

# □ CLASS CRUSTACEA



# ARGULUS=Fish louse

- These are most common in wild and pond-raised freshwater fish, particularly **cyprinids, salmonids, perch and pike**. Fish louse is a **disc shape, dorso ventrally flattened**, a very distinctive shape and appearance. *Argulus* is a large parasite (5-25 mm) that can be easily seen with the unaided eye. **They are found especially in skin and gill lamellae.**
- This **transparent crustacean** has **two pigmented eyes** in its head and **2 strong sucking discs** on the abdominal surface. The **proboscis** with a pre-oral **stylet** is also located on the ventral surface between the suckers. When feeding, the stylet is inserted into the epidermis of the fish and feed on blood and tissue sera. They have **4 pairs of swimming appendages**, but **no egg sacs**. Adults and juvenile stages which are similar to adults but lack suckers) are relatively easy to identify.
- They move about the skin of a fish very effectively and camouflage themselves well on the host. They are especially harmful to small fish. The pathogenicity of the *Argulus* not only in the **mechanical damage** to the fish's skin but also in irritation of the epidermis by **digestive secretion-enzymes**.
- *Argulus* infestations tend to **peak in the summer and fall**.

- The parasite finds fish by actively swimming. In most cases, it stays on one fish, but it can also change hosts. *Argulus* has a direct life cycle (complex series of molts), in which adult females leave the host after copulation and deposit up to 500 eggs in a gelatinous string on any suitable underwater surface such as stones. After she releases her eggs, the female returns to the fish host. While the *Argulus* life cycle averages 30 to 60 days, the actual duration depends on the parasite species and the water temperature (*A. foliaceus*, 17 days at 23°C). Thus, four generations can be realized in a single summer.
- All life stages of both sexes are parasitic. After attachment, 7 or 12 larval moults follow in rapid succession until the adult stage is reached. The larvae are similar to adults, and they also have a parasitic life style.

- **Spot hemorrhages, anemia, fin and scale loss, increased mucus production, lethargy erratic swimming, reduced feeding, hanging at the surface** (avoiding swimming into the water column) and **poor body condition**. Reddish lesions occur at the site of attachment, and this opens the up the skin to secondary infections. **Fish may "flash" or rub** against surfaces in an attempt to relieve irritation or to remove the parasites. In some cases, there may be no obvious signs of disease other than presence of the parasite.
- At the place of sucking, ulcers can develop in which bacteria and fungi spread out. Secondary pathogens, such as the bacteria ***Aeromonas*** and fungi ***Saprolegnia***, are often seen concurrently with *Argulus* infestations. Lice can also transmit ***Rhabdovirus carpio, Trypanosoma*** and ***Criptobia***.
- **Diagnosis:** Clinical signs and wet mount of skin. ***Argulus* is visible moving on the fish or swimming in the water.** The parasite can be identified on a wet mount of the affected tissue. Captured fish should be examined quickly because *Argulus* may rapidly leave the fish once it is disturbed or removed from the water.

# ERGASILUS=Gill maggot

- These are most common seen in freshwater fish, particularly tench, then carp, pike fish (especially in the gill). *Ergasilus* is known as the «gill maggot» due to presence of long white egg sacs that behind the body. *Ergasilus* is Cyclops-like, small, pear-shaped copepod and like anchor. The anterior part of its body broadens, while the posterior part narrows and ends in a tapered tail. It measures 1.5-2.5 mm in length and can be seen with naked eye. The body is composed of segments. At the head end, a pair of large antennae have robust claws. *Ergasilus* attaches to the gill filaments and skin of fish using 2 large antennae with claws. White-yellowish color thread hangs out of fish's. No sucking disk, 4 pairs of swimming appendages, 2 elongated egg sacs. Only mature females are parasitic.
- The outer surface of the gill cover, the grooves. They feed on the host's epithelial cells, blood and mucus.



- Each female has **two egg sacs** which contain 100-400 eggs, from which nauplius larvae hatch into the water. It has a life cycle with many stages, but **only the adult females are parasitic**. The life cycle of this involves a number of free-living stages before the adult females become parasitic. The males remains free-living. Parasite includes a series of **6 naupliar (free-living)** and **5 copepodid (parasitic)** stages. After mating (after the 5th copepodid stage), the male dies, while the female seeks a host fish. The males then die and fertilized females become infective and settles on the fish. After attaching to a fish, it loses the ability to swim, but its ability to move on the surface of the gills remains.
- This infection are seasonal (late summer and autumn). The speed of development depends on water temperature (10-70 days). **At 16 °C**, the development in the **eggs takes 10-12 days**, at **20 °C** it takes **6 days**, while at 25 °C it lasts only 3.5 days.

- Its feeding apparatus further injures the host fish when it inserts the stylet into the epidermis and underlying host tissue causing hemorrhage. Heavy infections of *Ergasilus* will reduce the surface area and function of the gills. Damage is due to attachment and feeding. This causes respiratory distress and loss of normal osmoregulatory function. They cause **loss of condition, respiratory distress, restless, asphyxia, slowed growth, marbling appearance at gills, swim to the inflow and lethargic (sluggish) behaviour**. They are less tolerant of environmental changes such as low or fluctuating oxygen levels. Infected fish are emaciated, restless and swim to the inflow. When the infection is severe, death is common. They are likely to become more susceptible to secondary diseases, such as bacterial infection.
- **Diagnosis:** Clinical signs and wet mount of gills. These crustaceans as well as the changes they cause, can be easily seen with the naked eye, as **they appear as white spots**. Therefore, this disease can easily be diagnosed.

# LERNAEA=Anchor worm

- These parasites infect body surface of freshwater fish (skin, gill, fin, muscle and oral cavity). Carp are highly susceptible. They are easily **visible to the naked eye** and may be **more than 2 cm (1.2-2.5 cm) in length**. *Lernaea* shows **sexual dimorphism**. Its **males have a typical Cyclops shape**. Its **females**, however, after the copepodite stage, when attaching onto the host, completely **change their morphology**. The body of the **female is elongated and unsegmented**. **Fused cephalothorax, 2 pairs of horn-shaped appendages** (anchor is buried in the host's musculature), **rudimentary swimming appendages, 2 elongate egg sacs (females)**. Males look like copepod.
- This slender worm infects many species of fish, especially **during the summer months**. They adhere and burrow under scales to attack the muscles, anchor causes tissue damage, egg sacs are very obvious, and easily identified.



- Although *Lernaea* has complex life cycles, they do not need to pass through an intermediate host; **they can spread directly from fish to fish**. This direct life cycle can take from 18 to 25 days to complete (26-28°C), and only a fish is necessary for the organism to develop from egg to adult. In its life cycle, just as for *Ergasilus*, *Lernaea* has a free-living and a parasitic stage. **Naupliar** live free in the plankton, while **copepodite**.
- This copepod attaches to the fish. After male and female mate, the male dies within 24 hours and female permanently embed into the skin and muscle of the fish, and differentiates into an adult. **Only mature females are parasitic**. Female begins to release eggs from 2 sacs on its posterior end. Newly hatched nauplii are free-living and develop **3 naupliar** stages. At that point they molt into the first copepodid stage, become parasitic, and attach to the host. The parasite develops **5 copepodid** stage. Male separate but female remains parasitic.
- Adult females can overwinter on the fish host, producing eggs when water temperatures warm up in the spring. Females can produce batches of up to 250 nauplii every two weeks for up to 16 weeks at temperatures warmer than 25°C.

- When female parasites attach to the fish, they burrow deep into the tissues and eventually embed an anchor into the fish's body. Intense **focal inflammation** and hemorrhage can occur at the attachment site, making **the area appear red** and ulcerated.
- Small number of parasites is extremely **irritating to the fish**. Large numbers of lernaea can kill small fish by damaging their gills and making it **hard for the fish to breathe**. Infection lead to **focal hemorrhage, flashing, emaciation, lethargy** and muscle necrosis. Infected **fish rubs against objects, whitish-green threads hang out of the fish skin**. The scale is often lost. Anchor causes tissue damage. **If gills are affected respiratory distress**. At the attachment point, the parasite causes a puncture wound. Due to the necrosis of tissues, wounds become secondarily infected by bacteria (e.g., *Aeromonas*) and fungi. These secondary infections sometimes worsen and kill the fish.
- **Diagnosis:** Clinical signs are important for identification of parasite