

**Order Diptera - The True Flies**  
**Suborder Nematocera**  
 ("long-horned" flies)

Mosquitoes (family Culicidae)

Note the long multi-segmented antennae that place these flies in the Nematocera.

Factoid: the males have "fuzzy" antennae, the females have many fewer hairs on their antennae.



**Mosquito (a long-horned fly)**

Note the long antennae on this mosquito. This is characteristic of the Nematocera (long-horned flies).

Factoid: male mosquitoes have "fuzzy" antennae, females do not.



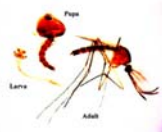
male *Culex* sp.

● (to suborder)

**Mosquito life stages**

Like all members of the Diptera, mosquitoes have the following stages in their life cycle:

Egg, larva, pupa and adult. However, the larva and pupa of the mosquito are aquatic and thus look much different than those of other flies.



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**Order Diptera**  
**Suborder Nematocera**  
 ("long-horned flies")

Black flies (family Simuliidae)

Note the long multi-segmented antennae that place these flies in the Nematocera.



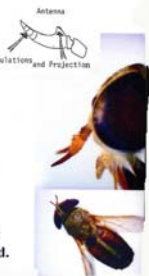
*Simulium* sp.

● (to suborder)

**Order Diptera - The True Flies**  
**Suborder Brachycera**  
 ("short-horned flies")

Deer and horse flies (family Tabanidae)

Note the size and shape of the adult. Also note the antenna sticking straight out from the center of the anterior of the head.



***Tabanus* sp. (Horse Fly)**

Note the size and shape of the adult. These are robust, large-headed flies.

Also note the antenna sticking straight out from the center of the anterior of the head.



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**Order Diptera - The true flies**  
**The "Muscoïd" flies (suborder Cyclorrhapha)**

Cyclorrhapha fly head

Note the typical club shaped antenna laying in the groove between the eyes.

(anterior)

(side view)

*Lucilia, Sarcophaga and Calliphora* adults

See lab handout.

suborder Cyclorrhapha

(be able to identify to the suborder Cyclorrhapha - The muscoïd flies)

*Melophagus ovinus* - sheep ked  
 (Fam. Hippoboscidae)

Collected from lambs at New Bolton Center

Note:

1. This is a wingless fly (order: Diptera)
2. strong legs
3. sac-like abdomen

The adults live in the wool of sheep. The female lays mature larvae and cements them to the wool. The larvae immediately pupate. The adults irritate sheep by their bites and soil the fleece with feces and blood. Wool is damaged when the sheep scratch and rub themselves.

The life cycle of a muscoïd fly.

*Gasterophilus intestinalis* and *G. nasalis*

Specialists can use the rows of spines on the segments to key these bots to species (see Figure #8). You will not have to do this; just know that these are "bots" and by their location in the stomach of a horse, they are members of the genus *Gasterophilus*.

(bots)


*Gasterophilus intestinalis*

Larvae attached to the mucosa of the stomach of a horse. You can see lesions where the larvae have detached. Note the ring of inflammatory thickening with an eroded center where the larvae were attached.

(as a bot)

**Gasterophilus sp.**


Egg on the hair of a horse.



A microscopic image showing a dark, oval-shaped egg with a textured surface, firmly attached to a single horse hair. The hair is light-colored and appears as a thin line next to the egg.

**Gasterophilus sp.**

Note the conspicuous eggs on this hair from a horse's leg. These are a key diagnostic stage indicating a possible infection. They should be removed wherever they are found (face, chest, forelegs depending on fly species). Most owners will know to do this. Note that louse eggs will be found on the hair from all areas of the horse, not just the front.

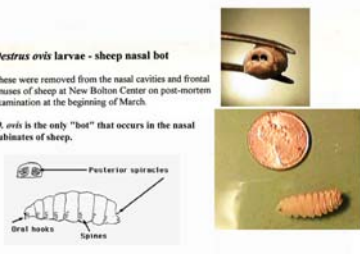


A microscopic image showing a hair with several small, dark, oval eggs attached to it. The eggs are clustered along the length of the hair.

**Oestrus ovis larvae - sheep nasal bot**

These were removed from the nasal cavities and frontal sinuses of sheep at New Bolton Center on post-mortem examination at the beginning of March.

*O. ovis* is the only "bot" that occurs in the nasal turbinates of sheep.




A diagram of a sheep's head showing the location of the nasal turbinates. Below it, a photograph shows a larva being removed from a sheep's nose with tweezers. Another photograph shows a larva next to a coin for scale. A third photograph shows a larva with its characteristic spiracles.

Labels in diagram: Pectoral spiracles, Oral hooks, Spines.

(as a bot)

**Hypoderma sp. - MATURE LARVAE**

An expert entomologist can identify these larvae to species using their size, shape and the characteristics of the spiracle plates.




Two photographs of mature larvae. The first is a reddish-brown, segmented larva. The second is a lighter, more segmented larva.

*H. bovis*      *H. lineatum*

(identify as a bot)

**Leather damage due to Hypoderma**

This piece of leather shows the healed lesions following the emergence of *Hypoderma* sp. larvae from the back of a bovine. The light spots are the scars. The scars lower the price received for the hide.




A photograph of a piece of light-colored leather with several small, circular, light-colored scars scattered across its surface. A coin is placed next to the scars for scale.

**Cuterebra larva**

This is a mature larva which would be found in a dermal pocket in the host.

Found in rodents and rabbits and inquisitive dogs and cats that stick their nose into rodent burrows.



Two photographs. The first shows a mature larva next to a coin for scale. The second shows a close-up of a cat's nose with a yellow arrow pointing to a small, dark spot on the skin, which is the larva.

(identify as a bot)

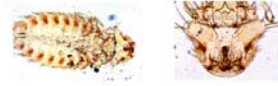
**Order Pthiraptera - Lice**  
**Suborder Mallophaga**  
**The Chewing Lice**  
**The Amblycera:**

These chewing lice have their antennae recessed into grooves at the side of their head. Many of the chewing lice of birds fall into this group.



***Menopon gallinae* - The Shaft Louse**

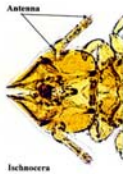
This chewing louse of poultry is an example of the Amblycera. Note that the antennae lie in grooves in the side of the head.



(as belonging to the Amblycera group of chewing lice.)

**Order Pthiraptera - Lice**  
**Suborder Mallophaga**  
**The Chewing Lice**  
**The Ischnocera**

These chewing lice have antennae that stick out from the side of the head.



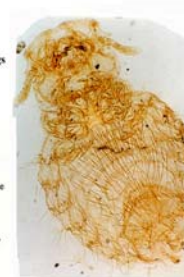
***Trichodectes canis* - The chewing louse of dogs**

Note:  
 General structure:  
 - head, thorax, abdomen  
 dorsoventrally flattened

Three pairs of legs with 1 claw at the end of each leg.

Antennae extend laterally from head (ischnocera)

Head - anterior end is broad and flat, characteristic of the biting lice

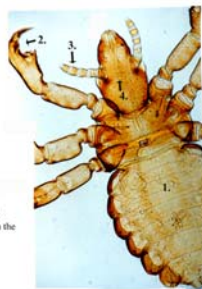


(as belonging to the Ischnocera group of chewing lice.)

***Haematopinus* spp. - sucking louse**

Note:

1. General structure  
 - head, thorax, abdomen  
 dorsoventrally flattened
2. Three pairs of strong legs each with a claw
3. Antennae extend laterally from head
4. Narrow, pointed head with recessed stylets (adapted for sucking). These are visible within the head of this cleared specimen.



(as belonging to the Anoplura - sucking louse)

***Linognathus* sp.**


Sucking lice of this genus are found on cattle, goats, sheep and dogs.



(as belonging to the Anoplura - sucking louse)

***Linognathus setosus* - Nit (egg)**


Egg cemented to the hair of a dog.  
All louse eggs are similar to this one.



●

***Phthirus pubis* - crab or pubic louse of humans**  
- a sucking louse (Anoplura)


This louse is a parasite of humans and does not have a reservoir in domestic animals (remember the host specificity of lice!)



●

***Pediculus humanus* - head or body louse of humans**  
- a sucking louse (Anoplura)

This is an adult, the nymphs are smaller but have a very similar structure.  
This louse is a parasite of humans and does not have a reservoir in domestic animals (remember the host specificity of lice!)



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***Ctenocephalides felis* - the cat flea**

The cat flea, the dog flea, and the human flea can act as intermediate hosts for *Dipylidium caninum*. The larval stage of the flea becomes infected by eating *D. caninum* eggs and cystercercoids then develop within the flea. The final host (dogs, cats, man) acquire the infection by swallowing the infected adult flea.

Note:

1. Presence of both genal and pronotal ctenidia (combs)
2. The head is longer (less blunt) than that of the dog flea, *C. canis*.
3. The first two spines on the genal ctenidium are almost the same size. (May be hard to see.)

● (using flea key)




***Ctenocephalides canis***

Note: General structure - head, thorax, abdomen and 3 pairs of legs


1. Presence of both genal and pronotal ctenidia (combs)
2. The head is more rounded than that of *C. felis*
3. Short first tooth on the genal ctenidium

● (using flea key)



***Ctenocephalides felis* - larvae**

These larvae are free-living. Live larvae may have a red color from feeding on the adult flea's feces and dried blood.



●

Flea larvae feed on the feces of adult fleas that fall off the host. Therefore you will find larvae where the pet is spending a lot of time. After all, the larvae are there because that is where the eggs fell off the host and they survive because that is where the flea dirt also falls off the host. Thus, you normally will find larvae deep in the carpet by the pet's favorite chair, or by (or in) the pet's bed. The dark line you see down the middle of a live flea larva is digested blood, and if you smash the larva on a white paper towel and add a drop of water the area around the larva will quickly become red. The same can be done with flea dirt combed off the cat or dog - this is sometimes what it takes to get the client to believe that the cat actually has fleas! For example:

"Doc, my cat is hemorrhaging from where you neutered him!" - He pulled a drenched cat from the carrier. "We just put him down in the tub to give him a bath when the water turned red with blood!" I looked down at his record. I had neutered this cat three years earlier. No possible way was he bleeding from his incision. Further examination revealed the problem.

"Mr. Johnson, the flea poop on your cat dissolved and turned the water red!" ...  
From "No Dogs in Heaven? Scenes from the Life of a Country Veterinarian." Robert Sharp, DVM. 2005.



### Flea Life-Cycle

Egg - larva - pupa - adult

