

# MEDICAL AND VETERINARY ENTOMOLOGY

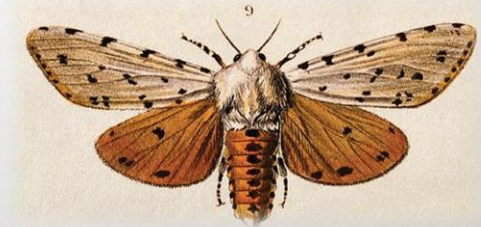
Hymenoptera and



Lepidoptera



as vectors of pathogens



**ASST. PROF. VLATKA MIČETIĆ STANKOVIĆ,**

**SENIOR CURATOR**

# Order HYMENOPTERA



- > 120 000 species
- Membranous well developed wings
- Large compound eyes



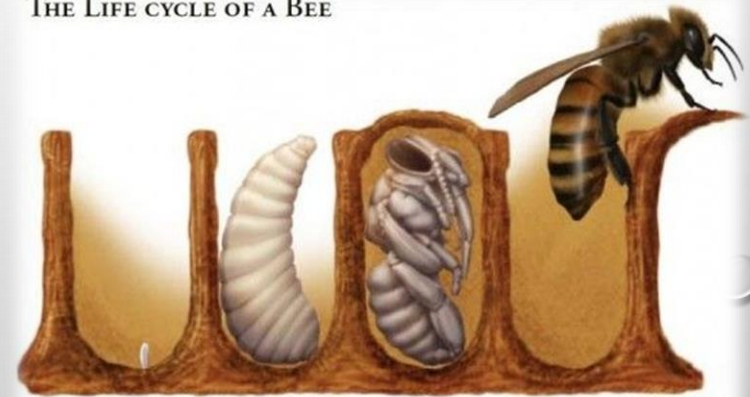
Symphyta



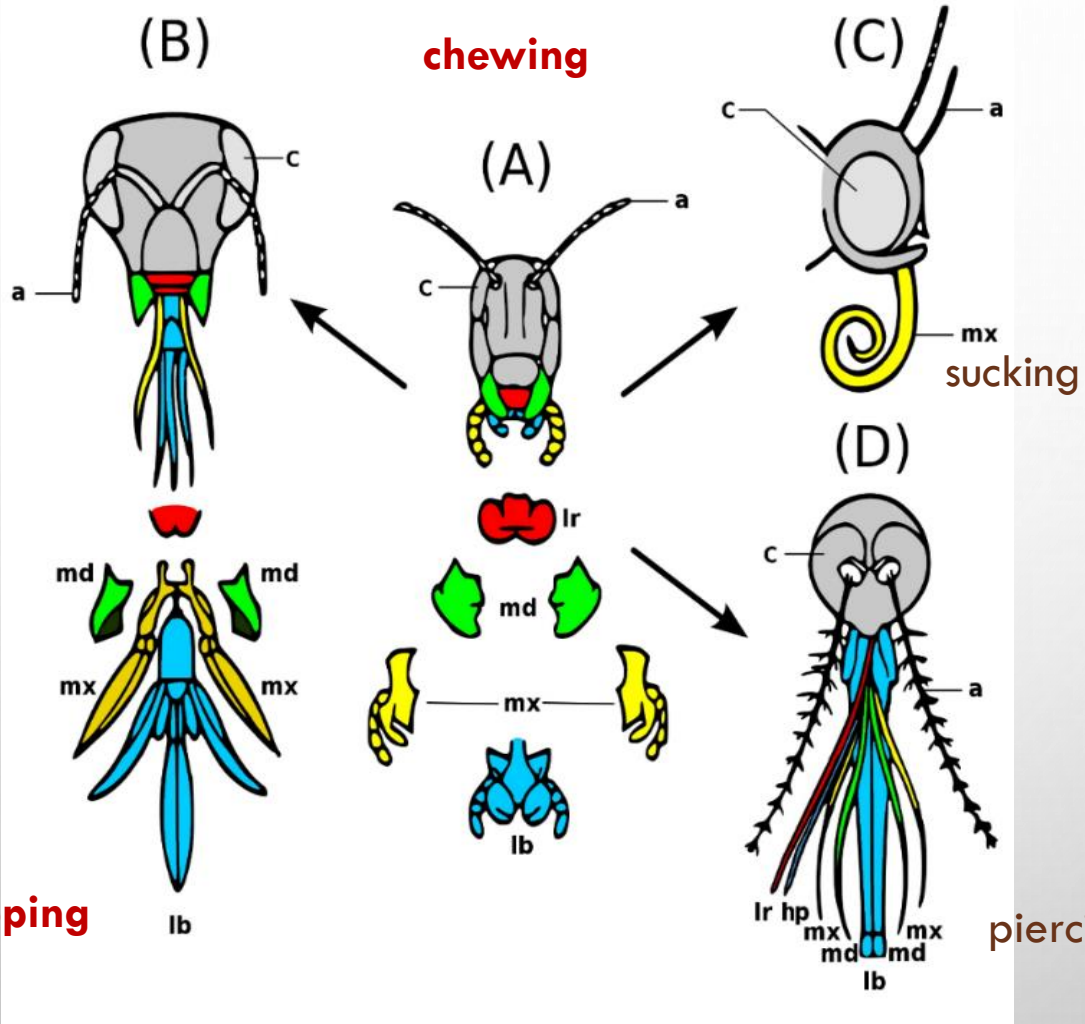
Apocrita



THE LIFE CYCLE OF A BEE



EGG LARVAE PUPAE ADULT



**lapping**

**piercing and sucking**

# Order HYMENOPTERA



Carstvo Animalia

Podcarstvo Bilateria

Koljeno Arthropoda Arthropoda

Potkoljeno Hexapoda

Razred Insecta

Podrazred Pterygota

Nadred Holometabola

Red Hymenoptera

Podred Apocrita

Mon. skupina Aculeata

VESPOIDEA

APOIDEA



Formicidae  
ants



Mutillidae



Pompilidae



Vespidae  
wasps

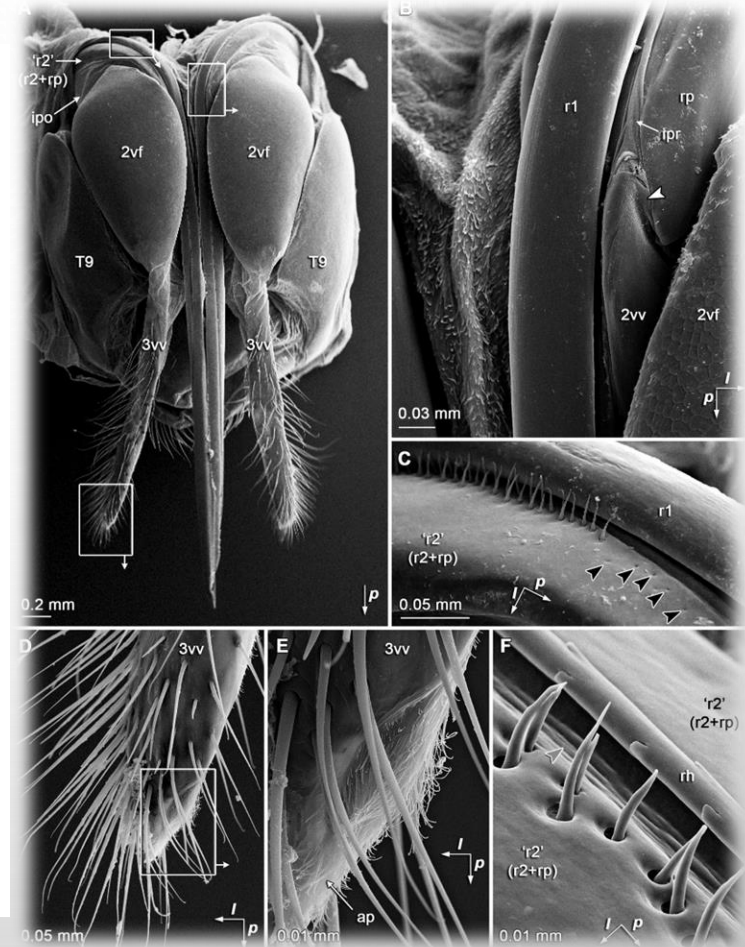
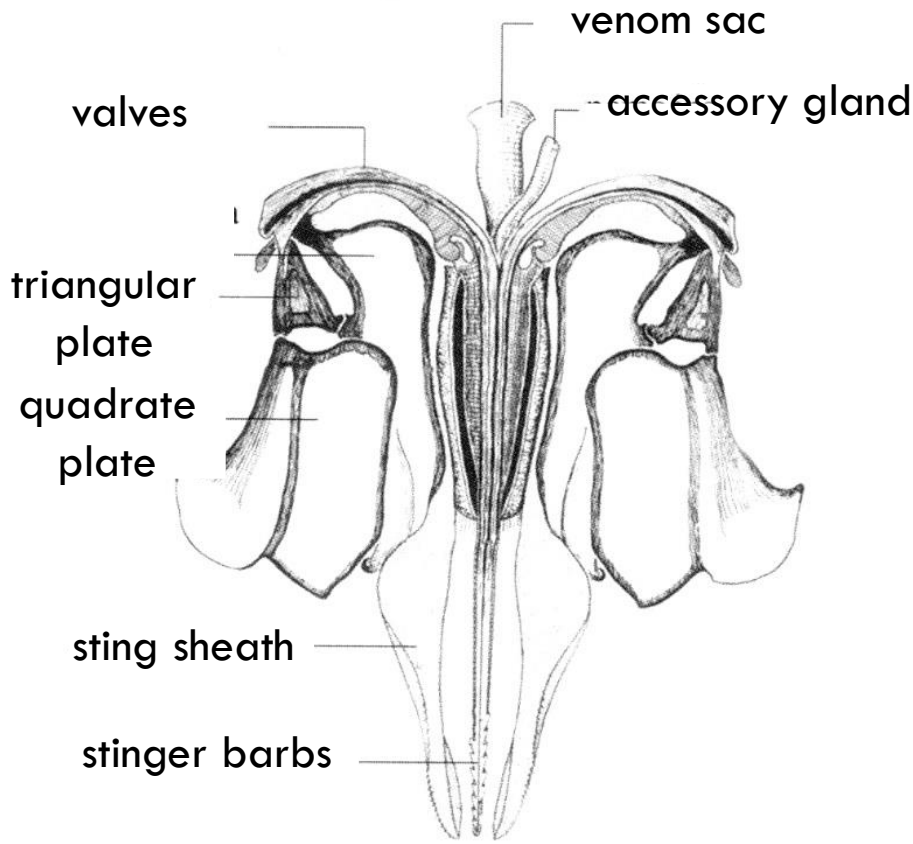


Apidae  
honey bees



Halictidae  
sweat bees

# Order HYMENOPTERA



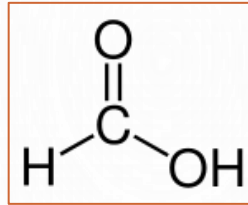
The stinging apparatus of the bee

Photography of stinging apparatus of hornet by electronic microscope

# Order HYMENOPTERA

## Formicidae

- cosmopolitan
- social insects



### Formic acid

cytotoxic, hemotoxic, fungicidal,  
insecticidal, bactericidal

- Genus *Solenopsis* > 200 species, native to S. America



*Solenopsis invicta* Buren, 1972  
fire ant



*Paraponera clavata*  
(Fabricius, 1775)  
bullet ant



# Order HYMENOPTERA



## Formicidae



- 2 mm body size
- native to tropical Asia
- colonies to several millions
- vectors of pathogens:  
*Staphylococcus*, *Pseudomonas*,  
*Klebsiella*, *Enterobacter*,  
*Acinetobacter*, *Escherichia*,  
*Listeria*; *Candida*, *Aspergillus*..

*Monomorium pharaonis* (Linnaeus, 1758)  
pharaoh ant



Distribution



# Order HYMENOPTERA

## Vespidae



*Vespula germanica* (Fabricius, 1793)



*Vespa velutina* Lepeletier, 1836



## Apidae



*Apis*: *A. mellifera* Linnaeus, 1758

*A. dorsata* Fabricius, 1793

*A. cerana* Fabricius, 1793

*A. florea* Fabricius, 1787



**Apitherapy**  
bee venom therapy



# Order HYMENOPTERA

## Veterinary importance

Fire ants – just hatched or born animals

Wasps – mastitis in cows; wounds and skin lesions in horses



*Apis mellifera scutellata*  
Lepeletier, 1836  
african bee



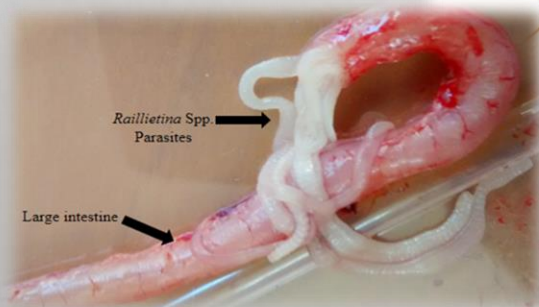
*Raillietina tetragona* (Molin, 1858)



*Formica* spp.



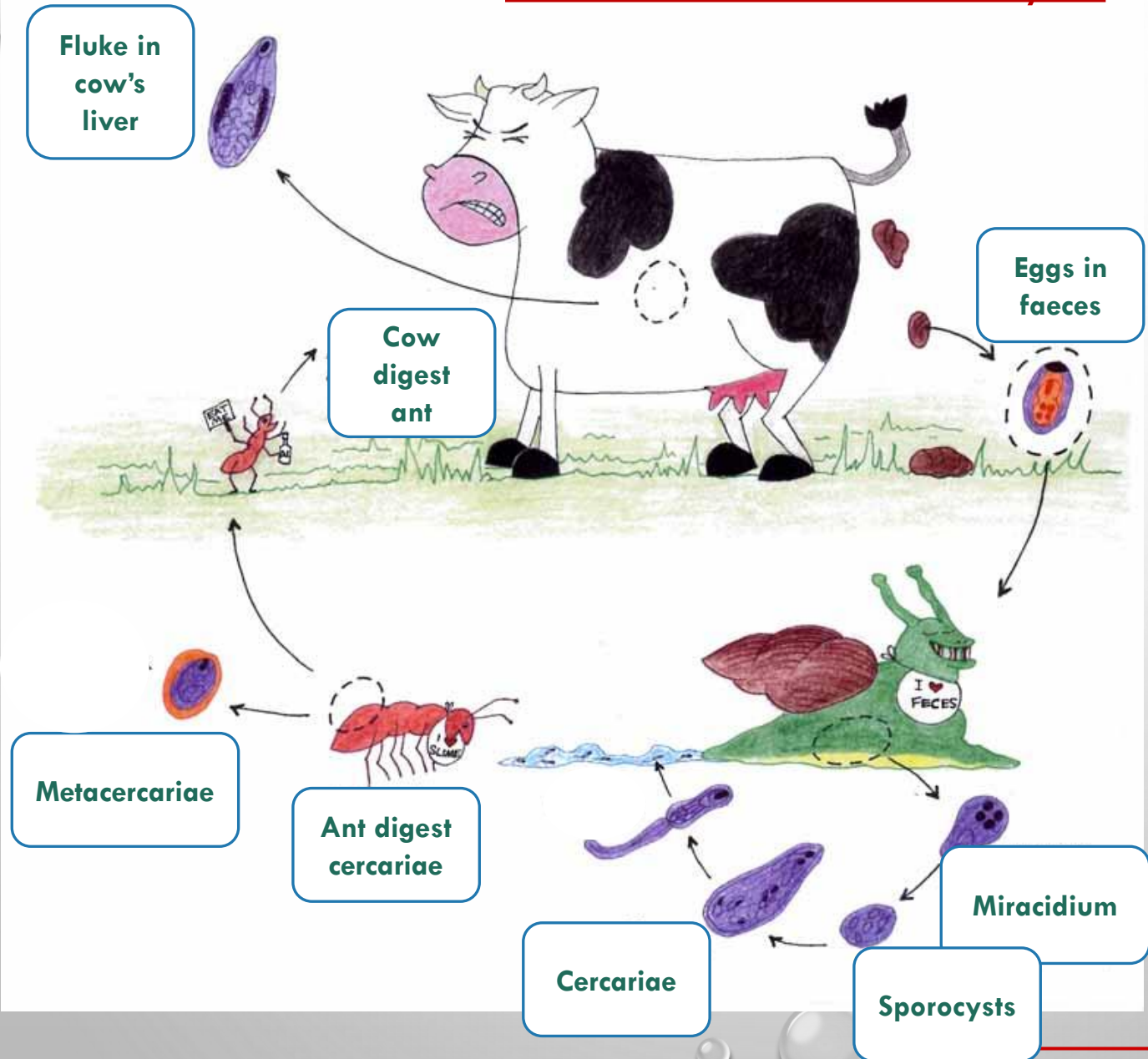
*Dicrocoelium dendriticum* (Rudolphi, 1819)  
lancet liver fluke



poultry

\*Lofgren, 1986; Kamal i sur., 2020

# Lancet liver fluke – life cycle



MIRACIDIUM –  
ciliated  
swimming larvae

CERCARIAE –  
larvae with tail

METACERCARIAE  
– cocooned  
larvae

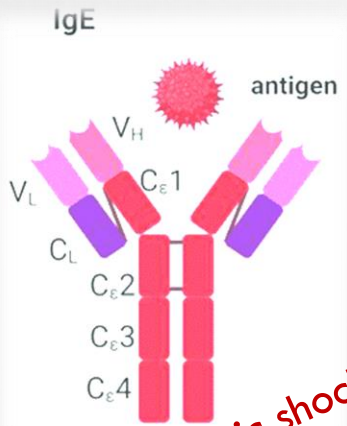
**Zoonotic trematode  
infection**

# Order HYMENOPTERA



## Public health importance

- 22% / 1 millions ER visits (2001-2010.)
- Bees 4x > Wasps
- Fire ants: increased ER visits, couple millions



Anaphylactic shock: IgE

LOCAL

**STING LOCATION  
REACTION**

TOXIC

SYSTEMATIC

# Order HYMENOPTERA



REMOVE STING

COLD  
COMPRESS

WASH STINGING  
PLACE

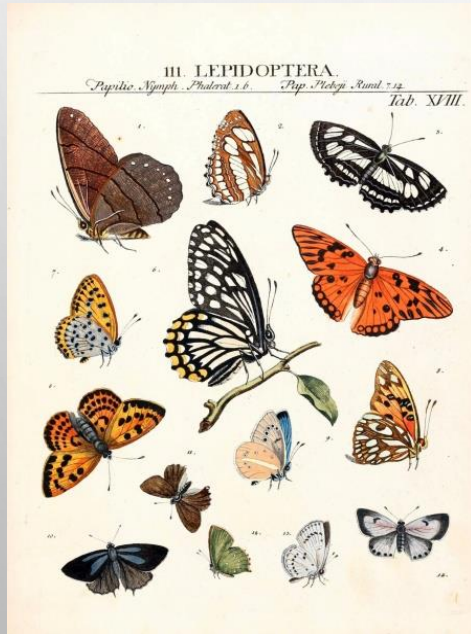
ANTIHISTAMINES  
EPINEPHRINE



# Order LEPIDOPTERA – butterflies and moths



- > 180 000 species
- Large compound eyes
- Diverse antennae
- Sucking mouthparts - proboscis
- HOLOMETABOLOUS



Butterflies



Moths



Life cycle

# Order LEPIDOPTERA – butterflies and moths

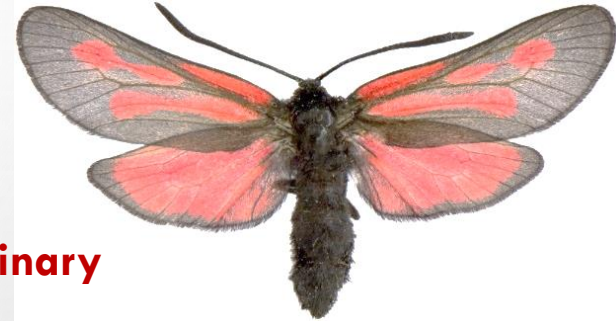


lepidopterism



Noctuoidea  
owllet moths

**~ 100 species of medical and veterinary significance**



Zygenoidea  
burnet moths



Bombycoidea  
hawk-moths



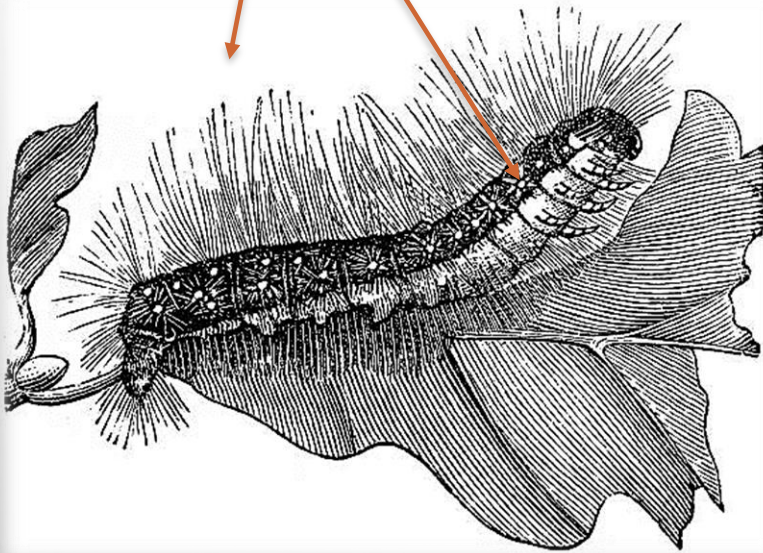
Papilionoidea  
swallowtails

# Order LEPIDOPTERA butterflies and moths

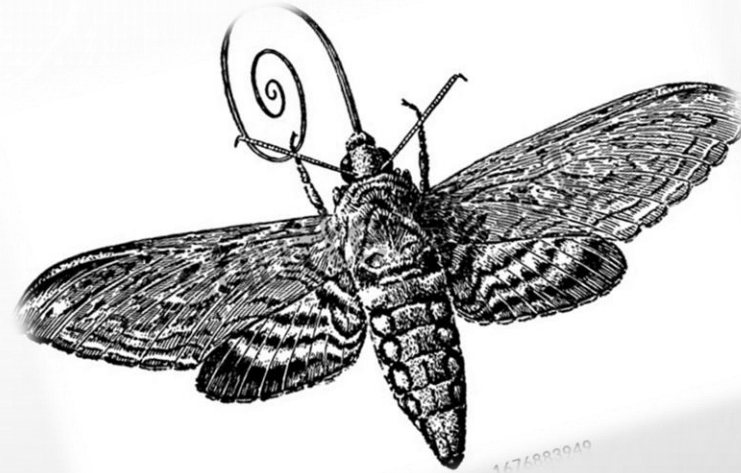


Caterpillar

erucism



Adult

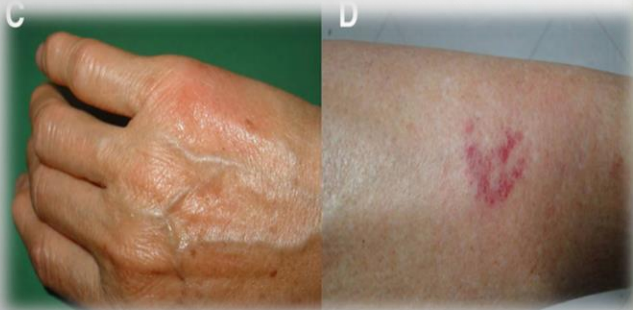
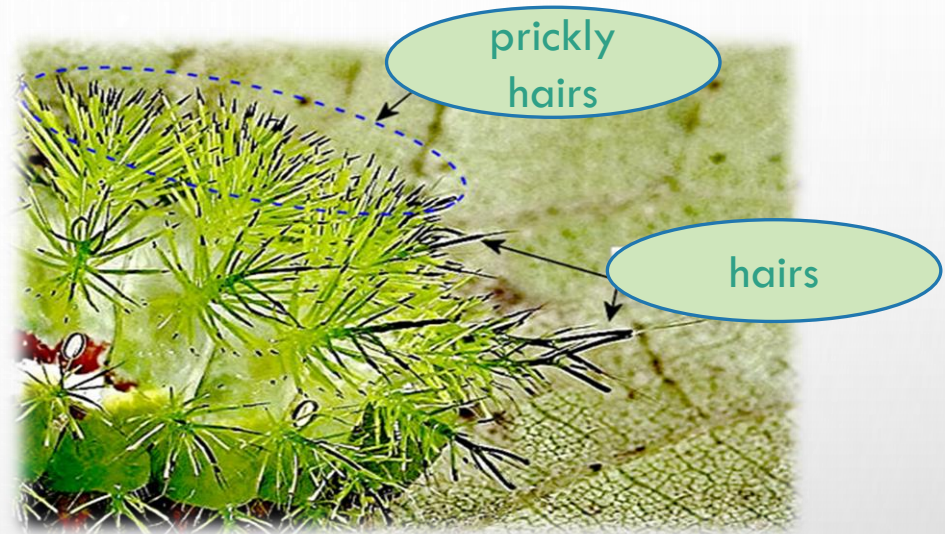


- **hematophagous**
- **lachrymaphagous**
- **sudophagous**

# Order LEPIDOPTERA – butterflies and moths



## Megalopygidae flannel moths



*Megalopygae opercularis* (JE Smith, 1797)





<https://www.youtube.com/watch?v=Aiqqw-X5sJg>

# Order LEPIDOPTERA – butterflies and moths

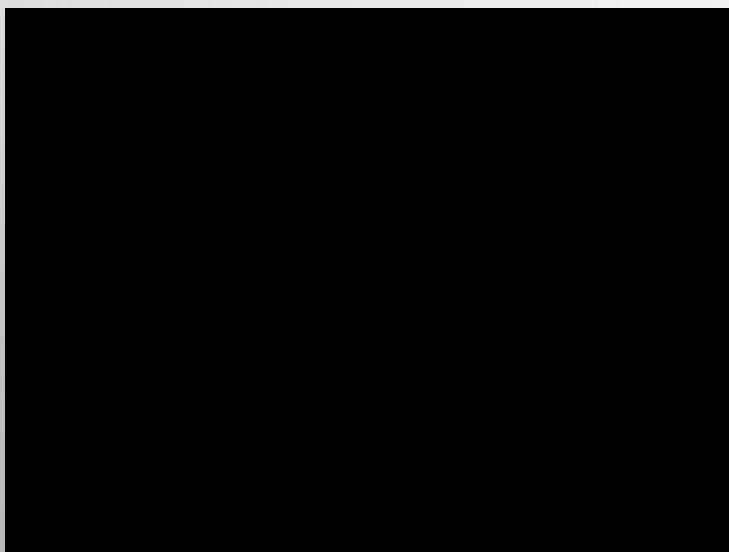


## Limacodidae cup moths

## Saturniidae saturniids



*Acharia stimulea* (Clemens, 1860)

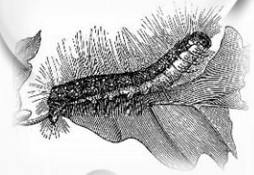


*Lonomia obliqua* Walker, 1855

# Order LEPIDOPTERA – butterflies and moths



## Lymantriidae tussock moths



*Lymantria dispar*  
Linnaeus, 1758  
gypsy moth



...Arctiinae, Catocalinae, Lasiocampidae,  
Noctuidae..

## Thaumetopoeidae processionary moths



*Thaumetopoea processionea* (Linnaeus, 1758)  
oak processionary

# Order LEPIDOPTERA – butterflies and moths



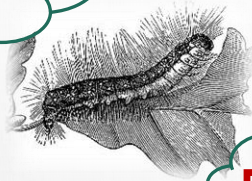
## Medical and veterinary significance

Labor erucism

Allergies

Ingestion

Dermatitis



Horses abortions (2001/2002.) USA



© Gary L. Spicer

*Malacosoma americanum*  
(Fabricius, 1793)

\*Collenette 1934, Krinsky, 2013

# Order LEPIDOPTERA – butterflies and moths



## Lachrymaphagous species

- > 100 species; mostly tropical
- ...horses, cattle, elephants; from year of 1852 first records

Geometridae, Nymphalidae, Noctuidae, Crambidae, Drepanidae, Sphingidae...



*Hemiceratoides hieroglyphica*  
(Saalmüller, 1891)



**ACTIVE OR PASSIVE**



*Lobocraspis griseifusa* Hampson, 1895

# Order LEPIDOPTERA – butterflies and moths



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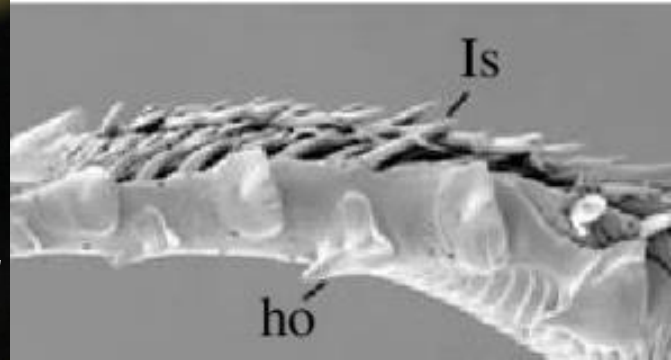
**ACTIVE OR PASSIVE**



*Lobocraspis griseifusa* Hampson, 1895



*Hemiceratoides hieroglyphica*



# Order LEPIDOPTERA – butterflies and moths



Proboscis – spines and hooks

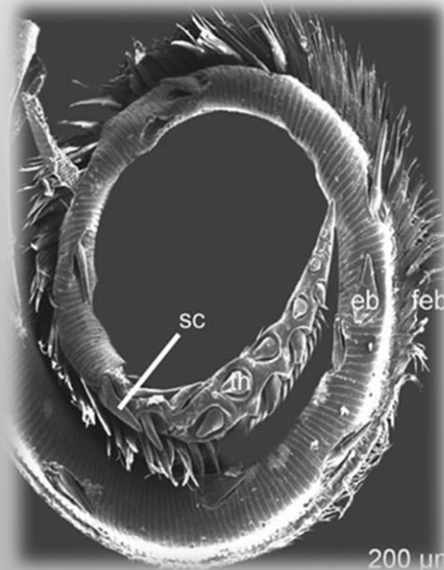
## Hematophagous species



*Calyptra* sp.



<https://www.youtube.com/watch?v=ZEZNcLNGMZE>



PROBOSCIS

\*Collenette 1934



# Order LEPIDOPTERA – butterflies and moths



## Medical importance

- Local swelling, inflammation and irritation

POTENTIAL  
VECTORS OF  
PATHOGENS



Dr. Hans Bänzinger and  
*Chaeopsestis ludovicæ* Le Cerf, 1941



Dr. J. M. Zaspel

*Staphylococcus* sp.

## LITERATURE



- Forbes AA, Bagley RK, Beer MA *et al.* (2018) Quantifying the unquantifiable: why Hymenoptera, not Coleoptera, is the most speciose animal order. BMC Ecol 18, 21. <https://doi.org/10.1186/s12898-018-0176-x>
- Gullan PJ, Cranston PS (2010) An Outline of Entomology. 4th ed. , Wiley-Blackwell.
- Stetsun H, Matushkina NA (2020) Sting morphology of the European hornet, *Vespa crabro* L., (Hymenoptera: Vespidae) re-examined. Entomological Science 23(4): 416-429 .
- Klotz JH, Schmidt JO, Pinnas JL, Klotz SA (2005) Consequences of Harvester Ant Incursion into Urbanized Areas: A Case History of Sting Anaphylaxis. Socialbiology 45, 3.
- Wetterer JK (2010) Worldwide spread of the pharaoh ant, *Monomorium pharaonis* (Hymenoptera: Formicidae). Myrmecological News 13:115-129.
- Lofgren C S (1986) The economic importance and control of imported fire ants in the United States. U Vinson SB (ur.), Economic impact and control of social insects (str. 227e256). New York: Praeger, 432.
- Rojas-Nossa SV, Calviño-Cancela M (2020) The invasive hornet *Vespa velutina* affects pollination of a wild plant through changes in abundance and behaviour of floral visitors. Biol Invasions 22, 2609–2618. <https://doi.org/10.1007/s10530-020-02275-9>
- Villemant C (2008) *Apis cerana* defends itself against *Vespa velutina*: observations in the forset massif of Bi Doup, Vietnam (Hym.). (*Apis cerana* se défend contre *Vespa velutina*: observations dans le massif forestier du Bi Doup, Vietnam (Hym.)) Bulletin de la Société Entomologique de France, 113(3): 312.
- Kamal M, Khan W, Nisa NU, Yasmeen G, Hassan HU, Ihsanullah (2020) Acute raiilietiniasis in domestic pigeon (*Columba livia domestica*). Adv. Anim. Vet. Sci. 8(11): 1180-1183. <http://dx.doi.org/10.17582/journal.aavs/2020/8.11.1180.1183>
- Kariyawasam H, James L (2020) Chronic Rhinosinusitis with Nasal Polyps: Targeting IgE with Anti-IgE Omalizumab Therapy. Drug Design, Development and Therapy. 14: 5483-5494. 10.2147/DDDT.S226575.
- Xu Y, Huang J, Zhou A, Zeng L (2012) Prevalence of *Solenopsis invicta* (Hymenoptera: Formicidae) venom allergic reactions in mainland China. Florida Entomologist 95(4): 961e965.
- Jeandron A, Rinaldi L, Abdyldaieva G, Usubaliev J, Steinmann P, Cringoli G, Utzinger J (2011) Human Infections with *Dicrocoelium dendriticum* in Kyrgyzstan: The Tip of the Iceberg? The Journal of Parasitology 97 (6): 1170-1172.
- Krenn H (1998) Proboscis sensilla in *Vanessa cardui* (Nymphalidae, Lepidoptera): Functional morphology and significance in flower-probing. Zoomorphology 118: 23-30. doi: 10.1007/s004350050053
- Junior V, Lastória J (2014) Envenomation by caterpillars (erucism): Proposal for simple pain relief treatment. Journal of Venomous Animals and Toxins including Tropical Diseases 20, doi:10.1186/1678-9199-20-21.
- Plotkin D, Goddard J (2013) Blood, sweat, and tears: a review of the hematophagous, sudophagous, and lachryphagous Lepidoptera. Journal of Vector Ecology 38(2): 289-294. <https://doi.org/10.1111/j.1948-7134.2013.12042.x>
- Büttiker W (1997) Field observations on ophthalmotropic Lepidoptera in southwestern Brazil (Paraná). Rev. Suisse Zool. 104: 853–868.

Bänziger H, Büttiker W (1969) Records of eye-frequenting Lepidoptera from man. *Journal of Medical Entomology*, 6: 53-58.

Hilgartner R, Raolison M, Büttiker W, Lees D, Krenn H (2007) Malagasy birds as hosts for eye-frequenting moths. *Biology letters* 3: 117-20. doi: 10.1098/rsbl.2006.0581.

Gouws J, Coetzer JA, Howell PG (1995) A comparative microbiological study of clinically healthy eyes and those affected by ophthalmia in cattle and the association of noctuid eye-frequenting moths. *J. S. Afr. Vet. Assoc.* 66: 160–169.