- **4-NEMATODES**
- Nematodes are known commonly as roundworms and belong to the phylum Nematoda. The adult stage is typically elongated and cylindrical in shape, tapering at each end, and lacks body segmentation. These outward features differentiate nematodes from the tapeworms that, when adult, have flattened and distinctly segmented bodies. In the case of nematodes the sexes are separate, and most species are opaque to white in colour.

- The life cycles of nematodes are fairly complex, involving various developmental stages, and require sequential transmission through two or three different host species. In the case of fish parasitic nematodes, the life cycle may involve transmission, for example, through a freshwater invertebrate, then through two fish, the latter typically being a piscivorous species which is the final (definitive) host.

- Nematodes are rarely life threatening to their cyprinid hosts. They may however damage the parasitised organs and cause general poor health such as emaciation, reduced growth and reduced fecundity. The range and degree of these detrimental effects varies depending upon the nematode species involved, the intensity of infection, and whether the host is final or intermediate.

- Cyprinids may be either final or intermediate hosts, depending on the nematode species. For example, *Philometra abdominalis* this nematode requires only two hosts to complete its life cycle, involving cyprinids as final hosts and cyclops as the intermediate host. Yet another host combination is shown by *Eustrongylides mergorum* in which a cyprinid, e.g. common carp, is the second intermediate host and a piscivorous bird is the final

- **5-ANNELID WORMS (LEECHES)**
- Leeches are parasitic annelid worms belonging to the class Hirudinea, which comprises both terrestrial and aquatic species. Leeches are blood-feeders that are equipped with suckers at each end of the body(oral and posterior suckers) enabling them to maintain a grip on their host.

Fig. 7.38. *Piscicola* leeches on the head of a salmonid. (By courtesy of Dr C. Sommerville.)

- Several species of leech feed on the blood of cyprinids and other fish, although host-specificity varies according to the leech species. One well-known family of freshwater fish leeches is the Piscicolidae, which includes *Piscicola geometra*, known simply as the fish leech. This species grows to 30 mm in length, but some specimens may reach 50 mm. It lives for less than one year.

- Most fish leeches are temporary parasites, detaching from their host after having taken one or more blood meals. When replete, the leech will swim in the water, settling on the substrate where it hides among rocks or plants to digest its meal. Leeches are more commonly encountered on wild and pond-cultured cyprinids but are rare in aquarium maintained stocks.

- **Health threats of leeches on fish:-**

- 1-Leeches themselves are not generally considered to pose serious health threats to cyprinids, being rarely fatal under normal circumstances.
- 2-In heavy infestations the host may suffer from anaemia and listlessness.
- 3- The leech's bite wounds are prone to secondary infections for example by fungi.
- 4- Leeches work as vectors of fish diseases. Leeches are known to be capable of transmitting certain viruses to fish, such as the spring viraemia of carp virus (SVCv), leeches may also be natural vectors of some bacterial fish pathogens, in contrast, their role in transmitting various species of blood protozoa is well documented. For example, the leeches *Piscicola geometra* and *Hemiclepsis marginata* are both capableof transmitting the haemoflagellate *Trypanoplasma carassii* to goldfish, carp and other cyprinids.

- **Life cycle:-**
- The life cycle is direct, with hermaphroditic adults laying eggs in cocoons that are attached to aquatic plants or hard surfaces such as the undersides of rocks. Young leeches hatch from the cocoons.

- **Clinical signs:-** as most leeches spend only a proportion of their time attached to the fish, often the only evidence of a leech problem is the presence of circular red or white bite marks on the fish’s skin.

- **Control:-**
- 1-remove aquatic plants
- 2- remove the water completely from a lake or fish pond and apply lime.
- **Treatments**:-use

1-Dipterex(O.P.C.) 1PPM add for ponds water.

- 2-NaCl 2.5% for 1 h.
- 3-NaCl 30000 PPM for 5-15 sec.
- 4-$CuSO_4$ 0.5 PPM for 5-6 h.