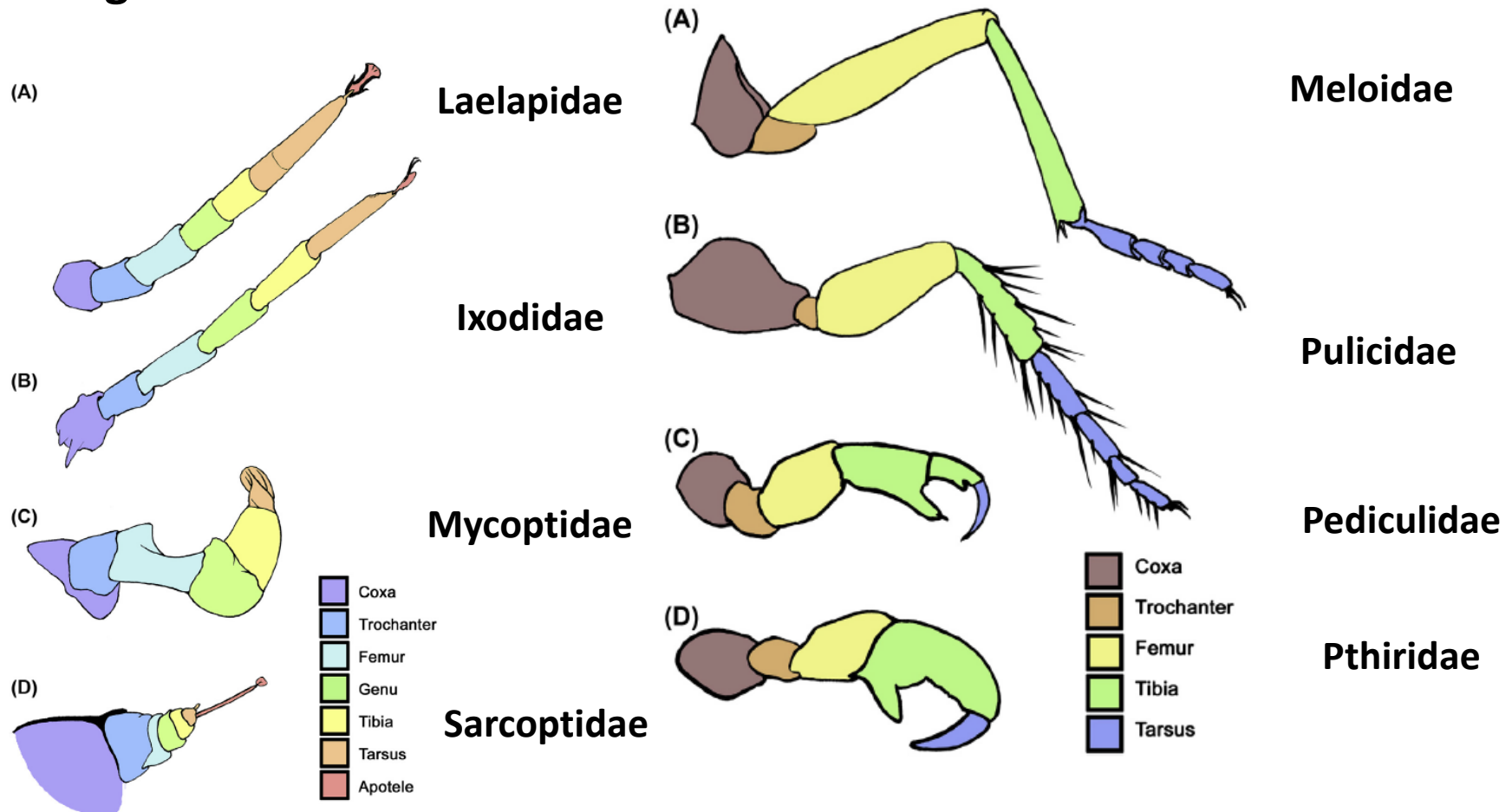
# Arthropoda and morphological adaptations

- Oral organs - Acari - oral organs adapted for piercing the skin, accepting the individual as caretakers and for sucking blood - the tip of the chelicera resembles a pair of tweezers (CHELATE - one fixed, the other movable) - in ticks the CHELAE is lost and looks like a short dagger, and the hypostome is used for fastening

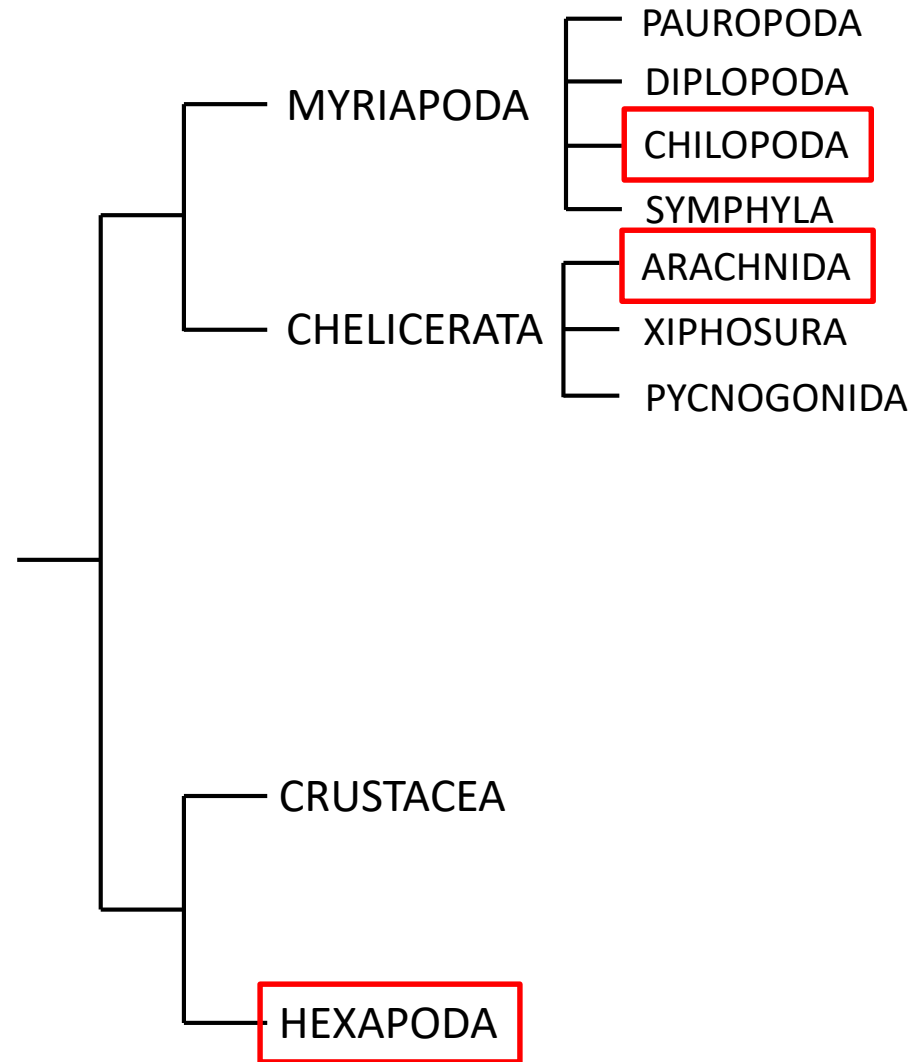
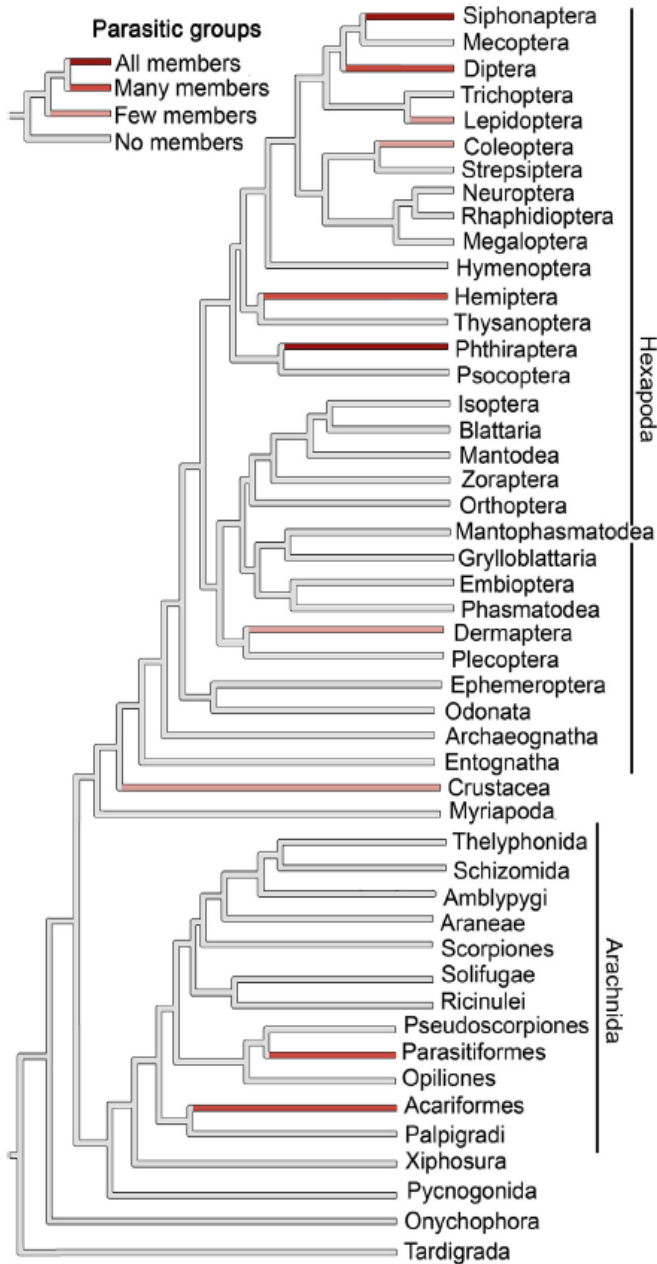


# Arthropoda and morphological adaptations

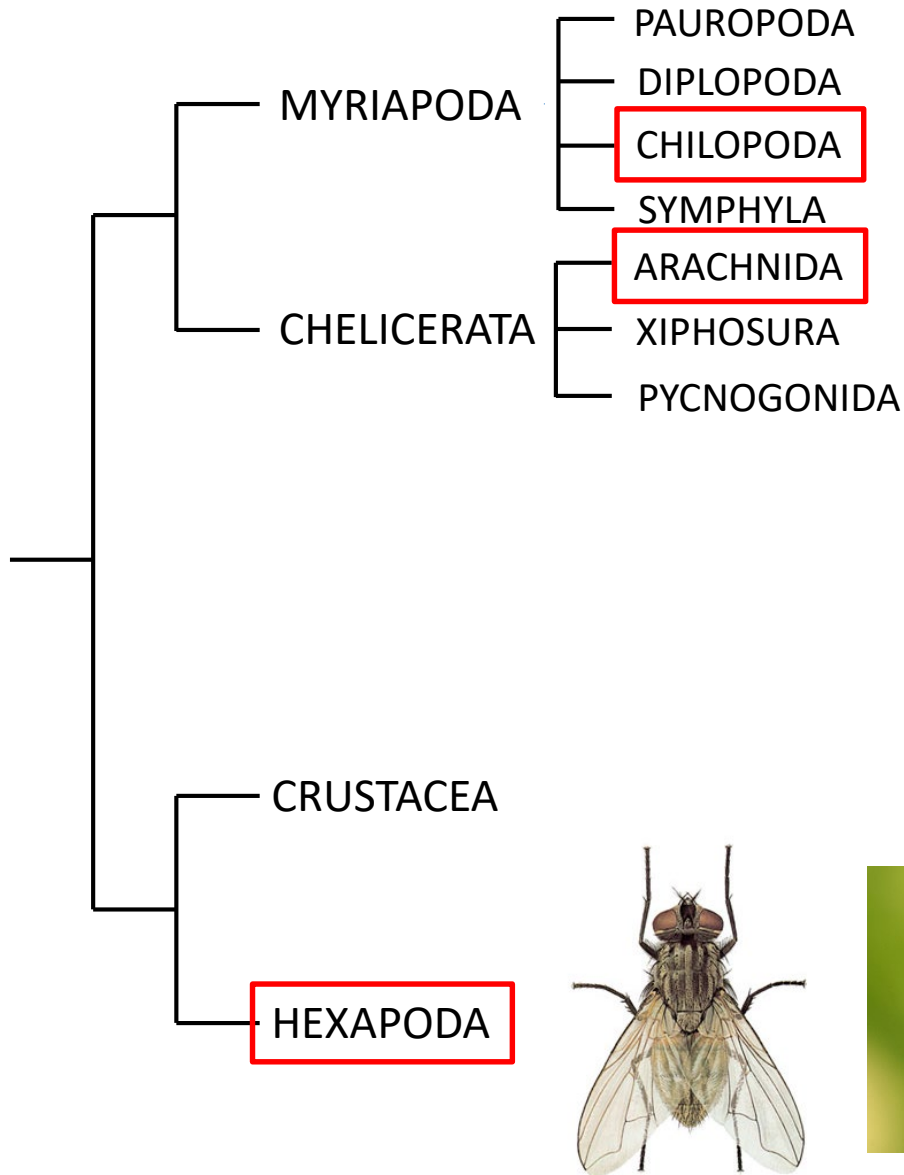
- Legs - those groups that live a longer part of their lives or their whole lives on their hosts (lice, ticks, fleas, Hippoboscidae) have very enlarged legs in relation to the body or with special structures that allow easier holding on to hair or feathers



# Medically important Arthropoda



# Medically important Arthropoda



# Medically important Arthropoda - Arachnida

4 orders of medical and veterinary importance



SOLIFUGAE



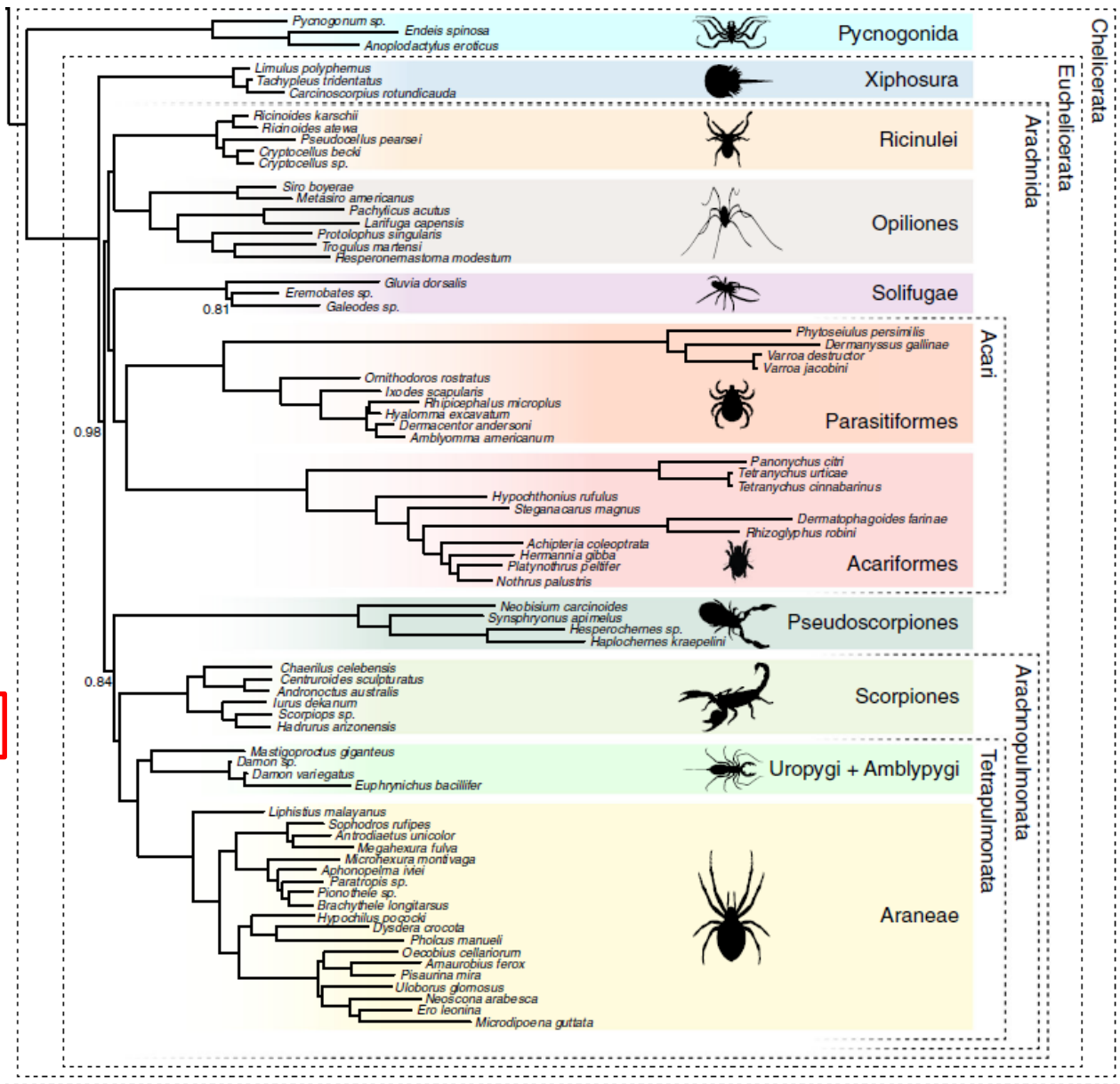
ACARI



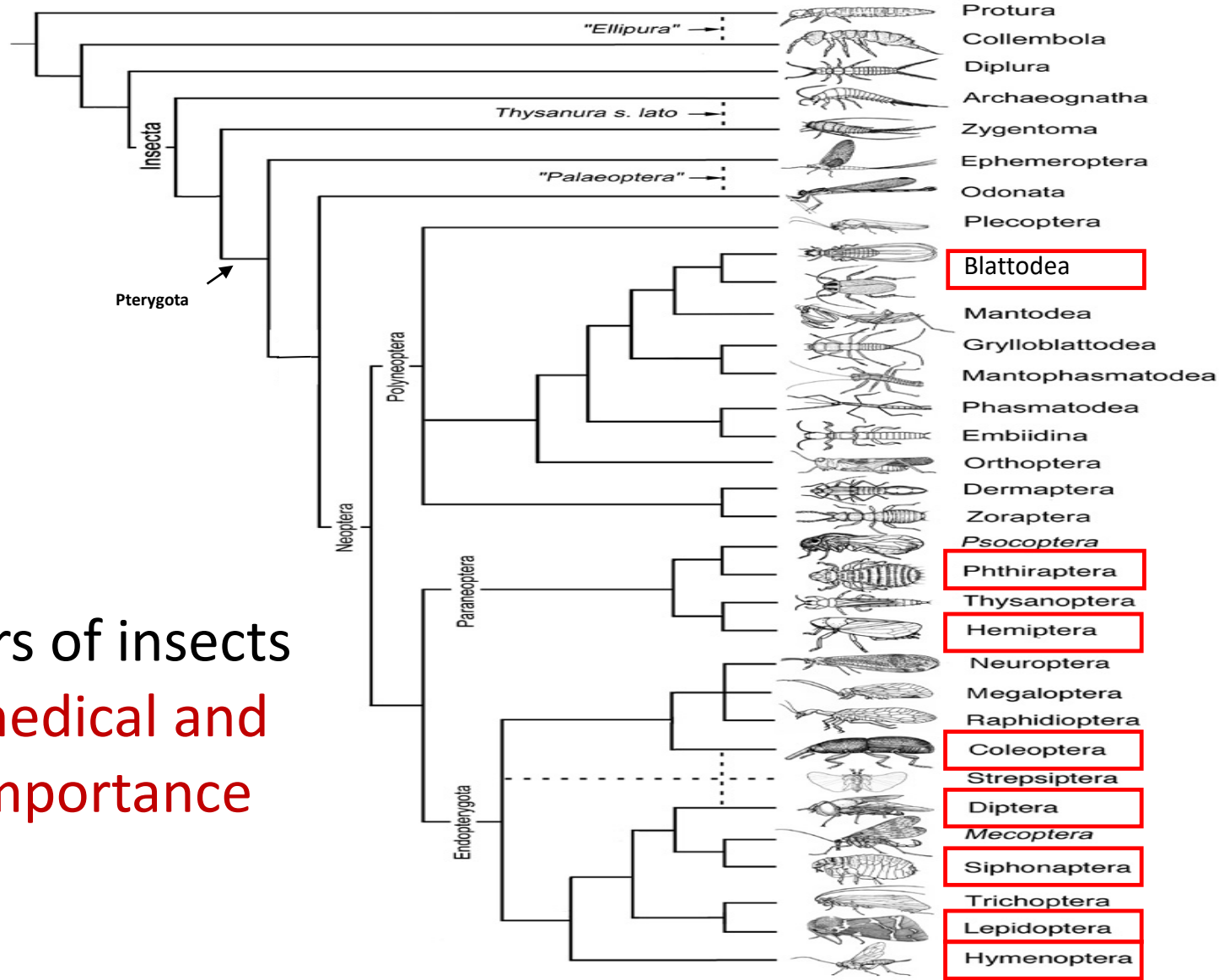
SCORPIONES



ARANEAE



# Medically important Arthropoda - Insecta



29 or 28 orders of insects  
 8 orders of medical and  
 veterinary importance

# The groups we will cover during the lectures

## **Class Myriapoda**

**Order Chilopoda**

## **Class Arachnidae**

**Order Acari**

**Order Araneae**

**Order Scorpionida**

**Order Solifugae**

## **Class Insecta**

**Order Blattodea**

**Order Psocodea**

**Order Siphonaptera**

**Order Hemiptera**

**Order Diptera**

**Order Lepidoptera**

**Order Coleoptera**

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