Like all other animals, fish are also attacked by various parasites and become diseased. Majority of the infectious diseases of fishes are caused either by bacteria or protozoa. Besides these, fungi, worms and parasitic copepods also infect various species of fishes. Very frequently, fish are infected with more than one species of parasites at the same time.

The majority symptoms of disease of fish are loss of appetite, abnormal swimming movements, increase in the rate of ventilation, clumping of fins, remaining in the surface water, inactive in the bottom, production of excessive mucus and change in colouration (Varghese, 1988).

Generally, fishes have a good resistance power. But when conditions like lack of dissolve oxygen, extreme temperature, poor water quality, injury and shocks etc. occur, then disease attack the fish.

constantly monitored to detect any abnormal behaviour. A quarantine / hospital tank is always maintained to accommodate diseased fishes. Specific prophylactic and control measures formulated are administered to the diseased fishes. In the present investigation, the malady of the fish is classified into three major groups.

a) Infection from bacteria

b) Infection from fungi

c) Infection from parasites

9.1. Zymosis type and traits

The nosology of fish species so far reported by earlier workers occurring in different freshwater fishes along with those accounted in the present test fish are depicted below in tabular form (abbr +, recorded, -, not recorded)

<table>
<thead>
<tr>
<th>NAME OF THE DISEASE</th>
<th>OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. BACTERIAL INFECTION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Tail and fin rot</td>
<td>+</td>
</tr>
<tr>
<td>2. Gill disease</td>
<td>-</td>
</tr>
<tr>
<td>3. Dropsy</td>
<td>-</td>
</tr>
<tr>
<td>4. Exopthalmia</td>
<td>-</td>
</tr>
<tr>
<td>5. Ulcer disease</td>
<td>+</td>
</tr>
<tr>
<td>6. Mycobacteria</td>
<td>-</td>
</tr>
<tr>
<td>7. Furunculosis</td>
<td>-</td>
</tr>
<tr>
<td>8. Piscian tuberculosis</td>
<td>-</td>
</tr>
<tr>
<td>9. Colmanaries cotton wool disease</td>
<td>-</td>
</tr>
<tr>
<td><strong>B. FUNGAL DISEASE</strong></td>
<td></td>
</tr>
<tr>
<td>1. Gill rot</td>
<td>-</td>
</tr>
<tr>
<td>2. Body fungus</td>
<td>+</td>
</tr>
<tr>
<td>3. Eye fungus</td>
<td>-</td>
</tr>
</tbody>
</table>
### C. PARASITIC DISEASE

(a). Protozoan

<table>
<thead>
<tr>
<th>Disease</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ichthyophthiriasis</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Ichthyobodosis</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Spironucleus</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pleistophorosis</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Velvet/ rust</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Whirling disease</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Blood flagellate</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

(b). Crustacean

<table>
<thead>
<tr>
<th>Organism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Argulus</td>
<td>-</td>
</tr>
<tr>
<td>Lernaea</td>
<td>-</td>
</tr>
<tr>
<td>Clinostomum</td>
<td>-</td>
</tr>
</tbody>
</table>

(c). Helminth

<table>
<thead>
<tr>
<th>Organism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dactylogyrus</td>
<td>-</td>
</tr>
<tr>
<td>Gyrodactylus</td>
<td>-</td>
</tr>
</tbody>
</table>

(d) Hirudinean

<table>
<thead>
<tr>
<th>Organism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hirudinosis</td>
<td>-</td>
</tr>
</tbody>
</table>

Out of the 25 types of fish diseases reported in fishes, only five types are recorded in the present investigations. Significantly, these diseases do occur only in the laboratory condition and not in natural population (Figure 24). A brief account of each of the diseases recorded is given below.

### BACTERIAL INFECTION

1. Tail and fin rot:

The causative bacteria for these diseases as reported by earlier worker are mainly

*Aeromonas sp, Vibrio sp* and *Pseudomonas sp*
FIGURE 24. Zymosis types in *Schizothorax richardsonii* (Gray)  
(1 & 2. Body fungus; 3 & 4. Tail rot and 5,6 & 7. Whirling disease)
Symptom:

The first sign of the disease is the appearance of a white line on the margin of fin, which gradually spreads to the base of fin. The fishes are with split fins often with frayed edge.

Stages of infection:

Infection is found mainly in adult fish. But subadult fish is also found affected.

Period of infection:

Major infection is observed from March to May and November to January.

2. Ulcer disease

The causative agent is bacteria, as reported by earlier workers.

Symptoms

In the initial stage of infection, inflammatory red spots are formed on the body.

The infection gradually turns to large and deep ulcer.

Stages of infection

Adult and sub adult fish are found mainly affected.

Period of infection

The disease is observed in the summer months.

FUNGAL INFECTION

3. Body fungus

Mostly *Saprolegnia* and aquatic fungi reportedly cause body fungus.

Symptoms

Fluffy, cotton wool like growth on site or sites of injury. White patches on the body and white tufts near the fins are observed.
Stages of infection
Mainly adult and sub adult.

Period of infection
Throughout the year.

PARASITIC INFECTION

4. Ichthyophtheriasis / White spots
The causative agent is mainly a ciliate Protozoan *Ichthyophthirias multifilis*.

Symptoms
Body and fins are covered with small pin head sized white spots.
The spots are clearly visible.

Stages of infection
Advanced fry and adult are mainly affected.

Period of infection
The disease occurs in summer months.

5. Whirling disease

Symptoms
Disease can be observed only in the advanced stage. The fish swims listlessly, whirling, swimming in dorsal or lateral position, anal gets inflammed.

Stages of infection
All stages.

Period of infection
Through out summer, maximum in the month of June and July. The infection last for 7 – 8 days.

9.2. Prophylactic and control measures

It is possible to control fish disease by prophylaxis (preventive treatment), therapy (curing treatment) and metaphylaxis (after cure). It is well known that prevention is better than cure, this also applies in the case of fish. With the observance of this principle most of the losses can be avoided from the very outset, particularly when disease are often difficult to cure or cannot be cured at all once they break out.

Prevention measures and practices should be economical and should cover as far as possible all fish disease. The origin of many fish diseases may be due to one hand, deficiencies in the environment and the maintenance and on the other hand, due to the general conditions attained by fish and the inherited and acquired resistance.

The general prophylactic measures adopted in the present experiment for the prevention of disease of the test fish under aquarium condition are:

1. Avoiding over crowding: This is not an actual cause of disease but contributes to the rapid spread of any infection when the fishes are reared in aquarium.
2. Avoid over feeding: Over feeding contributes to disease sometimes because uneaten food on the bottom of the tank will rot and pollute the water.
3. Avoid supply of inadequate diet: The supply of inadequate feed especially poor quality dried food is one of the factor of gross imbalance in protein – carbohydrate – fat ratio, which leads to a variety of infection.
4. **Maintenance of water quality**: Rapid changes of the physico-chemical properties of the aquarium water will have weakening effect on fish. The water quality like dissolve oxygen, water temperature, pH values and hardness are maintained in permissible limit for prevention of disease. Water need to be changed regularly in order to maintain an ideal condition and to prevent build up of excess nitrogenous waste in the aquarium.

5. **Precaution on new addition**: The unfortunate experience of introducing new fish, plants, accessories in the established aquaria have caused a sudden onslaught of disease. Therefore, precautionary measures are taken before introduction of new addition.

6. **Quarantine process**: The precautionary measure for preventing disease is the quarantine process. All new addition is kept in the quarantine aquarium for 2 – 4 weeks.

7. **Avoid contamination**: The contamination takes place due to unsterilized net and unwashed hands.

Specific prophylactic and control measures effectively formulated in the present study on the observed diseases are purported below:

1. **Tail and fin rot**

   **Prophylactic measures**
   
   1). Removal of affected fish.
   
   2). Removal of metabolic end product and residues.
   
   3). Partial replacement of water every two days.

   **Treatment**: The following treatment is found to be effective in initial stage of infection.
   
   1). Short bath with 10 mg Oxytetracycline/ 10 litre water for 20 – 25 minutes for 6 - 8 days duration.
   
   2). Norfloxacin 0.2 mg/ litre water is used for long bath of 2 – 3 days.
Period of recovery: 8 – 10 days.

2. Ulcer disease

Prophylactic measures

1). Diseases fish are removed as soon as possible.

2). Removal of water and continuous flow of clean water.

3). Proper sanitation of aquaria is maintained.

Treatment: The effective treatment for the present test fish are as follows.

1). Long bath with 250 mg Hostacycline/ 50 litre of water for 4 – 6 days.

2). 250 mg Oxytetracycline/ 20 litre of water for 3 – 4 days long bath.

Period of recovery: 8 – 9 days

3. Body fungus

Prophylactic measures

1). Careful handling of fish and avoidance of mechanical injury.

2). Proper sanitation.

Treatment: The effective measures are

1). Long bath treatment with Cephalaxin 0.2 mg/ 10 litre of water for 2 days.

2). Short bath with 1 mg of common salt/ litre of water for 2 – 3 days.

Period of recovery: 8 – 10 days

4. White spot / Ichthyopithiriasis

Prophylactic measures:

1). Introduction of new fishes, plants and stone are avoided without proper quarantine for a duration of four to six week.

2). Spawning fishes are removed from breeding. The fishes in very early stages are transferred from breeding aquaria / pond as early as possible.
Treatment: The following treatments are found effective for the eradication of parasite.

1). 250 mg of common salt/litre of water is highly effective for short treatment.

2). The parasite is dislodged in 0.15 mg/litre of Malachite green for a period of 3–4 days.

Period of recovery: 6–8 days

5. Whirling disease

Prophylactic measures:

1). Systematic investigation at intervals of ten days at least from May to June.

2). Ponds where infection occurs should be disinfected with Malachite green.

Treatment: The effective measures are

1). Long bath treatment with Cephalaxin 0.2 mg/10 litre of water for 3 days.

2). Short bath with 1 mg of common salt/litre of water for 2–3 days.

Period of recovery: 5–7 days