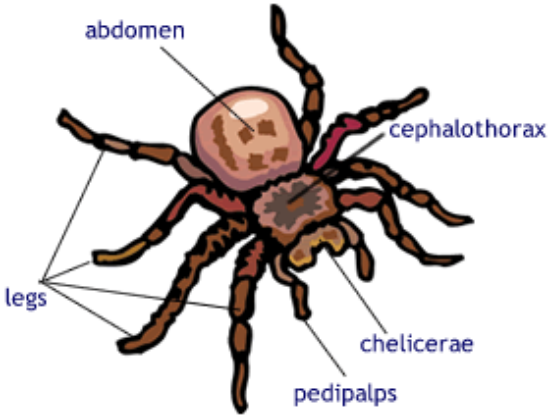
Phylum Arthopoda

- segmented body
- jointed limbs
- cuticle (chitin, calcium carbonate)
- about 1 milion species described
- haemocel (opened circulatory system)
- ladder-like nervous system
- compound eyes
- metamorphosis

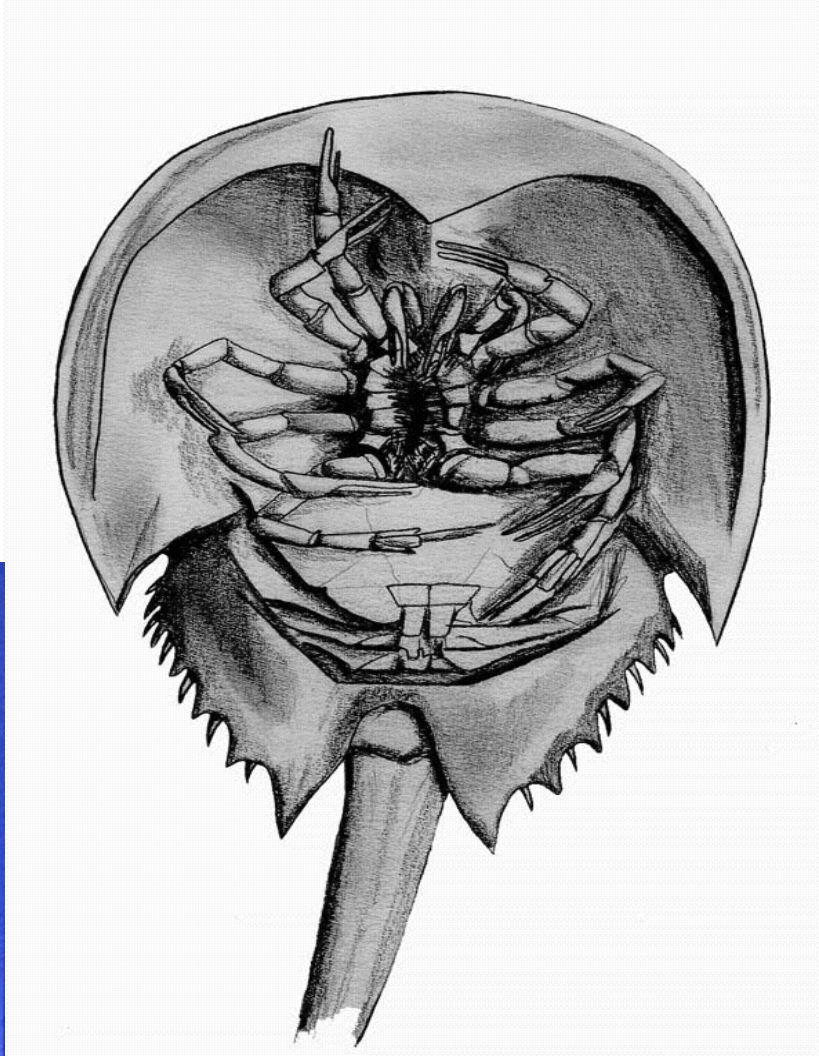
subphyllum CHELICERATA

- **prosoma, opistosoma**
- **chelicerae – inervation: supraoesophagial ganglion**
- **pedipalpi**
- **4 -5 pairs of walking legs**
- **no antennae!!**



Class: Merostomata

- marine chelicerata
- 4 living species(many extinct)
- 5 pairs of walking legs
- compound eyes (lost in all other chelicerata groups)
- *Limulus polyphemus*
- 60 cm
- Mexican bay

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SubPhylum?
Class?
4cm
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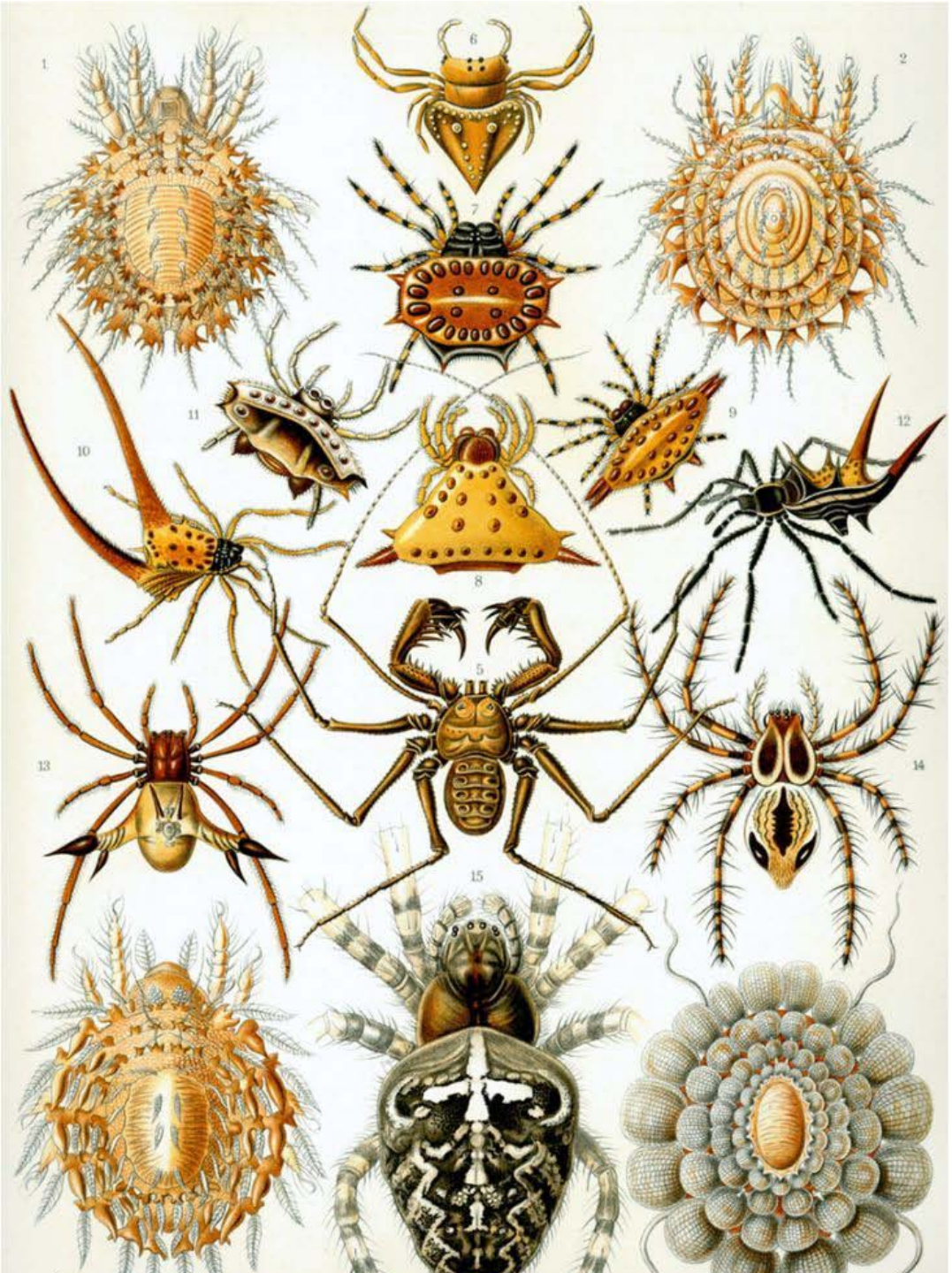
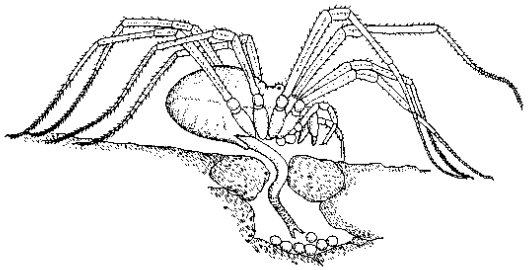
R.Koss 1998



Class: Arachnida

• Subclass: Opiliones

- 6500 species
- small to large
- **pedipalpi similar to walking legs**
- long legs (autotomy),
- pseudosegmented
- **segmented opistosoma broadly joined to prosoma**
- **ovipositor present**
- ***Phalangium opilio***



- Female laying eggs with ovipositor

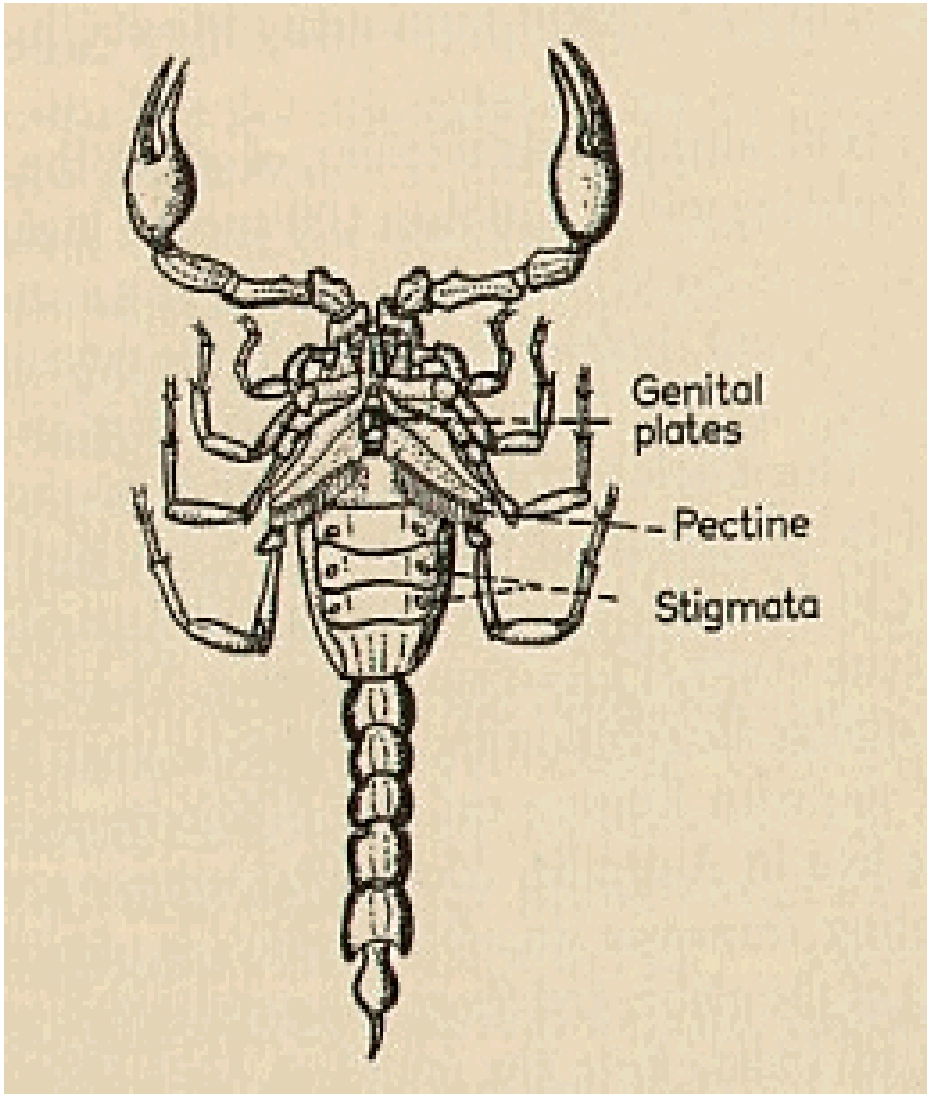
- *Ischyropsalis helwigi*
- 5-8-mm
- montane forests
- predator of molluscs

subclass: Scorpions (Scorpionida)

- **2000 species south of 50°N**
- **predators**
- opisthosoma divided into two parts: thick and narrow
- Prosoma: chelicerae, pedipalps (claws) + 4 pairs walking legs
- **Opistosoma ends with telson with the sting**
- **4 pairs of pulmonary sacks**
- **sexual reproduction, male lays spermatophore and female receives it with genital opening**

several primitive (plesiomorphic) features present:

- **three jointed chelicerae**
- **2 pairs of malphigian tubes**
- **4 pairs of pulomonary sacks**
- pectines of unknown function (detection of vibrations?)



Development
viviparous (x nearly all other chelicerata)
at least 1st instar juveniles live with mother

Central Europe – northernmost location of the group:
several spp. of genus *Euscorpius*

subclass: pseudoscorpions (Pseudoscorpionida)

- 3300 species
- 2 - 8 mm
- pincers resembling scorpions
- however: opistosoma not divide two parts
- opistosoma segmented
- poison gland openes in the end
- of pedipalps
- tracheae
- predators

- **Reproduction**
- spermatophore sometimes pushed into female genital opening by first pair of male legs
- The female carries the fertilized eggs in a brood pouch attached to her abdomen, and the young ride on the mother for a short time after they hatch
- After reaching adulthood, pseudoscorpions live two to three years. They are active in the warm months of the year, overwintering in silken cocoons when the weather grows cold

- *Chelifer cancroides* cosmopolitan synanthropic species

▪subclass: **Solifugae (Solpugida)**

▪more than 1000 species

▪Most Solifugae inhabit warm and arid habitats, including virtually all deserts in both the Eastern and Western Hemispheres, excluding Australia. Some species have been known to live in grassland or forest habitats.

▪predators (termites, beetles)

▪large (up to 70 mm)

▪ **two segmented chelicerae very long,**

▪ **pedipalpi resemble first pair of legs (but longer)**

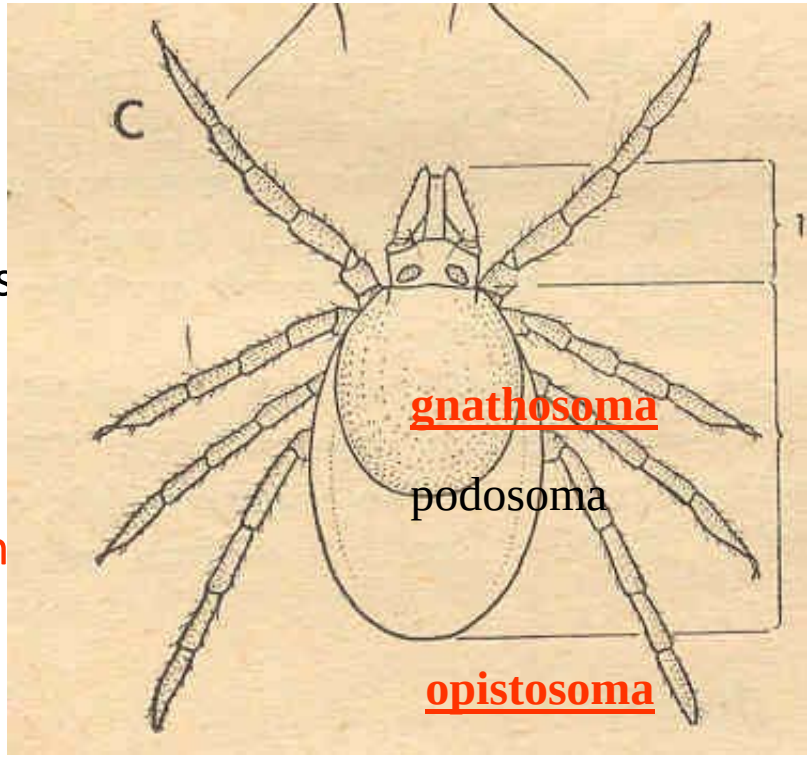
▪**no poison gland**

▪**chelicerae strong – be careful!**

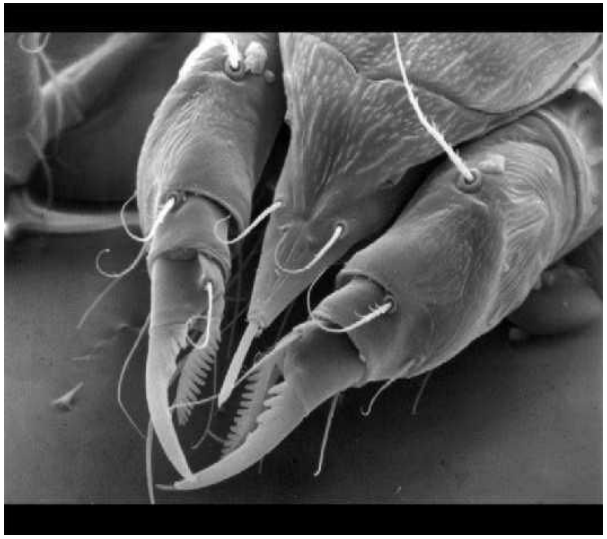
▪6 species in Europe

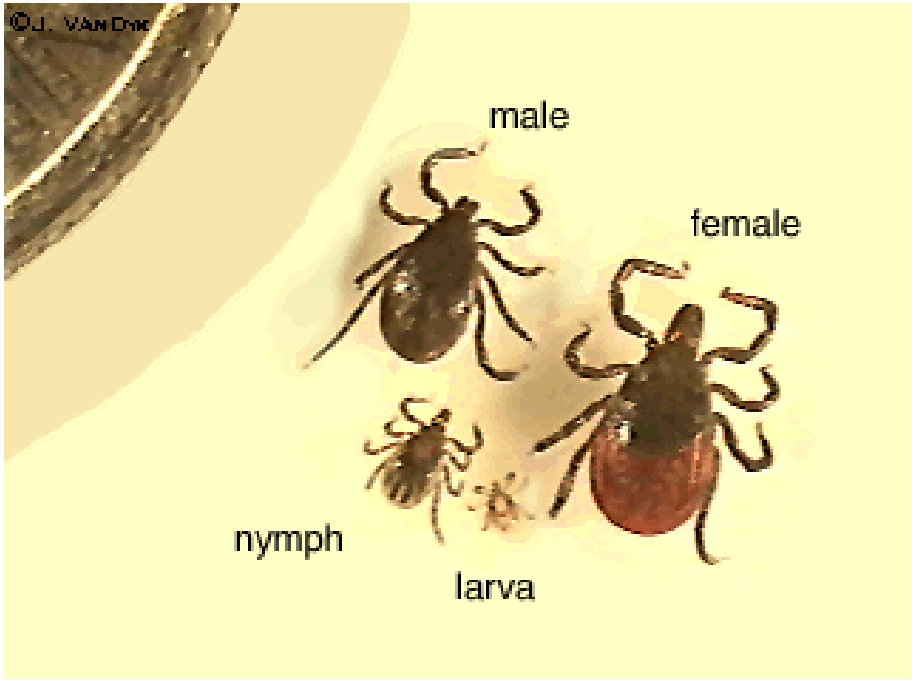
subclass: mites and ticks (Acarina)

- Most acarines are minute to small (e.g. 0.08–1.0 mm), but the largest Acari (some ticks and red velvet mites) may reach lengths of 10–20 mm. It is estimated that over 50,000 species have been described (as of 1999) and that a million or more species are currently living.
- **prosoma** = gnathosoma (chelicerae + pedipalpi)+ podosoma (4 or less pairs of walkin legs)
- **opistosoma not segmented, fused with podosoma**
- The mouth parts of mites may be adapted for biting, stinging, sawing or sucking. They breath through tracheae, stigmata (small openings of the skin), intestines and the skin itself



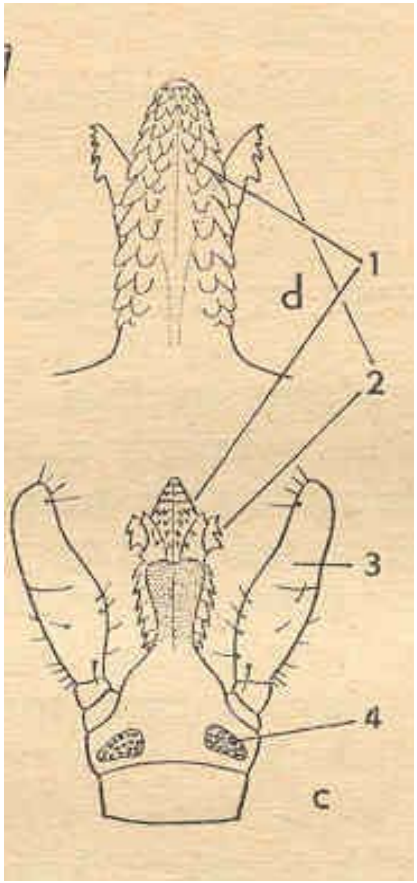
- Acarine ontogeny typically consists of an egg, a prelarval stage (often absent), a larval stage (hexapod except in Eriophyoidea which have only two pairs of legs), and a series of nymphal stages. Larvae (and prelarvae) have a maximum of three pairs of legs (legs are often reduced to stubs or absent in prelarvae). Usually a maximum of three nymphal stages are present and they are referred to in sequence as protonymph, deutonymph, and tritonymph.





Ticks (Ixodida)

- Ticks are ectoparasites (external parasites), living by hematophagy on the blood of mammals, birds, and occasionally reptiles and amphibians.



1 - hypostome

2 - chelicerae

3 - pedipalpi

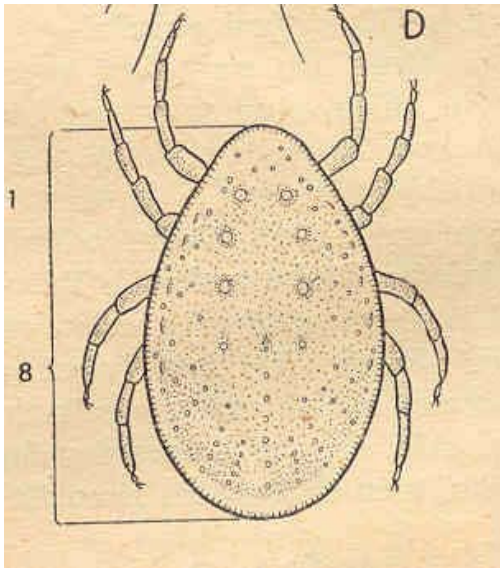
4 – sensory area

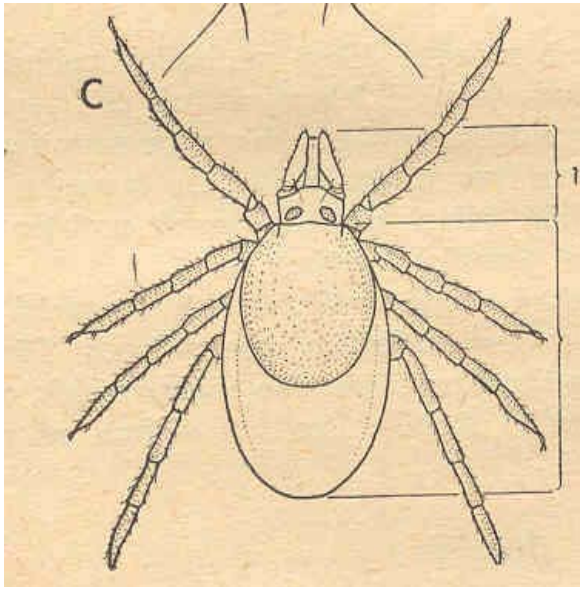
- Ticks are vectors of a number of diseases, including Lyme disease – borreliosis (bacterial infection) and Tick-borne meningoencephalitis (viral infection)

860 spp. in 3 families, most important: Argasidae and Ixodidae

Argasidae:
•hidden mouthparts, shield absent

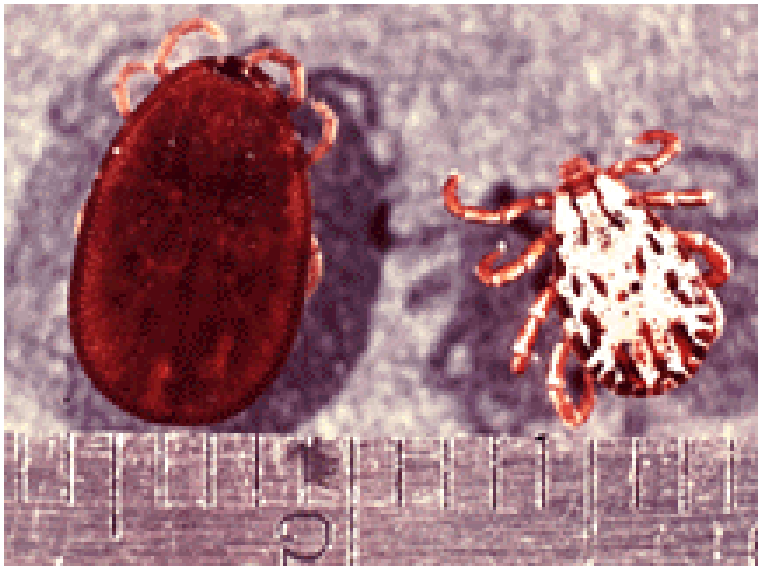
Ixodidae:
•exposed mouthparts





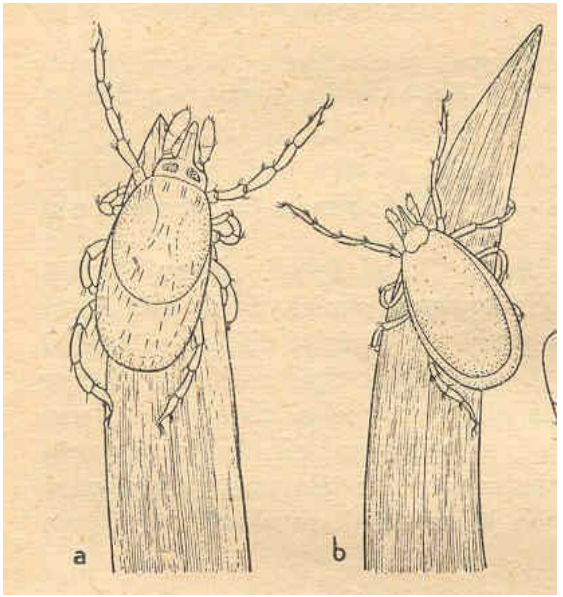
Argas reflexus

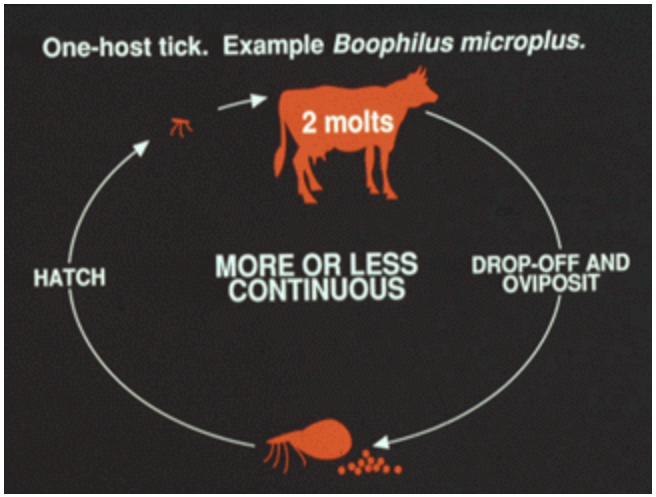
- 5-11 mm
- parasites of birds
- in Prague and other cities on pigeons

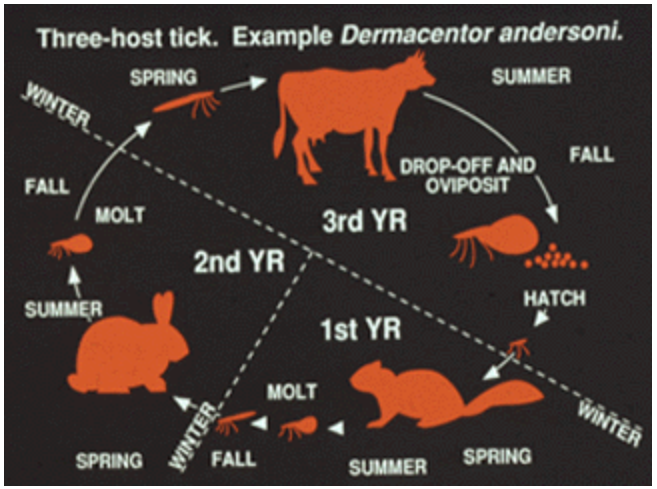


Ixodoidea

- **scutellar shield often present**
- **mouthparts visible from above**
- **up to 300x expanding bodies**

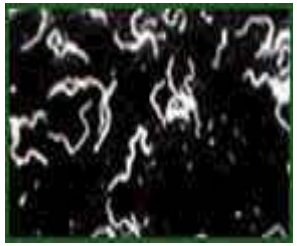


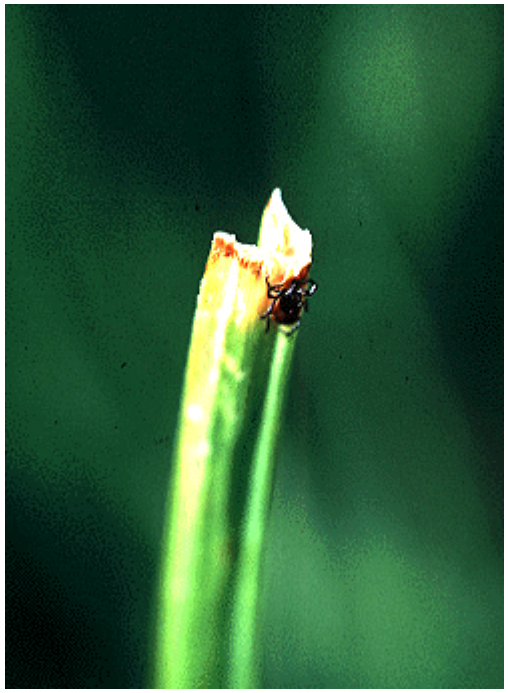




single, two or more hosts

- ***Ixodes ricinus***
- three hosts
- **Lyme disease** *Borrelia spp.*
- **tick-borne meningoencephalitis**
- **tularemy**





Dermacentor marginatus, D. reticulatus

along rivers, largest of our ticks

babesia, tularaemia, west Nile

comparison of *I xodes ricinus* and *Dermacentor marginatus*

Haemaphysalis concinna

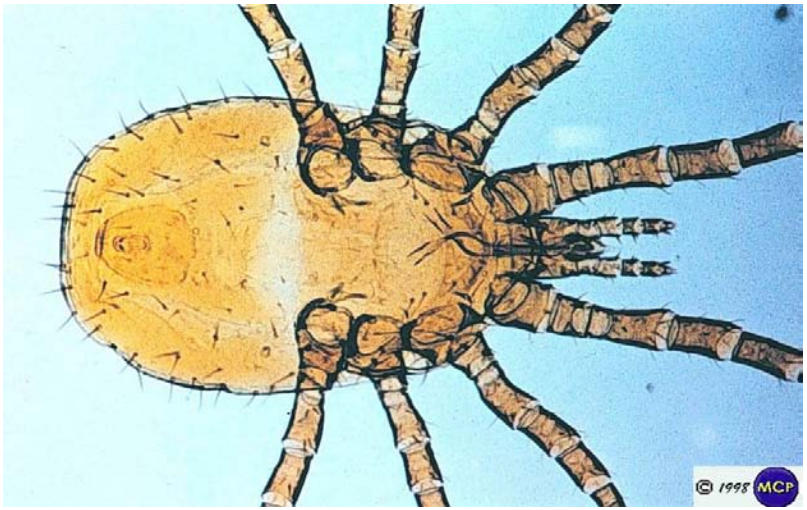
- forests with deer
- Human encephalitis, tularaemia

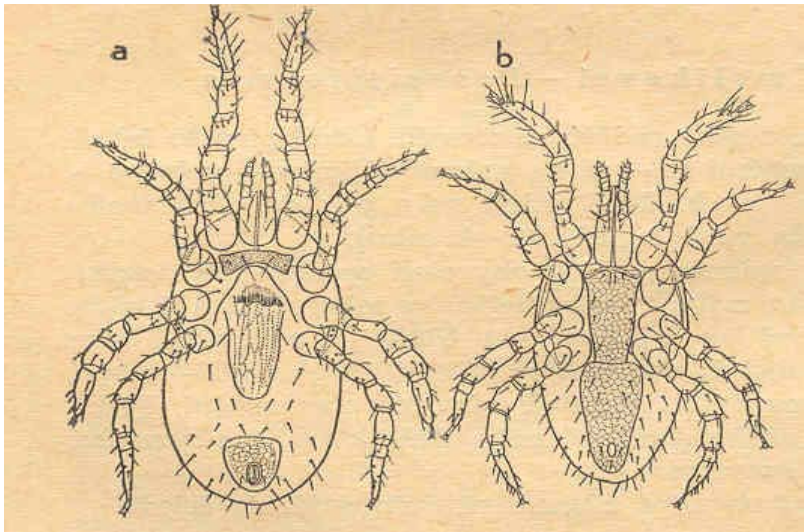
order Mesostigmata

•**single pair of spiracles laterally on body**
many are non-parasitic

Dermanyssus gallinae

piercing chelicerae and padipalpi
0,6-0,8 mm (up to 2 mm after sucking blood)
ectoparasite of poultry, other birds, also humans
heavy infestations cause anaemia





Varroa destructor

- parasite of bees (*Apis mellifera*)
- sucks haemolymph of host
- A significant infestation leads to the death of a honey bee colony, usually in the late autumn through early spring
- spreading: 1960 (Japan), 1965-70 (Europe), 1971 (Brazil), 1987 (USA), 1992 (England), 2000(New Zealand), 2007 (Hawaii)

Neotrombicula autumnalis

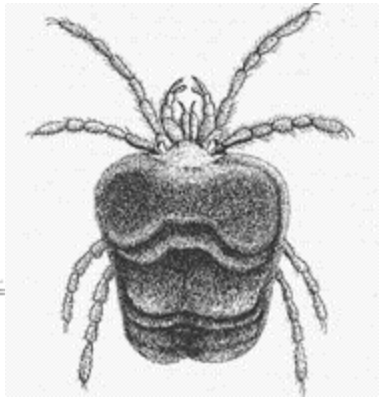
6 legged larvae are parasites of many animals includin humans

mainly in autumn

larvae form a hole in skin damaging skin cells but not sucking blood

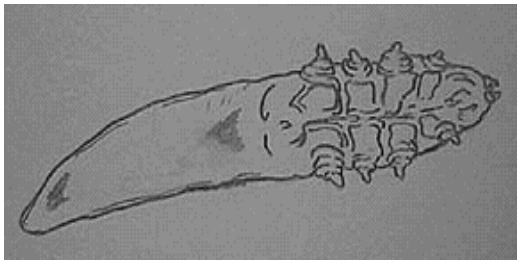
cause severe irritation and swelling

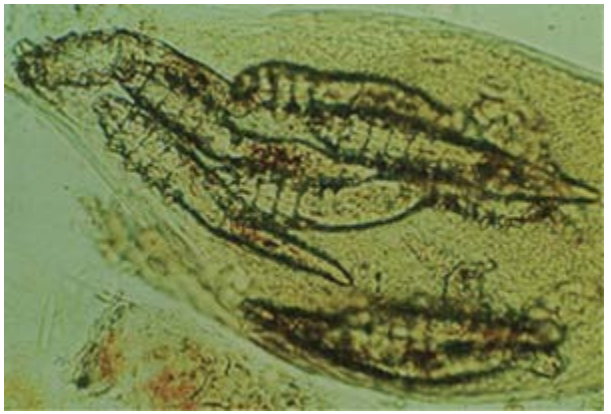
ornage to red colour of body



Demodex

- **parasitic mites, two species on humans (*D. fliculorum* and *D. brevis*), *D. canis* on dogs**
- **short legs, 0,3 mm long body, live near hair follicle**
- **elderly people upo to 96 % infestations, without symptoms (remove eylash and under microscope)**

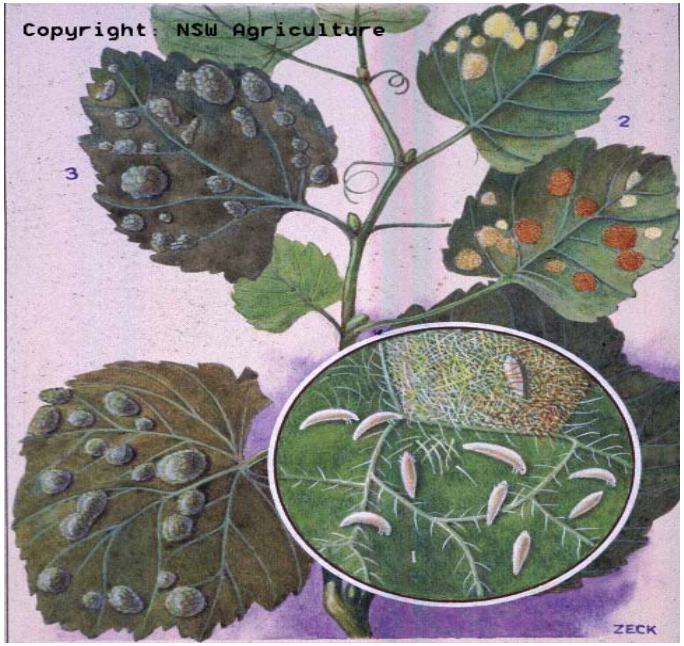




Eriophyidae

- **Eriophyidae** is a family of more than 200 genera of mites, which live as plant parasites, commonly causing galls
- White to purple, microscopic, 2 pairs of legs, worm-like
- Some are major plat pests, economic damage

- Eriophyes tiliae



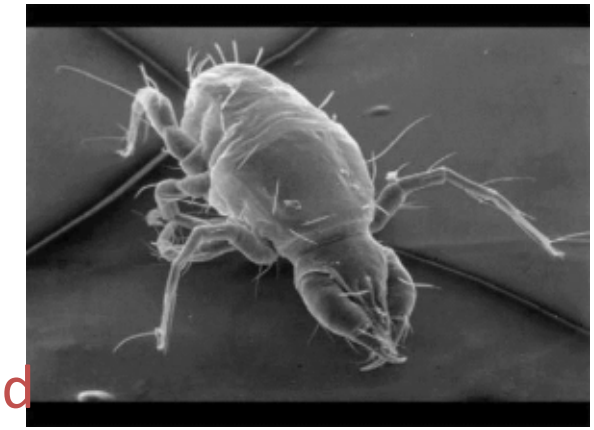
Tetranychidae – spider mites

- Less than 1 mm, různě zbarvení
- Produce silk web
- Puncture plant cells to feed

- Teranychus urticae
- ***Panonychus ulmi, P. citri***

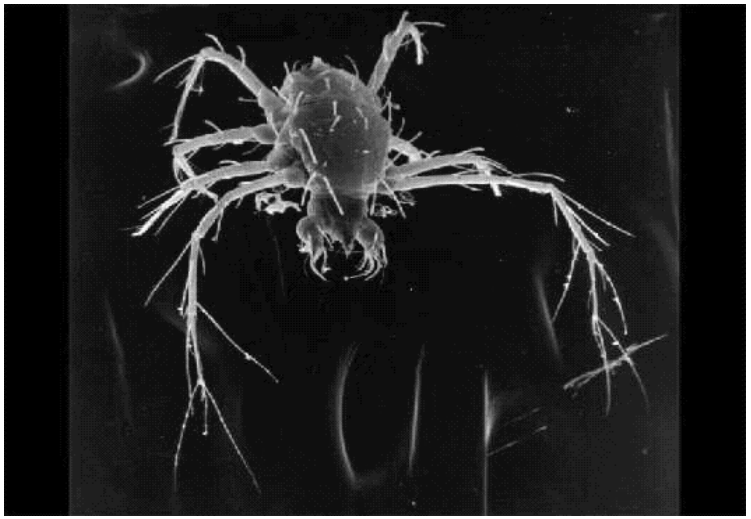
Cheyletidae

- Some species are parasites of animals and some are predators
- Cheyletus eruditus – biological control of acarid mites



Dravčík spižní (*Cheyletus eruditus*)

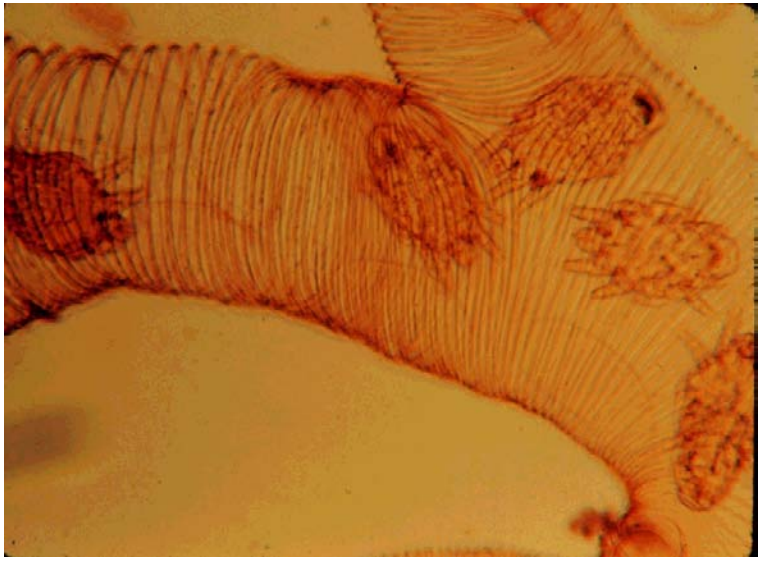
- *Cheylotomorpha lepidopterum*



Honey bee tracheal mite (*Acarapis woodii*)

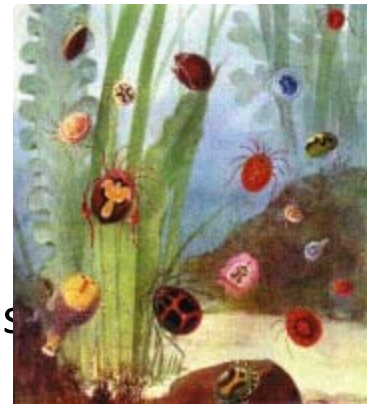
Small mites (0,2-0,3mm)

is a mite that is an internal parasite of honey bees



Hydrachnellae

- Mites living in waters
- Bright colours often
- Larvae sometime parates of aquatic ins
- Phoresy common



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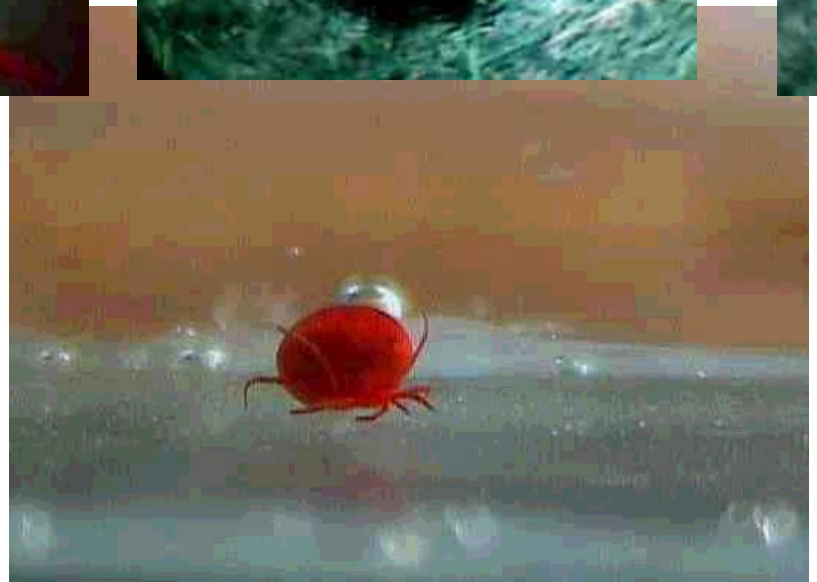
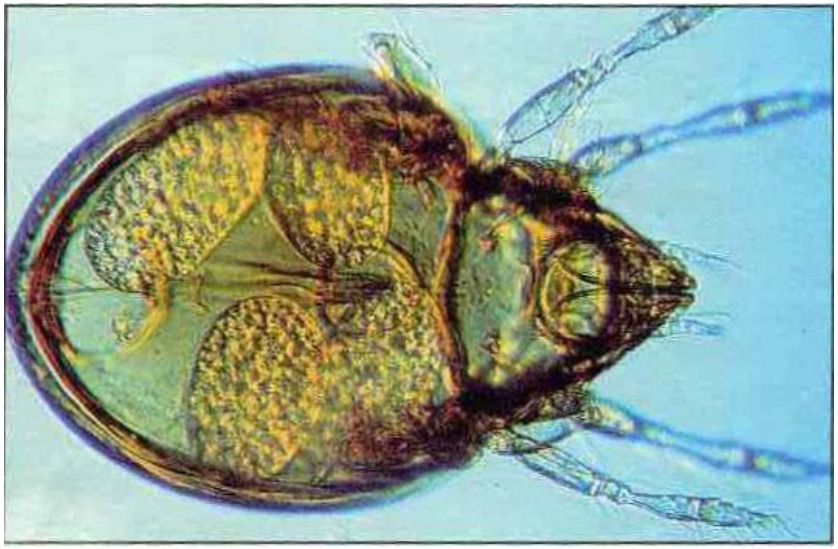


Oribatida (= Cryptostigmata)

- Oribatida are one of the most numerically dominant arthropod groups in the organic horizons of most soils, where their densities can reach several hundred thousand individuals per square meter.Půdní roztoči
- Undisturbed soils can easily yield examples of 50-100 species. Within soils, oribatids help to promote fungal and bacterial growth through their feeding actions, as well as contribute to soil microstructure through addition of fecal material to the soil substrate.
- Oribatid mites have five active postembryonic instars: larva, 3 nymphal instars and the adult. All these stages feed on a wide variety of material including living and dead plant and fungal material, lichens and carrion, some are predaceous; but none is parasitic

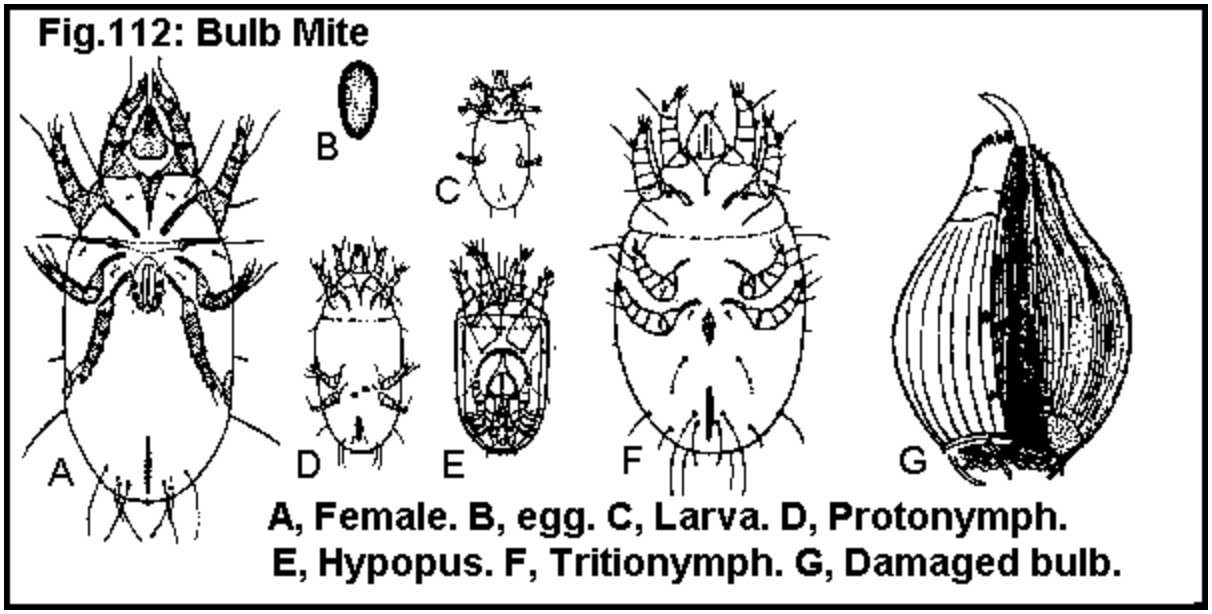


Acaridae

Order Astigmata

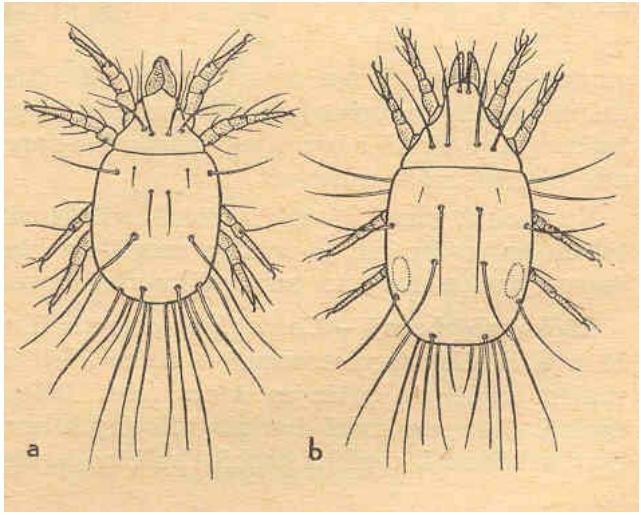
Larva + 2-3 nymphal stages

deutonymfa- hypopus, resistant stage, often phoretic



Acarus siro (The flour mite)

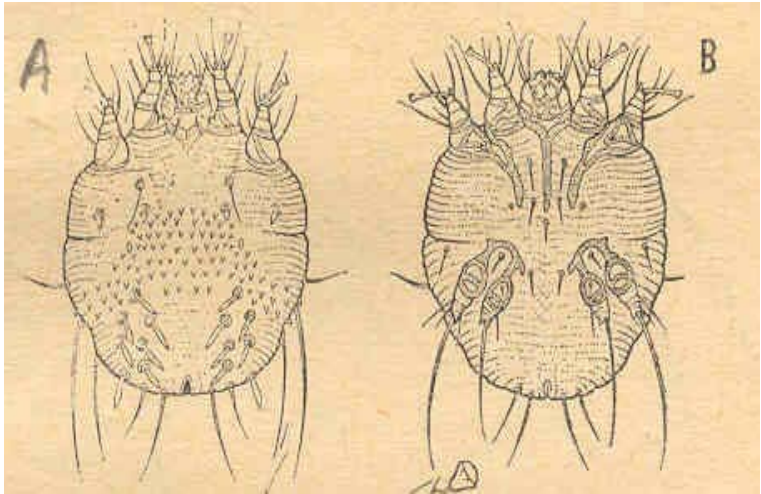
- important pest of stored grain and flour.
- pale greyish white with pink legs, the most common species of mite in foodstuffs.
- Flour mites contaminate grain and flour by allergens and they transfer pathogenic microorganisms. Foodstuffs acquire a sickly sweet smell and an unpalatable taste.
- When fed infested foodstuff, animals show reduced feed intake, diarrhoea, inflammation of the small intestine and impaired growth.

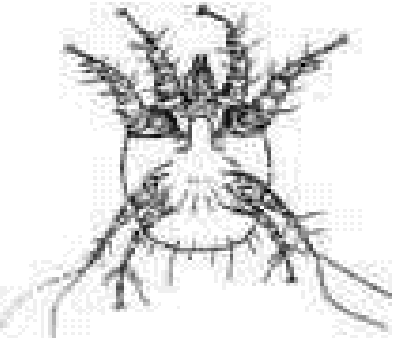


- *Tyrophagus putrescentiae*
- Common species, also in households

Sarcoptidae

- ***Sarcoptes scabiei*** is a parasitic arthropod which burrows into skin and causes scabies. Animals affected include not only human but also wild and domesticated dogs and cats in which it is one cause of mange. Also affected in the wild are ungulates, boars, bovids, wombats, koalas, and great apes.





Psoroptidae

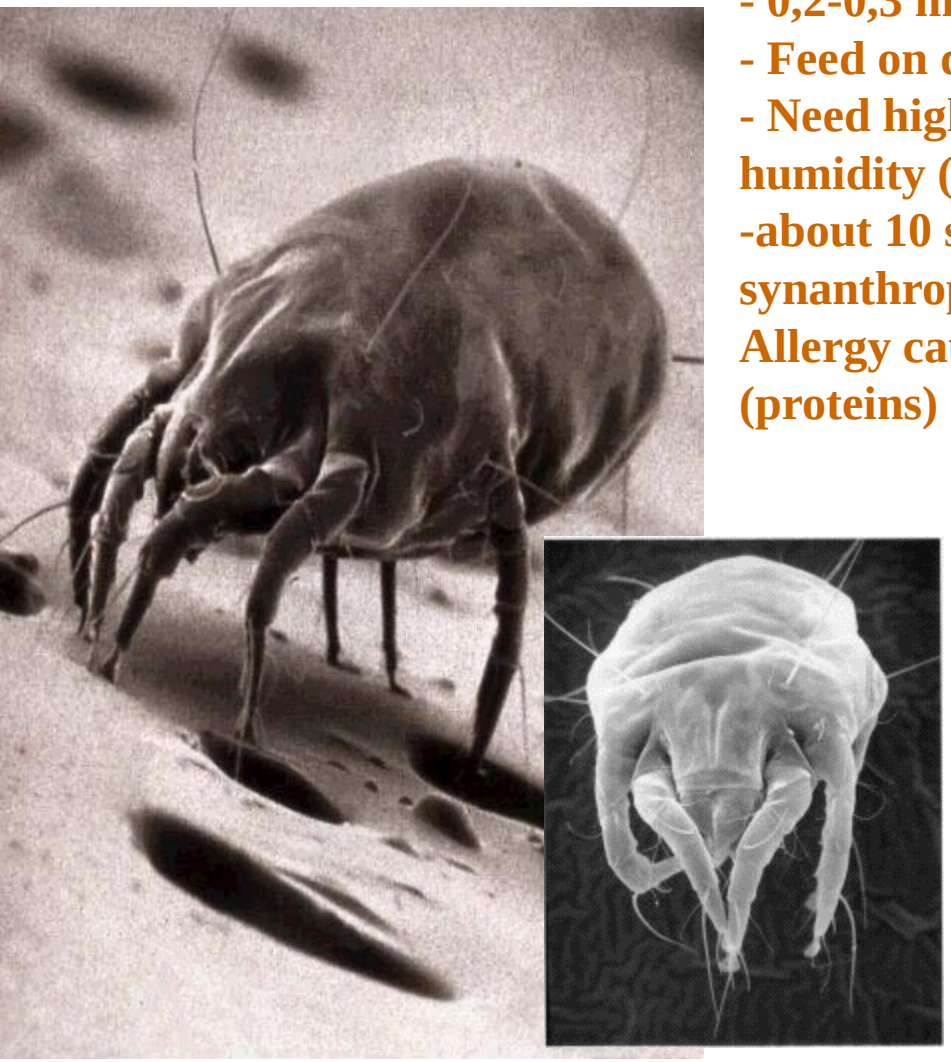
Chorioptes ovis

Parasite of sheep

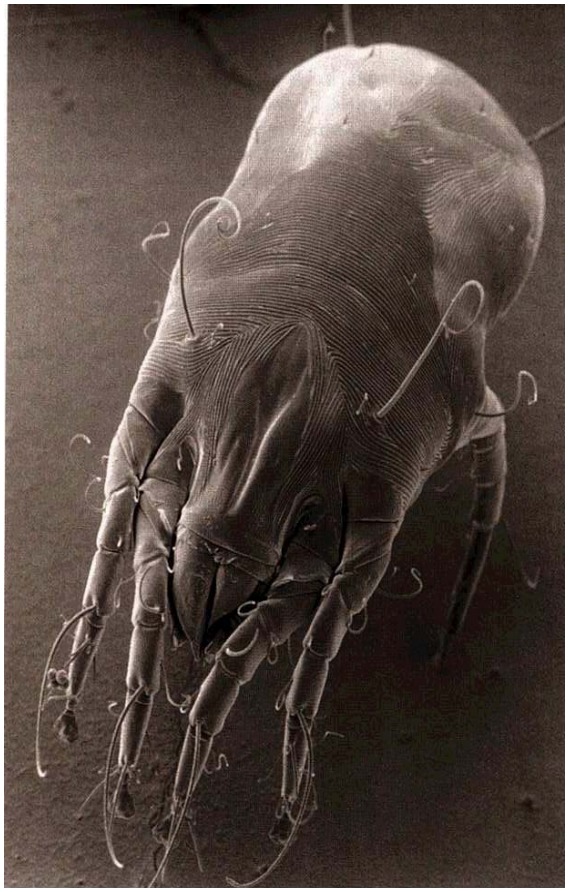
Chorioptes bovis

Parasite of cattle, rabbit

Dust mites (mites causing allergies and some types of asthma)



- **0,2-0,3 mm**
- **Feed on dead skin, fungi**
- **Need high relative humidity (over 60%)**
- **about 10 species synanthropic**
- **Allergy cause faecal pelets (proteins)**

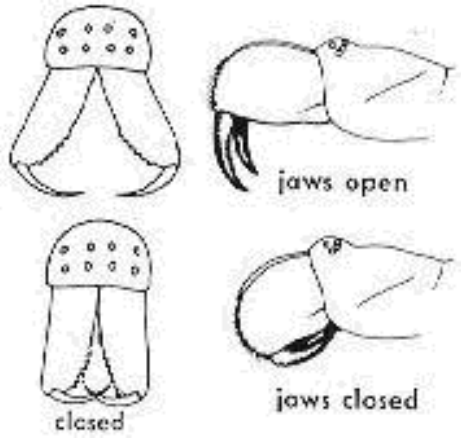


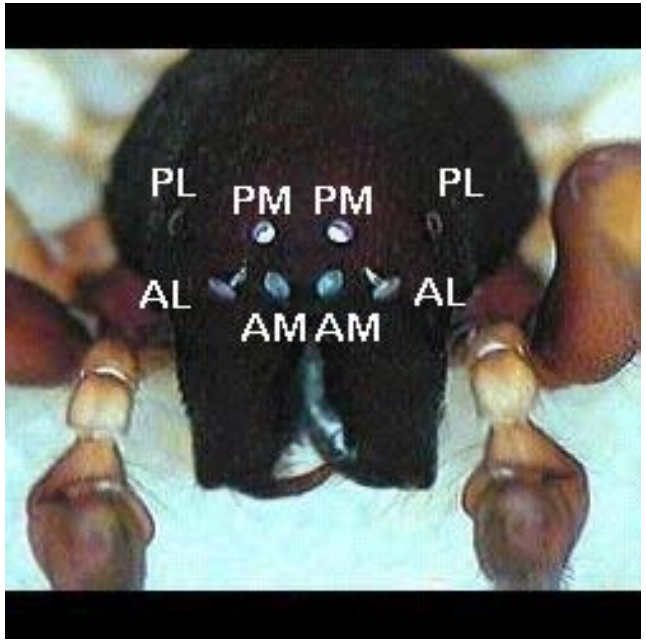
Dermatophagoides pteronyssinus

Dermatophagoides farinae

Ordo: Spiders (Araneae)

Largest order of arachnida
40 000 spp.
Opistosoma non-segmented, narrowly jointed to prosoma
Sometimes complicated courtship behavior
Silk production (webs)





Sexual dimorphism *(Maevia inclemens)*

- 4 pairs of simple eyes
- **Touch sensors (setae)**
- The abdomen has no appendages except those that have been modified to form one to four (usually three) pairs of short, movable spinnerets, which emit silk
- spiders and a few other groups still use hydraulic pressure to extend limbs
- Spiders reproduce sexually and fertilization is internal but indirect, sperm is inserted into the female's body by the male's syringe-like structures on the tips of their pedipalps

- **Classification: 3 groups (orders, suborders)**

- Mesothelae (87 spp.)
- South-east Asia, remnents of segmentation on opistosoma
- Live in burrows with trapdoors

- Mygalomorphae (2600 spp.)
- Long development, large body, two pairs of book lungs, live in burrows

- Araneomorphae (37000 spp.)
- 1year development, 1 pair of bok lungs,

Mygalomorphae

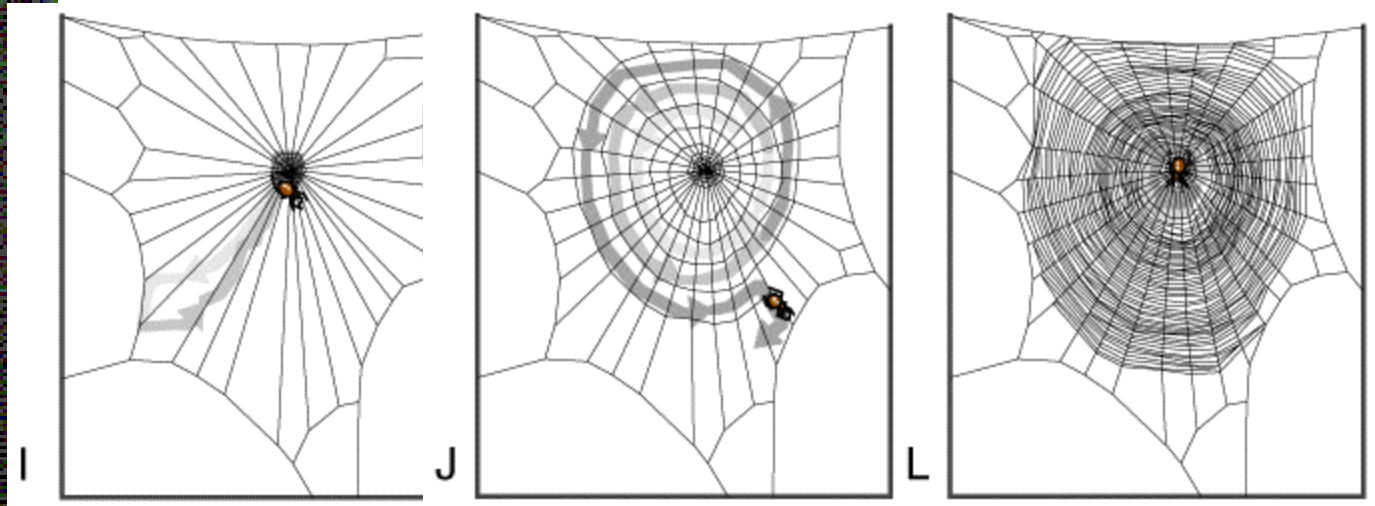
- Tropical species, several also in Europe and North America
- Large species
- two pairs of book lungs, and downward pointing chelicerae

Araneomorphae

- Black widow (*Latrodectus mactans*)
- Most spiders without any danger, 100 deaths in 20th century
- Potent venom (toxin) causing rarely death

Araneus maromoreus

- Araneidae
- Characteristic colou pattern on opistosoma
- big catching webs
- *Araneus diadematus*



- Pholcidae
- Synatrhropic species
- Long legs
- Webs not much dense
- Female carries cocoon in chelicerae

- *Pholcus falangoides*

- Salticidae
- Jumping spiders
- *Salticus scenicus*

- Agelenidae
- Flat nets horizontal with funnel-like opening
- Synanthropic species: *Tegenaria domestica* very large spider

- Tetragnathidae
- Slim body, long legs, loose webs
- *Tetragnatha laboriosa*

- Lycosidae
- No webs
- Cocoon attached to tip of opistosoma
- Largest species of C. Europe: *Lycosa singorensis*

- *Micromata roseum*
- Green large spider

- Thomisidae
- Teo fore pairs of legs elogate
- Waiting for prey under flowers
- Changing colour of bodies
- ***Misumena vatia***
- *Philodromus dispar*

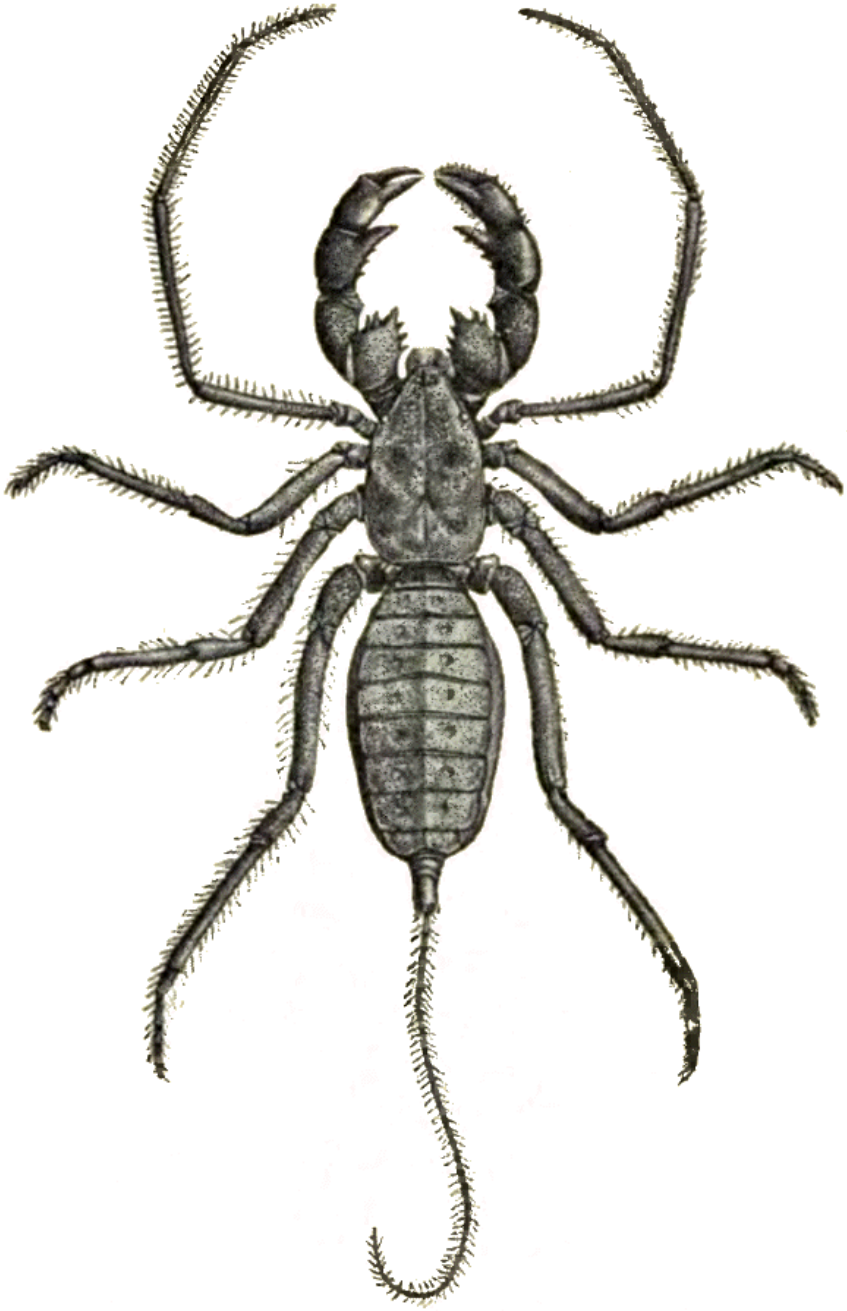
- Pisauridae
- Large spiders
- Banks of rivers, ponds
- *Dolomedes fimbriatus*

- Argyronetidae
- 1 aquatic species
- Females build underwater "diving bell" webs which they fill with air and use for digesting prey, molting, mating and raising offspring. (*Argyroneta aquatica)*

- Clubionidae
- Yellowish bodies
- *Cheiracanthium punctorium*
- **Potent toxin**

Thelyphonida (Uropygi)

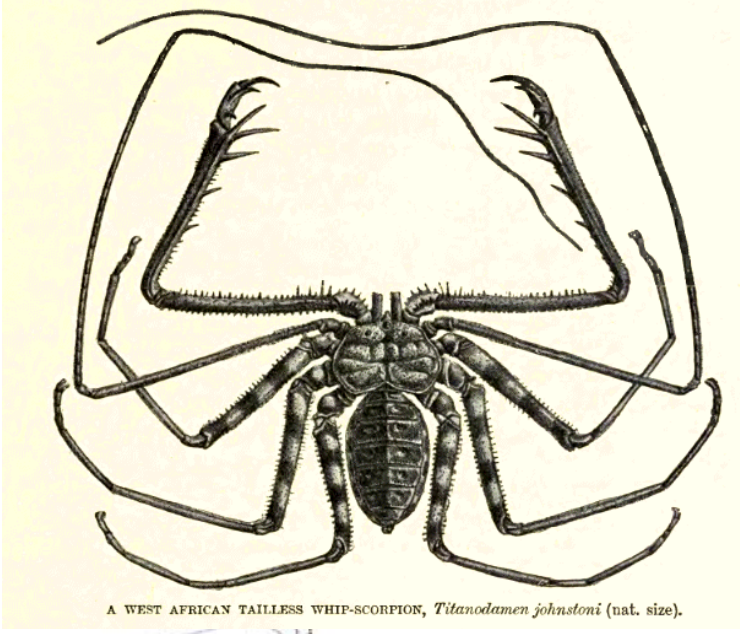
- 25-85 mm
- use only six legs for walking
- first two legs serve as antennae-like sensory organs
- Many species have very large scorpion-like pedipalps (pincers)
- one pair of eyes at the front of the prosoma and three on each side of the head, a pattern also found in scorpions
- no poison glands, but glands near the rear of their abdomen that can spray
- **Nocturnal predators**
- **More than 100 species**

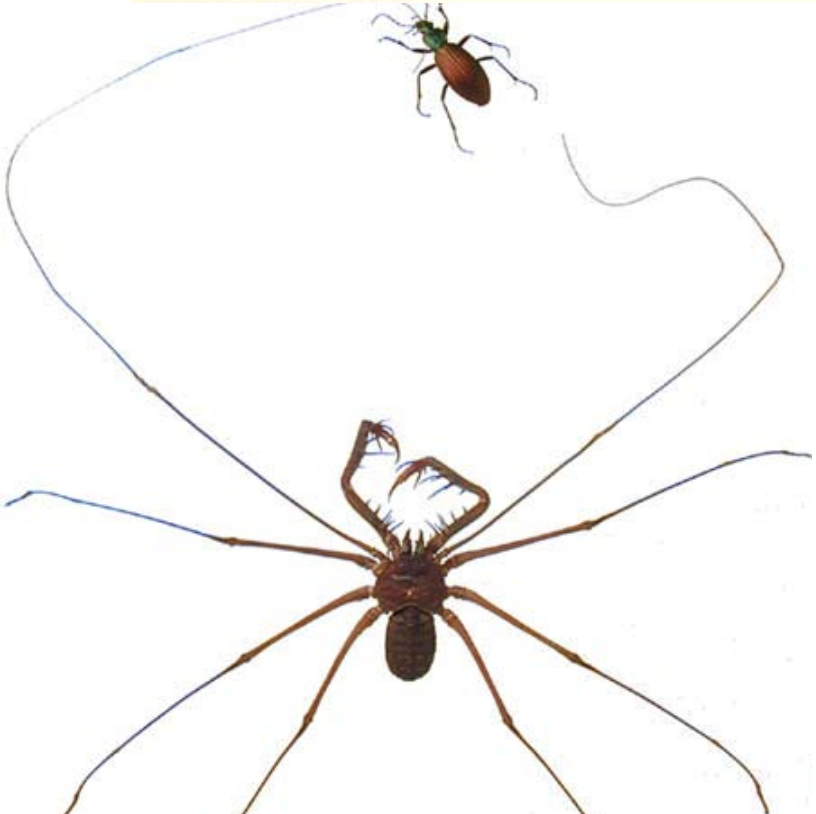


FEMALE OF BORNEAN WHIP-SCORPION, *Thelyphonus hoseri* (nat. size).

Amblypygi

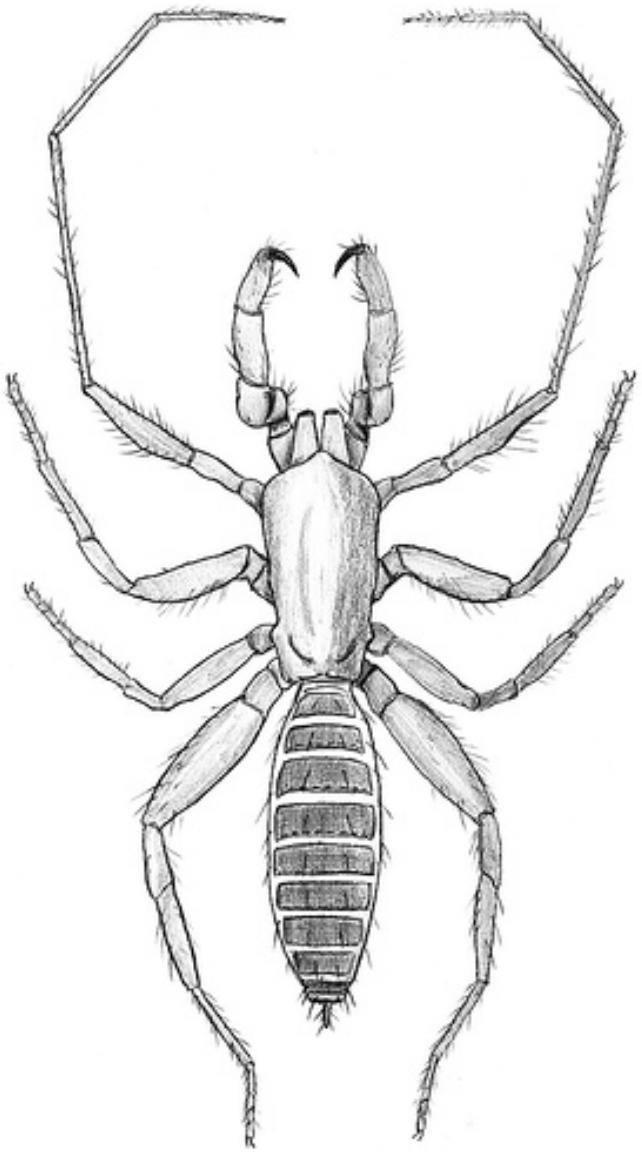
- 4 to 45 mm
- Bodies broad and flattened, segmented opistosoma
- pedipalps are large and somewhat pincer-like, adapted for grabbing prey.
- the first pair of legs modified to sensory organs and can extend several times the length of body
- no silk glands or venomous fangs
- About 150 species


A WEST AFRICAN TAILLESS WHIP-SCORPION, *Titanodamen johnstoni* (nat. size).



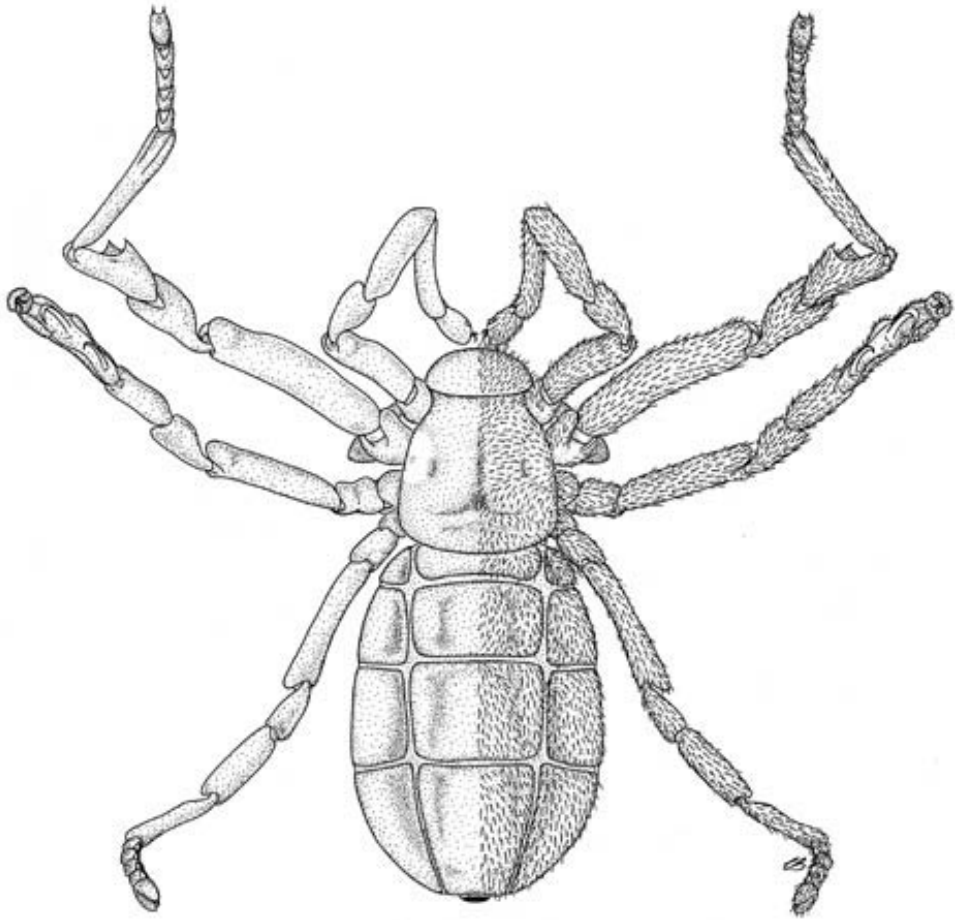
Schizomida

- Less than 5 mm
- 250 species
- Prosoma – 3 segments, opistosoma – 12
- No eyes
- Formery part of „Uropygi“



Ricinulei

- 5-10 mm
- Africa, south america
- 60 species
- no eyes
- 2nd pair of legs longest
- Thick cuticle on body and legs



Palpigradi

- no more than 3 millimetres
- thin, pale, segmented integument, and a segmented abdomen that terminates in a whip-like flagellum
- no eyes.
- first pair of legs are modified to serve as sensory organs
- palpigrades use their pedipalps for locomotion, so that the animal appears to be walking on four pairs of legs.