Healthy fish are lively; they react well to environmental stimuli. No visible disorders or injuries can be seen on their body. They search for their food vigorously.

Sick fish swim about sluggishly, or float in the water turning to their side or back, or swim round, or gather at the water inflow, or they gasp for air near the surface of the water. Also, they do not have appetite; they do not bite the bait. There may be typical, visible disorders on sick fish, e. g. distorted spine, abdominal lesions, excessive thinness, bulging eyes, broken fins, raised scales, discoloration of the skin, irregular skin disorders, parasites and tumours on the surface of the skin, etc.

Fish live a hidden life so we can study their health status only by thorough observation, and by knowing the fish pond and its environment.

Biotic fish diseases are all the disorders caused by viruses, bacteria, fungi and parasites.

Abiotic fish diseases are caused by irregular environmental factors, e. g. conditions of lack of oxygen, bad quality water, presence of toxic materials, feeding problems, feeding bad, mouldy materials, etc.

Biotic Fish Diseases

Viral diseases

- **Spring viremia of carp (Virus septicaemia infectiosa cyprinorum)** - a disease which affects mainly one or two year old carp, caused by RNS virus. The disease begins in spring when the temperature of the lake exceeds 13-15 °C. The abdomen of the dead or sick fish is enlarged, the eyes bulge, the rectum protrudes, the scales are raised, and haemorrhaging can be seen on the skin. The dissected fish have accumulated fluids in the abdominal cavity, bleeding all over the body, swollen internal organs. Survival chances of the fish are minimal, especially if secondary bacterial infection complicates the viral disease. Earlier the disease of the dead fish infected by the two germs was called ascites. The viral disease can be prevented by the strong resistance of the body while the bacterial disease can be prevented by feeding antibiotic food. The spring viremia has to be reported to the animal health authority. Quarantine has to be introduced in the area of the disease. The quarantine can only be lifted by the animal health authority.
Fish pox – carp herpes (*Epithelioma myxomatosa cyprinorum*) – a disease of the carp, rarely of the catfish, caused by the herpes virus. Greyish white, scattered or merged lumps of jelly-like touch appear on the head, fins and often on the body of the sick fish, which are attached to the skin tightly and if they are removed, haemorrhaging area remains there.

The fish rarely die of this but because the taste of the flesh changes, it cannot be eaten by humans.
Koi herpesvirus disease - was first described in Israel where 80 % of the common carp and koi carp was killed in a few month time by this disease caused by the herpes virus. Later the disease appeared in Indonesia, as well. Koi herpes usually occurs in summer when the water temperature is about 22-27 °C. The dead fish have gills with white spots, necrosis, haemorrhaging; their eyes are hollow; there are pale marks, blisters on the surface of the body.
- **Viral disease of the salmon type fish** – includes the viral haemorrhaging septicaemia (VHS), the infectious haematopoietic necrosis (IHN) and the infectious pancreatic necrosis (IPN) of the trout.

  The fish with VHS become dark, inflamed areas appear on the skin and in the muscles, bleeding and degeneration occur in the liver and kidneys, and inflammatory fluid accumulates in the abdominal cavity. The mortality rate can be as high as 50%. IPN makes the young fish sick. The evidence for this illness is – besides the isolation of the virus – the necrosis of the pancreas and the hyaline degeneration of the muscles. These diseases must be reported to the authorities, and in case of mortality, designated laboratories must be contacted for investigations.

- **Pike Fry Rhabdovirus Disease** (*Virus septicaemia infectiosaeosium*) – also known as the red disease of the pike. Redness on the body, skin and gill bleeding, bulging eyes and hydrocephalus appear in the 4-5 cm long pike fry. The disease is transmitted by gold fish and water.

- **Lymphocystis in ornamental fish** – appears in fish tanks and in ponds with ornamental fish. Pearl-like growths appear on the fins, skin and gill of the infected fish which become ulcerated later. The sick fish feed badly and their development slows down.

- **Cauliflower disease in the eel** (*Papillomatosis anguillarum*) - a viral disease that appears in older fish. Greyish white, irregular surfaced cauliflower-like growths, the size of a peanut or walnut appear on the area of the upper jaw. These fish are not suitable for eating by humans, which has an economic consequence.
Diseases caused by bacteria

- Ascites caused by Aeromonas hydrophila (*Septicaemia haemorrhagia cyprinorum*) – It is a disease of different species in cases of low resistance, which causes death with abdominal ascites, internal inflammations and bleeding. The symptoms are similar to those of spring viremia.
  The factors that make the fish susceptible to the disease are: wrong feeding, great fluctuation of the water temperature, transportation and packing that causes stress, and it may develop as a complication of other diseases. The germ is a facultative pathogen bacterium, which is always present in water, in the environment of the fish and even in the intestines, and it breaks into the bloodstream if the resistance in the fish becomes weak, starts to multiply and causes bacteraemia.
  The treatment in pond farms could be feeding the fish with antibiotic supplement, bathing the fish in a solution containing antibiotic, or individual vaccination.

- Ulcerative dermatitis (*Erythrodermatitis*) – is caused by a type of Gram-negative bacterium mainly in carp but it occurs in other fish species as well. Round ulcers develop on the body of the diseased fish except on the head, which penetrate deep into the tissues. The ulcers cause degeneration of the cells of the epidermis, dermis and muscles but the organs in the abdominal cavity are not affected.
  The disease, which lasts for a long time, often occurs among fish stock of low resistance in the spring months, so previously it was believed to be a chronic form of ascites. The disease is known by anglers as wounded carp. Mortality is usually less than 20 %.
  The disease can develop in two year old carp as well which are introduced into fresh water in spring if the fish have become weak during winter time.
  The chance of recovery is favourable if antibiotic feed is given to the fish or they are bathed in antibiotic solution in the fish pond.
- **Columnaris** – occurs mainly in carp but also in any other fish species in ponds, fish tanks where the chemical composition differs from the optimal values or if feeding problems rise, i.e. lack of plankton. The disease got its name from the column-shaped Gram-negative bacteria.

White, cloudy patches appear on the body – often on the gills - of the fish, which is followed by the necrosis of the skin and the gill filaments. Clinical sign of the disease is the fragmentation and discolouration of the gill filaments. The disease may often appear when rearing catfish.

It appears in both fish ponds and angling lakes if the resistance of the fish becomes weak when the otherwise facultative pathogen bacteria multiply excessively.

A successive treatment could be bathing the fish in salty water but eliminating the unfavourable environmental conditions is equally important.

- **Fish tuberculosis (Tuberculosis piscium)** – It is mainly a disease of tank fish. All fish species are susceptible to the disease but it poses no danger to humans. Different Mycobacterium strains cause it. The abdominal volume of the listless, weak fish grow, fluid accumulates in the abdominal cavity, and pea sized tubercles appear in the guts. The disease cannot be treated, the infected fish have to be destroyed and the fish tank has to be disinfected thoroughly.

- **Ulceration in pike (Morbus maculosus esocium)** – Its pathogen is not clarified. Mainly spawning and older pike get the disease in spring. The diseased fish stay close to the shore and near the surface of the water. In the beginning redness and inflammation appears on some later more scales on different parts of the body. Later the scales fall out, the skin dies and the tissues and muscles beneath infiltrate with blood and fluids. These parts are surrounded by a red ring. Later the dead skin falls off and a deep ulcer remains in the muscle. The ulcer will not heal and the fish die.

Dissection reveals the weak condition of the fish and sometimes liver degeneration and intestinal inflammation can occur.

The treatment of the fish is not possible. It is advisable to collect and destroy the dead fish.

- **Red mouth disease in trout** - is caused by Gram-negative bacteria belonging to the Salmonella strain. The most significant symptoms are the bleeding and inflammation around the moth and on the lips and later on the gills. The colour of the skin becomes darker and the eyes bulge. The diseased fish lose their appetite and swim about listlessly. There are bleedings everywhere inside the body, revealed after dissection.

The disease last for 3-4 weeks and 30-50% of the younger trout and 15-20% of the older may die. The treatment could be vaccination or sulphonamide or antibiotic. In some countries it is a disease that has to be reported to the authorities.

- **Septicaemia in silver carp** - is caused by Pseudomonas fluorescens bacteria. It appears during or one or two months after harvesting. Bleedings appear on the skin, the fins, on mucous membrane of the mouth and the gill cavity and in the eye cavity. Similarly, bleedings, infiltrations with mucous can be found in the internal organs with liver and kidney degeneration. Treatment is not possible in winter time, the disease can be prevented by observing the technology strictly.

- **Mucophilosis** – is caused by the similarly named organism. Formulae of 60-70 µm diameters can be seen in the gill epidermis of the infected fish, which are the accumulated mass of the germs in the cells. It is a disease of mainly the carp and the grass carp. There is no treatment for this disease at present. It is advisable to dry the pond and treat the soil with lime.
Diseases caused by fungi and algae

Fungi multiply with spores, their cells contain no chlorophyll, thus their nutrition is heterotrophic and they need organic materials to survive. The fungi that cause fish diseases all belong to the groups of Archimyteses and Phycomycetes. They can only cause diseases if the biological balance of the pond is disrupted (lack of oxygen, change in pH of the water, etc.).

- **Saprolegniasis** – one of the oldest known fish diseases. The disease is caused by the fungi living on rotting, decaying organic material. The fish develop different sized, whitish greyish cotton-like growths on the skin. Fungi create these growths, whose one end penetrates the skin and the other floats in water on the fish. The growth can cover the whole body.
  It occurs on the injuries as well in angling ponds after the introduction of the fish. In pond farms, the growths appear on the sites of injuries caused by cormorants, gulls or carnivorous fish. The scales are usually missing under the fungi, the skin is necrotized, fin rays are fragmented, and the cornea is bright.
  The diseased fish swim about in the water listlessly. The very ill fish can hardly be cured. If the disease is recognized early, a favourable result can be reached by bathing the fish in malachite green solution of 4 ppm concentration (1:250,000 dilution) for 20 minutes.

- **Gill rot (Branchiomycosis)** – can develop in any reared fish species. It mainly occurs in angling ponds where the abundant organic material promotes the overpopulation of algae and plankton. It is caused by an alga fungus which parasitizes in the blood vessels of the gill. The spores of the fungus are spread by the fish but they can be transferred with contaminated water as well. The fungi in the blood stream get into the blood vessels of the gill where they block the capillaries and cause the necrosis of the gill. The diseases can be separated from other similar gill problems by identifying the alga.
The acute form appears in the end of summer or the beginning of autumn and lasts for 2-3 days. The semi-acute form occurs in spring or in the beginning of summer and lasts for 1-2 weeks. The chronic type appears in spring or late autumn and lasts for months, which manifests itself by sporadic mortality. The seriously infected gill has a marble colour showing a disorder in circulation and causes the death of the fish.

After identifying the disease, feeding has to be cancelled immediately and the pond has to be refreshed with a large quantity of oxygen rich water. The quantity of the accumulated plankton can be decreased by adding lime (200 kg/ hectare) but the pH of the water should not be higher than 9. The disease can be attacked by adding copper sulphate (8-12 kg/ hectare). The agent must be sprayed in a 1% solution from May to August monthly. The disease can be prevented if infected fish are not purchased. The rotting plants in the lake have to be eliminated quickly and if roast ducks are reared in the pond, 100 ducks are placed in the lake per hectare at most. If the disease is suspected, the animals have to be moved from the lake.

- **Ichthyosporidiosis** – is a disease of tropical fish living in fish tanks. It is caused by a fungus of the same name. The diseased fish become thin, the fins break off, lose their scales, and ulceration appears on the skin. After dissection, necrotic nodules will be found in the spleen and the liver. The fish soon die because the disease cannot be cured. In order to postpone the death of the fish we can add 5 g/100 l Chlorocid antibiotic into the water of the fish tank. The disease can only be eliminated by strict disinfection by destroying the fish and the plants as well and the cleaned tank should also be sterilized when it is dry. The other equipment should be disinfected by hydrochloric acid.

- **Diseases caused by algae** – The algae which stick to the skin and gill obstruct gas exchange, their toxins cause poisoning, when they overpopulate, they disturb the balance of the wet environment.

  - **Algal poisoning** is caused by some green and blue algae species by their toxin production. The toxicosis will affect fish farms that use a lot of manure and fertilizer.

  - **Algal blooms** appear in summer in ponds rich in nutrition, which leads to the biotope imbalance of the lake. The overpopulated algae form a blocking layer on the surface of the water and obstruct the oxygen from getting into the water. They themselves use oxygen and they also consume the nutrition in the water. After overpopulation they die, which fastens the rotting process and this leads to even less oxygen in the water. During rotting, hydrogen sulphide and methane are produced, which causes the death of the fish in large quantities with drowning symptoms. Significant changes in the pH lead to gill damage as well.

Algal bloom should be prevented by keeping the level of the use of fertilizers at an optimal level. If the algae have started to overpopulate in a pond, we can hinder it by adding copper sulphate or quicklime to the water. Rearing ducks in ponds that tend to have algal blooms should be carried out with great care and complying to the technology.

- **Mucophilosis (epitheliocystis)** – causes disease in the carp and grass carp. A similarly named unicellular germ multiplies in the epithelial cells of the gill. The gills of the diseased animals are full of tiny round patches. The disease will occur in June or July. It often occurs in ponds where the water contains a lot of organic materials that tend to decompose.

  The diseased fish gather at the inflow, they become listless and swim about near the shore. The best method of fighting against this disease is maintaining the hygienic conditions of the pond
Diseases caused by parasites

Most fish diseases are caused by parasitic lower organisms. Fish parasites are commonly protozoa or worms but some species of arthropods and molluscs can also parasitize on fish. A number of parasites move on the body of the fish freely and after detaching from it finds another fish. Some groups of parasites specialize on one fish species, e.g. gill worms, blood parasites and coccidia.

Because of the special features of the wet environment, fish will probably never be reared without parasites. A small scale parasite infestation does not mean disease. When parasite infestation becomes a disease depends on the kind and number of parasites, the age, development and condition of the fish, and on the duration of the infestation, etc. The natural resistance of well fed, well conditioned fish is usually enough to prevent the development of the disease. However if conditions get weaker, severe diseases can occur. Parasites can harm the gills so much that they cannot perform gas exchange and fish drown. Another significant harm occurs because of the mechanic and toxic effect of the parasites. The gill necroses because of the parasites adhere and feed on it, and the epithelial starts to proliferate. Weather the fish dies from the damage of the gill depends on the temperature and oxygen level of the water. Fish in waters of higher temperatures die sooner than in colder waters. The oxygen content of the water is another important factor.

- **Ichthyophthiriasis** – is the most well-known and one of the most economically significant fish diseases. It occurs in ponds of both cold and warm water and in tanks too. It is caused by a uniformly ciliated protozoan, which is visible to the naked eye because of its 1 mm size. The seemingly external parasite develops as an internal parasite under the outer layer of the epithelial and feeds on host organism’s cells and tissues. After detaching from the fish, the parasite reproduces outside and the swarming new individuals search new hosts. Because of this type of development, an intensive infestation may occur among fish kept in crowded waters, e.g. in angling lakes or intensive fish farms. The damage to the gill and the skin can cause 100% mortality. The fish whose skin is affected look as if they were covered with grist, hence the Hungarian name of the disease is grist disease. The affected fish leave deeper waters, look for waters with higher oxygen content, or they gasp on the surface. If possible, they try to rub their side and abdomen, which become red and sores may develop. Greyish white, sharply defined, a bit protruding nodules of 0.3-1 mm in diameter appear on the skin and the gill, which cannot be brushed off with hand.

For the treatment, malachite green is recommended. 400 g malachite green is diluted in lukewarm water and added to 1000 m³ water of the pond evenly. It is very important to mix the agent evenly in the water because malachite green is toxic to fish. After 24 hours it is recommended to change the water of the pond the treatment should continue with new solution.

The other possibility is putting the infected fish stock in flowing water and the swarming protozoa are drifted away by the current. The same is recommended for fish in tanks.
- **Fish sleeping sickness (Trypanoplasmosis)** – is caused by a flagellate protozoan living the blood of the fish. The infection is carried from one fish to the other by fish leeches. The parasites that float freely in the blood, whipping with their flagellums, and multiplying by fission make the fish weak by eating their blood plasma and damaging the red blood cells.

The fish are languid and move little; the very ill fish lie on their sides on the bottom of the water and fish leeches are abundant on their body. These fish become thin, their skin and gill are pale, and their eyeballs are hollow.

No specific treatment is known. It can be prevented by keeping good conditions and giving the fish abundant feed.

- **Chilodonellosis** – is caused by the similarly named protozoa. It mainly occurs in crowded fish stocks, fry rearing ponds and wintering ponds. The parasite is spread by water. It reproduces well in colder waters, too. The diseased animals are listless, and swim about near the surface. Several times they show constrained movement with their abdomen upwards. The fish that become apathetic can be caught with hands. The skin of the fish has a milky colour, the epidermis is frayed, the gills are pale, and their structure is blurred, covered by a lot of mucus and epidermis fragments.

The main possibility of preventing the disease is decreasing the crowdedness of the fish or medicine can be administered, too, e.g. tripaflavine, malachite green, copper sulphate, rivanol, methyl blue, etc.

- **Ichtyobodosis or Costiosis** – is the disease of densely introduced carp and trout of a few weeks of age. It is caused by a flagellate protozoan. The sick fry eat little food or do not eat at all. The fish stay near the surface of the water and they gasp. Their movement become slow and they do not react to stimuli from the environment. They can be caught easily. A veil-like greyish coating can be seen on the fins, skin and gills. In severe cases the fins lose their transparency, they become unclear, and injuries and deformations appear on them. The skin becomes frayed and its tatters float in the water.
This disease occurs mainly in ponds with acidic water inflow and where the fish are introduced densely. For treatment, older carps can be bathed in a 5% common salt solution, which has beneficial effect. In case of other species and fry, bathing in a 2.5% common salt solution for 15-20 minutes is recommended.

- **Trichodinosis** – is caused by ciliated parasites, which cover the gills, the skin and fins of the fish in big masses. The severe epidermis injury leads to death. Mainly herbivorous fish are affected in fish farms. The gills of the dead fish are pale and coated by mucus and tissue fragments. The recommended treatment is bathing in malachite green.

- **Fish Coccidiosis** – is a very common infestation but only common carp and silver carp coccidiosis have significance. Diffuse intestinal coccidiosis is caused by Eimeria carpelli. The whole development of Coccidium takes place in the fish. The oocysts bore themselves into the epidermis of the intestines, where they harm the intestinal cells mechanically and with toxic metabolites and disturb the secretion and absorption mechanism of the intestines. As a result the mucous membrane peels off at some places where bacteria start to accumulate. This disease happens at the end of winter among one summer old fish and during summer among the fry in rearing ponds. In case of severe coccidiosis, a great number of lutea are formed on the mucous membrane of the intestines. The infected fish become weak; they lie on the bottom of the pond and by the shore in masses. Their heads are usually in a downward direction. Their eyes are hollow, their backs and abdomens are retracted. The intestinal mucous membrane is covered by thick, reddish mucous layer, which contains the developmental forms of the oocyst. The individuals showing the clinical signs cannot be cured. The fight against the disease can only be prevention. The spring stock should only be introduced into a pond that has been dried and disinfected with lime.
Diseases caused by myxosporeans – Several types of myxosporeans occur in fish and some of them can cause significant harm. The sign of the infestation is the development of white lumps the size of a pinhead in the fins, on the skin and the gills and in the internal organs of the fish. These cysts are full of spores.

Common carp gill myxobolosis (Myxobolosis disparum) – The protozoa form cysts, the size of a millet-seed in the connecting tissue of the central and outer parts of the gill. If the fish are strong enough, they do not die. The infestation can be decreased if the ponds can be dried up and the upper layer gets frozen during winter. Reliable decontamination can be achieved by disinfecting the soil of the pond by lime and chloride of lime.

Common carp muscle myxobolosis (Myxobolosis cyprinorum) – The protozoa develops in the skeletal muscles of the carp but its spores are detectable in all internal organs. Watery infiltrations develop in the capillaries of the internal organs because of the spores, the scales stand away from the body, and eyes bulge. The kidneys and the muscles are easy to be torn; besides anaemia is visible.

Silver carp myxobolosis – The protozoa create cysts in the epidermis of the gill of the silver carp, which become unsuitable for breathing. On the sites of the emptied cyst, shortage of material is retained and often whole gill plates are shed. The ill fish gasp and float in the water belly up. In severe cases, mortality can become extensive.

Trout whirling disease (Myxobolosis salmonum) – It mainly causes economic harm among rainbow trout. It damages the cartilages of the skull and the spine. Its symptom is the fish turning round and round because of the damage to the balance centre. The back third of the body is darker than the front part. Because of the damage to the cartilage tissues, the spine may become slanted, the gills become uneven, the nose becomes “pug nose”, the mouth stays open, etc.. Fumagillin DCH pulvis is suitable to treat the disease, and the bottom soil of the pond should also be disinfected.
**Carp thelohanelllosis** – It can make the carp fry ill in the summer, while the fin rays get distorted and break off. The disease does not cause significant economic damage. To fight and prevent the disease, it is recommended to dry and disinfect the pond.

**Gill sphaerosporosis in common carp and grass carp** – The protozoa develop without cysts in the support providing multilayer epidermis of the gill, or rarely in the skin. So the disease cannot be diagnosed by simple observation. The infection has a special epidemiology; the spores can only be found in summer and autumn. At the onset of the disease the rate of the infected fish is 80-100 % in some ponds and another pond next to it might be free of infection. We can only find severely infected on or non-infected fish in a stock.

The ill fish show the signs of drowning: they swim about near the surface of the water, and they become weak and thin. Mortality rate is very high when the spores ripe. The gill of the dead fish is pale, has a blurred structure and damaged tissue fragments can be found.

In case the fish are fed optimally they can survive the infection and by the end of autumn the infection ends.

**Swim bladder disease** *(Aerocystitis)* – is a disease of carp in pond farms. One of the most significant fry diseases. It is caused by a protozoon that develops in the wall of the swim bladder. The disease can be divided into five stages: 1: the swim bladder becomes rich in blood and tiny bleedings appear; 2: the level of blood in the swim bladder decreases and distinct, brown or black patches, the size of a lentil seed, appear on the wall of the swim bladder; 3: the swim bladder becomes thick, inflammatory products appear; 4: the disorder becomes more serious, some layers of the wall of the swim bladder die; 5: cysts are formed in the wall of the swim bladder and its cavity is filled with serous, purulent fluid. From stage 3, the appearance of bacterial complication is likely.

As for the signs, in the first two stages the disease is asymptomatic. In the chronic form of the disease (from stage 3), the ill fish swim on their back losing their balance, or on or
their sides, or head down. Their tail fin sticks out of the water, they flutter them without success trying to sink. The symptoms start suddenly, when the water level in the pond or tank sinks a lot in a short time and the ill swim bladder cannot function normally in its hydrostatic role. The belly of individual fish becomes very large and its touch is rippling. About 10-20 % of the fish reach the most severe stages from the initial slight disorder and death is sporadic, too. It is worth noting that other fish living together with carp do not become ill seemingly. The course of the illness in fry is rapid, the parasite form tends to heal, and the swim bladder regenerates. In case of complications, a high proportion of the stock may die in a short time.

Treatment has not been resolved, the only effective medication for prevention is Fumagillin DCH pulvis.

- **Fish diseases caused by worms**, –usually external parasites, characterized by their strict host specificity. They usually colonize the gills, fins and skin of the fish, and in the nose cavity.

**Gill fluke disease of the cyprinids (Dactylogyrosis)** - Dactylogyrus are the tiny worms with elongated body, their body length is rarely more than 1mm. These parasites are hermaphrodites, and they produce eggs to multiply. The worms living on gills constantly empty the eggs, which sank to the bottom of the lake. The eggs become embryos on the bottom of the lake, and the larvae swim to find a host fish. The larvae settled on the gills start developing, losing their cilia. The worms which have settled in the gills gill fix themselves with their anchors latched onto the gills. They damage the epithelium with their side anchors and to feed on detached epithelial cells, tissue fluids, mucus, sometimes with blood. If the worm invasion occurs within a few days, a large number of gill worms settle, the fish die before the typical gill damages. The mortality rate depends on the size of the fish, the number of settled worms and the water temperature.

The ill fish are restless, looking for more oxygen rich water. The agonizing fish float on the surface with their bellies turned up. By definition, the gills are covered by pale, mosaic-like, abundant mucus.
To control the disease, it is important to avoid the direct contact of the fry with the older, for example mother fish, which could be parasite carriers. The perfect separation is facilitated by artificial propagation. The overwintering eggs can be eliminated by drying and disinfection of the soil. Another effective method is filling the ponds with water a few days before introducing the fish, and the hatching worm larvae die in the absence of a suitable host. In case of appropriate feeding, the fry soon reach 5-6 cm in size, and they outgrow the harm of the parasites. The parasites are harder to find host fish in less crowded populations.

The ill juveniles can be cured with bathing in 2.5% saline or ammonia a solution. The older fish can be bathed in 5% saline solution for 5 minutes. Equally favourable results can be reached by bathing in 0.1% ammonium hydroxide solution for a half minute as well.

**Gill worm disease of the catfish (Ancylostoidosis)** - The parasite specializes on catfish, it clings to the tissues of the gills with its middle anchors, and it damages the gills with side anchors and digestive fluids. The epidermis of the gill decays, tissue damage and bleeding occur. An acute gill worm disease develops in the fry and in older fish a subacute or chronic disease develops. The sick fish show signs of hypoxia and asphyxia, they move towards the inlet of the lake and they can be caught by hand. Some of the fish float upright in a vertical manner on the water surface. During the autopsy we observe similar disorders as in other fish species with the company of a large number of worms.

As for the medical treatment of disease, good results will follow the use of organic phosphoric acid esters, and bathing in a 0.1% ammonium hydroxide solution for half a minute.

The main requirement for preventing the disease is to prevent the mothers from contaminating the fry, or even it is advisable to bathe the mothers before spawning in the lake.

**Gyrodactylosis** – The parasites live on the body surface, fins and gills of the fish. It is a viviparous species where successive generations can be found in the worm's body at a time. The parasite feeds on carp in pond farms in particular (and on the crucian carp). The sick fish are listless; the fry are slow to develop and show symptoms of shortness of breath. The worm can be killed in salty, ammonia baths, and with organic phosphoric acid ester. The preventive measure is avoiding big fish density.

- **Fluke worms (Trematodes)** – are parasites that reproduce with intermediate hosts. Some of them are adult worm parasites in fish, in their intestines or vasculature. In this case, the first intermediate host are aquatic snails or mussels. The second intermediate host are organisms which is a food source of the fish, such as crabs, snails, insects, etc. If they do not need intermediate hosts, the developmental stages of the flukes (cercaria) find the fish with active swimming and get into their bodies.

**Blood fluke disease of the fish (Sanguinicolosis)** – The flukes, which are not more than 1 mm long and have an elongated body, parasitize in the blood vessels of carp gills. The intermediate hosts are snails. The flukes lay their eggs into the bloodstream of the carp where they parasitize; the miracidiums hatch there, which penetrate the tissues, and getting into the water they swim to find a snail. There they continue to evolve, and later leave the intermediate hosts and finding a fish they penetrate it, where they become sexually mature, the process begins again. The eggs, which are produced in large quantities, are capable of blocking the blood vessels, and on their impact congestion and necrosis occur.
When the **gill** becomes ill, due to clogged capillaries, some sheets of the gill die off and are destroyed. The gills become pale, sometimes mottled, dotted with haemorrhage. This form of disease is mainly characterized by the fry.

When the **kidney** becomes ill, the Malphigi bodies die due to clogged capillaries and because of the loss of kidney function, fluid accumulates in the abdominal cavity, the scales pockets and the eye cavity. The abdomen becomes enlarged, the scales turn outwards, and the eyes are bulging. This form of disease is characterized by the older carps.

The control of the disease is based on the extermination of snails, which can occur by freezing the pond bottom, resting the pond in summer, and by disinfecting with lime. A suitable snail disinfectant is a 5 mg/l copper sulphate solution.

**Diseases caused by fluke larvae (Diplostomosis)** - a widespread disease. The fluke larvae parasitize in fish eyes (eye lens), their mature form live in the guts of water birds (gulls, terns). The miracidiums that hatch from the eggs that fell in the water with faeces develop into cercaria after penetrating the snails. The cercarias leave the snail, and finding they fish penetrate their skin, and through the bloodstream they enter the eyeball, where they will remain for years without encysting in a viable state. The larvae migrating in the body of the fish or being present in the lens may cause the death of the fish, because the visual deterioration of the fish impedes food acquisition.

During the migration of the cercarias, the fish are restless, they perform forced movements, the skin darkens, and in the abdominal area small hemorrhages are visible. At the time of the eye disease, its indicator is that the animals become thin, and their blurred lenses appear as milky balls.

Elimination of infection is possible if we eliminate the two (inter-) host, snails and birds. The intermediate host can be eliminated by the above described pond bottom treatment, the host animals - by scaring the birds.
Fish tape worm disease
Khawiosis - the unsegmented tapeworm occurs in the intestine of carp and grass carp. The adult individuals are of 170 mm length, 4 mm wide. The Khawia reproduces with intermediate hosts (Tubifex tubifex), they reach the infective stage there and they get into the fish intestinal system by consuming the intermediate hosts, they adhere to the front section and become sexually mature there. The entire development cycle lasts for one year. Coracidiums are formed on the soil from the eggs excreted in the spring and early summer. This is consumed by the intermediate host, where the next developmental stage occurs, which is the feed of the fish with the tubifex. The disease has no typical symptoms, the fish are lean, their growth is retarded, do not feed properly. The intestinal epithelial lesions, ulcers are formed, but severe intestinal inflammation can also develop. The gut mucous production increases, the mucosa is swollen, marked in streaks, minor bleedings are also formed. Controlling the disease includes drying and freezing the pond bottom, together with the treatment of infected individuals. The diseased fish can be treated with 3-5-fold higher than usual amount of mixed Devermin drug in spring before the egg production begins.

Bothriocephalosis of the common carp and the grass carp - The tapeworm can reach a length of 150-200 mm, a width of 2.5-3 mm. The worm's body has several segments that widen in the rear. The coracidium is formed on the bottom of the lake after the eggs left the fish with the faeces, and floating in the water they remain infectious for 4-6 days. They then enter the lake crabs, in which they form into infectious forms in 1-3 weeks. The intermediate hosts gets into the intestinal track of the fish as food, colonizing the front part of the intestines and thus cycle is repeated. The disease occurs most often in pond farms, intensively used ox-bow lakes and reservoirs. The most commonly diseased fish among the farmed fish are the common carp and the grass carp. Among the wild spawning fish, the crucian carp and the red-eyed carp are infected. On the site in the intestine where the tapeworm attaches, catarrhal enteritis, excess serum, hyperaemia, haemorrhages, necrosis
and due to the toxicity liver and kidney degeneration may occur. The settled worms clog the intestinal lumen, prevent its normal operation and a significant amount of food is withdrawn from the host, which results in the fact that weight gain is significantly reduced. The disease symptoms are not typical; at first only the poor feed conversion is apparent. In case of severe infestation, the fish swim about on the surface of the water, do not consume the feed, become thin and die off. During the autopsy the yellowish-white worms are clearly visible in the gut. Controlling the disease is very difficult because all the conditions for the development of the worm in the lake are given. To prevent the disease, it is important to separate the fry from the adult individuals strictly, and also to dry and freeze the nursery ponds or treat them with lime for disinfection in every season. The worms in the water can be destroyed in different developmental stages with organic phosphorus acid ester, but at the same time the re-introduction of the plankton has to be ensured. The tapeworms living in the fish can be killed by adding a product called Devermin (0.1-0.3 g / kg body weight). The drug is fed in the lake after it is mixed thoroughly into homogenized feed. General, full recovery proves difficult for severely infected individuals consume the least from the feed, and will continue to be a source of infection.

**Ligulosis** - the adult worms parasitize in the gut of waterfowl, they stay until maturity. The first intermediate hosts are Cyclops, the second the cyprinoids. The worms need to be in the abdominal cavity of the fish for at least 425 days to become infectious. The infection of the fish can persist for over 3 years. The most common places of the infection are natural waters, lakes and ox-bow lakes. The ligulosis is capable of destroying a great proportion of the bream, roach and bleak stock. In the fish ponds, there may be significant infection among the carp and bighead carp populations. The tapeworms cause such serious changes in the abdomen that 1-2 items colonizing the fish can lead to mortality.
The worm can weigh up to one-third of the weight of the fish, so the abdominal wall expands, relaxes, the internal organs are compressed, blockages, adhesions are formed in the gut, there is a continuous peritoneal inflammatory status, and the cavity is filled with the effusion. The ill fish swim hard, staying close to the surface of the water, forced movements are carried out, and float turning up. They do not consume the feed placed into the lake, rather the plankton.

Pond farms can be fairly effectively protected from ligulosis by scaring the waterfowl away, and terminating their nesting opportunities. Ligulosist in natural waters can be decreased by removing the ill fish by propagating predators.

- **Diseases caused by Nematodes** - the sterlet, eel, bream, pike can be infected with the various types of nematodes. In general, no major economic injury is caused.
- **Fish diseases caused by Leeches – Fish leech** – Its body is cylindrical, the front and rear end has a suction cup, ca. 3 cm in length. Leeches are hermaphrodites. In summer they attach egg sacs on the lake vegetation, the soil or on the wet shore.

The hatched leeches are instantly able to suck blood. The leeches filled with blood detach from the fish and sink to the bottom. The hungry ones creep on stones, plants and they
attach to a fish if possible, their sucker adhering to the surface of the body and piercing the skin to suck blood. The salivary glands of the leeches contain anticoagulant (hirudin) and, therefore, after the leeches have come off, blood trickles for a while. Damaged skin is invaded by secondary fungi, bacteria, so the anaemia is accompanied by other diseases. The disease most often occurs in the wintering ponds, where it is the easiest to attack the fish for blood, whose life functions are decreased. Another favourable environment is the areas densely covered by plants. The disease is maintained by the older and wild fish. The fish living with leeches are restless, fiercely toss themselves. In the winter lake, they interrupt their winter dormancy and swim to the inlet water. In case of severe infestation, the fish become thin; their skin is ulcerated from which blood may ooze.

The disease can be significantly reduced or eliminated if we remove the aquatic plants in the lakes, or we introduce grass carp fish in the lakes. It is also important to keep away wild fish from farmed fishes. In winter, the dry lake bed should be disinfected with 2500-3000 kg lime per hectare. For the sake of introducing a leech-free stock, it is recommended to bathe the fish in 2.5% saline solution for 15 minutes, during which time the dazed leeches fall off the fish. The leeches can be destroyed by treating them with organic phosphoric acid esters as well.

**Diseases caused by crustaceans (Lernaeosis)** - a rare parasitic disease. Females are permanently attached to the fish; they fall off only after they die. The ones settled on the body of the fish penetrate their protrusion into the skin so deeply that they reach the muscle layer. At the site of the attachment, deep, inflammatory ulceration occurs; the edges are bright red, sharply demarcated from the normal tissue. Bacteria can colonize the ulcer, resulting in its growth, and tissue granulation begins. The granulation tissue rises above the plane of the body surface. The parasitosis most frequently occurs in fish living in channels of fish farms, on crucian carp, on sunfish, but pike and herbivorous fish have also been affected. First the ill fish are restless and avoid movement, do not feed, are emaciated. The young fish also die off. Organic phosphoric acid esters are suitable for medical treatment.
• **“Fish Lice” (Argulosis)** - Carp of every age can become infected and ill. The crab having attached to the fish becomes sexually mature with a complex transformation. The parasite survives the winter on the skin of the fish surrounded by mucus. The fish lice have a broad host range, they can colonize not only each fish species but amphibians too. They approach the fish with swimming actively, and adhere to the skin with suction cups and mandibular legs. They sink their boring organ into the skin, and feed on the blood sucked from the inflamed skin and on tissue fluids. On the site of the excess fluid discharge, a depression and later ulcer develops. The fish lice frequently change its location, and prick the skin in several places. Fungi and bacteria colonize the pricked areas. The fish lice play the role of the intermediate host of some parasite nematodes, and promote their spread. Younger fish are more sensitive to the presence of fish lice, they often die, too. The first summer old fish can be killed by 20-25 fish lice. The sick fish are restless; they reduce their food intake, and are emaciated. The infection can be established with the naked eye. The mass of lice is easily visible in the abundant mucus that covers fish body and fins. In order to control the disease, the older fish should be kept separate from young ones and the other fish species and frogs should be exterminated from the lake. Drying and freezing the pond bed is also recommended. The lake bed can be disinfected with chloride of lime or quick lime. The fish lice can easily be destroyed with organic phosphoric acid ester. A solution of potassium permanganate can be used as well.

• **Diseases caused by mussel larvae** – There is a relatively brief period in the development of mussels when the larvae colonize the fish gills, skin or fins and engage in a typically parasitic lifestyle. Parasites feed on tissue fluids, emigrated white blood cells, and epithelial cells. Fish are most commonly infected with mussel larvae in natural waters.
Diseases of Unknown Origin

- **Gill necrosis** - mainly occurs in carp populations. The gills of the ill fish swell, their structure becomes blurred, a large amount of mucus can be found on them. Some gill sheets are greyish-white; others are bright red due to the stagnant blood. The gills become fragmented due to the chipping of the ends of the gill sheets. The disease is thought to be autointoxication developed as a result of high free ammonia content, or it could be the combination of ammonia poisoning and a columnaris disease that followed it. The ill fish are restless, they gather around the inlet, while others exhibit spinning motion that appears to be a neurological symptom. The disease is detected in newly introduced fish in natural waters.

- **Winter skin disorder** – An illness of a few year old carp occurring during the winter time. On the back and fins of the ill fish, milk glass coloured mucous can be observed initially, under which the skin pigmentation changes. Later, the skin has a map-like pattern and becomes dry. Scratching the skin of the ill fish, one can notice unknown one-celled creatures. It is likely that the flowing water supercooled to 1-2 C° contribute to the onset of the disease.

- **Granulomatosis of goldfish** - The infection can be detected in all aged goldfish and usually the best, few year old individuals are killed. External clinical symptoms include abdominal volume enlargement, confused swimming, tilting to one side or floating on the water belly-up. In autopsy the symptoms resemble tuberculosis infection in every aspect.

Diseases caused by fish pests

- **Bird cuts** - Longitudinal injuries transverse to the body are frequently observed on body of the fish. These are the so-called gull cuts that arise when a bird lifts a fish from the water, and then drops it. The injuries mostly extend into the outer layer of the integument,
but it is possible to have deeper, bleeding injuries, too. Secondary fungal and bacterial complications can develop. The cormorants proliferated in the last decade, damage a lot more fish than they eat. The wounds have little chance of recovery in autumn, winter and early spring. The waterfowl can be controlled by scaring them.

- It is more difficult to defend the fish from damages caused by protected animals in the pond: the bullfrog and the marsh frog. In particular, the bullfrog can consume a large number of fry each day.
- **Invertebrate fish enemies** - Particularly in natural waters, the diving beetles, the lesser water boatmen, the backswimmer bugs and the water scorpions and their larvae are often able to inflict more damage than actual diseases. In natural waters, biological balance exists between the fish and their enemies, but in nurseries it is necessary to fight against them. These pests are quite sensitive to organic phosphoric acid esters.

### Abiotic fish diseases

#### Diseases caused by environmental factors

- **Lack of oxygen (Anoxemia)** - the most common cause factor that cases the death of the fish. The oxygen saturation of the water may drop below the optimum level for a number of reasons. In summer, the decrease is due to high water temperature, or a decomposition process, rotting that takes place in the water, or it may be due to the presence of a more than optimal, large amount of fish. In winter, the ice directly prevents oxygen from penetrating into water, and the snow and cuts off light from the water, so water plants cannot produce oxygen.

  Absolute oxygen deficit occurs when the oxygen content of the water is reduced to an extent that is not enough for the fish. The relative lack of oxygen causes damage to the gills. Then even there is enough oxygen in the water, the fish cannot utilize it. If the lack of oxygen occurs in the fish or in the water, the fish die. It is therefore necessary to monitor the oxygen content of the water and the fish gills continuously. Anoxic conditions always develop during the technical operations of rearing, e. g. when harvesting, transportation, introducing, etc. when the fish are in a crowded space. This relatively short period of time does not cause mortality but the stress has an effect and reduces resistance to disease, and promotes the development of diseases.

  In case of absolute oxygen deficiency, large amounts of oxygen rich water should be provided for fish (pumping). It is also suitable to have a motorboat run on the lake. In winter, holes are cut in the ice and the snow is ploughed off the ice for oxygen supply.

  In case of relative lack of oxygen, besides raising the oxygen content of the water, the gill disease should be treated and eliminated as soon as possible. To stop the rotting, decaying processes in the lake, the vegetation is removed from the water to prevent algal blooms. We should repeat this for wintering as well.

- **Poisoning (Intoxicationes Piscium)** - Today, not only drinking water but also good quality water for fish farming, free from contamination is becoming less and less available. The wastewater and water contamination cause problems around the world. In the fight against water contamination the fish play an indicator role. The water in which the living conditions of the fish are present can be used as drinking water after proper cleaning procedures.

  With the development of industry and the use of chemicals in agriculture, the waters are increasingly contaminated. Therefore, when massive fish mortality occurs, we can think...
of intoxication caused by water. Two thirds of the instances of immense fish mortality are
caused by the industry, and one-third has agricultural origin.
Toxins of organic origin are poisonous either because of their own chemical nature
(pesticides, phenol, etc.) or they may be harmless themselves (food industry waste water)
but their decomposition absorbs a large amount of oxygen, and it causes asphyxiation of
the fish. Inorganic compounds (heavy metal salts, ammonia, hydrogen sulphide, etc.) exert
their effects directly, and the death of the fish is caused by the toxins themselves.
The poisoning is characterized by the fact that same or different species of fish die in large
numbers at one time without preliminary signs. Mortality is often unnoticed; the result is
visible only. When trying to find out the causes of deaths, the first step is to exclude
oxygen deficiency. The lack of oxygen in the rivers does not happen usually even in the
summer heat, but it usually occurs in pond farms of high density (perhaps as a side effect).
Mortality due to lack of oxygen usually occurs in the early morning hours, which is shown
by the fact that the morning feed is still there in the water in midday.
Test samples (and water sample) should be sent to the institution of animal health from
the dead fish and the still alive fish as well in order to rule out the presence of viral /
bacterial and parasitic diseases. It is not always possible to detect the toxin from the body
of the fish. By the time the fish die and they are examined, the potential toxins in water
e.g. sewage water have already become diluted to an extent that they not show toxic
quantities. Therefore, in case of the rivers, samples should be taken from downstream as
well and be submitted to the laboratory. The diagnosis can be established by the
experience of experts at site visits and from the laboratory test results.
Autogenous poisoning – is usually caused by hydrogen sulphide and ammonia that is
produced in the water and in the bed of the lake due to rotting vegetation or abnormal
degradation in the mud. The hydrogen sulphide is formed by the decomposition of
sulphate ions in bound, acidic soils. The gas accumulates in the mud first, then the water
too. Mainly in summer, less often in winter, hydrogen sulphide is release due to the drop
of air pressure and it causes poisoning. Hydrogen sulphide is toxic even at a quantity of
0.5-4 mg / l. If the oxygen content in the water is low, the toxic effect is even stronger.
Hydrogen sulphide is toxic because it inactivates the enzymes containing heavy metals
and it inhibits the oxygen uptake and metabolism. The bream are the most sensitive to the
presence of hydrogen sulphide, followed by predatory fish and carp.
Ammonia – In alkaline water, over 20°C, the ammonium ion is converted into free
ammonia, and cause massive fish mortality slowly at 0.2-0.5 mg / l and rapidly above 0.5
mg / l. Due to the neurotoxic effects of ammonia the fish are restless, swimming
desperately in the water. The gill cover and the mouth of the dead fish are open, and the
blood oozes from the gills.
Some types of the agricultural water contamination cause a deficiency of oxygen.
Decaying organic matter, organic waste material originating from plants or animals may
come from pig farms, distilleries, sugar refineries and breweries or hospitals. To break
down the large amount of organic material, such a great amount of oxygen is used up that
it may lead to a massive death of fishes. When using lime for disinfection, the water pH
should be monitored continuously and if the reading exceeds 9, the epidermis of the gills
of the fish may be damaged severely, which leads to death.
Among the pesticides, primarily chlorinated hydrocarbons, ones that contain organic
phosphoric acid ester, as well as the herbicidal, algicidal and fungicidal substances are
poisonous. These toxic substances may get into the environment of the fish out of
negligence, or by the water flowing from the area which was treated with them, or by
accident. The toxic dose of the most commonly used pesticides is LD 50 (50% of the fish
die within 24 to 96 hours in the water containing a certain amount of poison). From these data, it can be concluded that each species has a varying degree of sensitivity to pesticides. The most dangerous ones are the chlorinated hydrocarbons which are capable of cumulation.

The pesticides are neurotoxins for the fish. Therefore, the symptoms of poisoning are manifested in excitement, writhing, convulsive swimming, jumping out of the water. The cause of death is usually respiratory centre paralysis. In case of acute poisoning, no disorders can be explored even in the histological examination. In chronic cases, degenerative condition can be found in hepatocytes; the chemical can be detected in the fish and the water. In order to avoid poisoning, the organic phosphoric acid ester, which is used for treatment, has to be added in very accurate doses in spite of its rapid degradation. When using this chemical it should be considered that the zooplankton is also destroyed, so the treatment should not take place in the pond but in the winter pond or in a designated pool.

Among the fertilizers, primarily those containing phosphorus and ammonium nitrate are harmful to fish. If large amounts get into the water, they change the ion balance of it, and by damaging the epidermis of the gills of the young fish gills, massive death of the fish may occur.

In case of industrial water contaminations, a great variety of inorganic substances, heavy metal salts, acids, bases, mineral oils, detergents, etc. may occur so that their examination requires special analysis. Their composition and concentrations vary significantly within a short period of time, they usually have a strong impact, but they can quickly become diluted and their damage does not extend to a large area relatively. The detergents (surfactant washing agents produced synthetically, which contain soaps or surfactants) get in the environment of the fish with household and industrial waste waters. The benzene sulphate and its derivatives do not only destroy the fish but also their eggs in a concentration of 5-10 mg / litre. The poison attacks the gills and skin of the fish; it stimulates mucus production and damages blood cells. Detergents are detected from the water.

Among the metals, the various compounds of iron, copper, lead and zinc are the most dangerous. These materials get into the water mainly from factories, mines and vulcanizing plants. Especially the fish populations of trout ponds and artificial hatcheries are vulnerable to these metals and their compounds.

The free chlorine can get into the water from industrial plants and swimming pools after disinfection. Poisoning can be caused by water containing 0.1-0.2 mg / l free chlorine in a few days. As a result of the poisoning, the respiratory epithelium of the gills dies; the fish die quickly with drowning symptoms. In chronic cases, the dead fish show the signs of liver degeneration.

Phenol is the most common toxic product among the derivatives of mineral oils. The symptoms of poisoning include the excitement of the nervous system. Even 5 mg / l phenol is toxic to carps. In chronic cases liver degradation may develop. Although only 0.02-0.1 mg / l phenol present in water does not induce mortality, the flavour of the fish becomes disgusting. If the fish are placed in clean water for about 6 weeks, the taste becomes normal again.

- **Temperature as a cause of disease** - Fish have a very good heat tolerance. The trout can survive 25 °C, the carp 35 °C, and the crucian carp 40 °C without damage to any of their organs. If the water temperature rises above normal and the fish die, the cause of death is not due to the heat but to the biological imbalance in the lake and the lack of oxygen. Fish suffer most from sudden changes in temperature of 10-15 °C. The fish that suddenly get
into waters of temperature under +6 °C develop shock-like symptoms - the movements of the gill cease, inability of swimming develops and they lose their ability to keep balance. Excessive cold water of about 0-1 °C is the most dangerous. Then the skin and gills are covered with greyish white membrane and emaciated fish die.

- **Feed-induced intestinal inflammation (Enteritis)** - is due to either a sudden change in feed or poor quality feed. The biggest threat is caused by the feeding of treated or dressed feed. The consumed dressing mostly does not cause death, but it builds up in the fish's body and it poses a human health hazard when the fish is eaten. Those feeds are dangerous that contain Escherichia coli or salmonella bacteria or their toxins. The bacteria and fungi, and their toxins and metabolites, for example aflatoxin, F2, T2 toxins, which accumulate in musty, mouldy feed, pose a threat. The pathogens produce toxic compounds (amines, peroxides) and as they get in the intestine, they alter the normal intestinal bacterial flora. In carp, bacteria and fungal spores remain intact in the absence of gastric acid, and in the favourable, slightly alkaline pH environment they exert their effects easily. Therefore, it may happen that the healthy fry introduced as usual do not develop sufficiently and remain small and weak. The retarded fish may have diseases such as enteritis, intestinal inflammation and varying degrees of liver degeneration. After the illness caused by feed, the fish regain their appetite after only a few weeks, so if 3-4 of these cases occur during the summer, the development of the fry may be reduced to a minimum. The fry with low resistivity can resist the external and internal parasites and infectious diseases to less extent.

In the summer, the fish harvested with feed bait for market sales have a full digestive tract, and if the delivery and new introduction goes together with stress, their digestion stops, the feed begins to decay, abnormal breakdown products are formed in the intestines, and the large amounts of gaseous decomposition products bring about enteritis and inflammation. The dead fish typically have bloated bellies. Such carp are unable to dive under the water, turning on their belly they struggle on the surface. The disease cannot be cured but can be prevented by resting the fish for 24 hours prior to delivery.

**Diseases of not well understood etiology**

- **Intestinal inflammation in grass carp** – It is a disease of 3-4 summer old grass carp (rarely silver carp) kept in lakes with little green vegetation, and fed intensively (hard fodder). The intestinal inflammation is always acute. The ill fish are clustered near the shore edge, they can be easily caught. The colour of their skin darkens, and lack of some scales can be observed. The gills are pale or blackish-red, covered with mucous and algae. At necropsy, the liver is a light brown oily to the touch, and easy to tear. The bowels are empty, their linings are inflamed on fields of various sizes, and the diseased fish soon die. The treatment is usually unsuccessful. The disease is preventable by ensuring optimum environment and providing natural plant food.

- **Gill necrosis** - a disease of fishes of two summer of age. Its etiology is unclear. The disease occurs in spring and summer, especially in intensively reared fish. In acute cases, it is completed in 10-15 days and the mortality rate can be between 50-60%. In chronic cases of the disease it can persist for 3-4 months, and mortality is minimal. The disease starts in the gill with the proliferation of amoeboïd cells, and the infiltrated part breaks off in tatters. The epithelial cells of the breathing sheets degenerate and their place is occupied by granulation tissue containing acidophyl cells. The proliferating tissue sticks together the adjacent folds, and later the plates also, making them unfit for breathing. Because of the disorder in blood supply, necrosis comes about in some parts accompanied
by extensive haemorrhaging. The dead plates come off, thus forming typically serrated
gills.
First a lack of appetite calls attention to the presence of the disease, and later the animals
start swimming restlessly on the surface of the water and they are clustered near the
inflow or the coast. The die even if sufficient fresh water is provided for them. In less
severe cases, the gills are pale, its structure is blurred, the plates are covered with large
amounts of mucus. In severe course of the disease, the gills are torn, the ends of the plates
are toothed (serrated).
Methods of medical treatment are not known, but if the disease is detected in time, the
damage can be reduced by providing natural feed, improving the quality of the water,
making it richer in oxygen.

**Tumours** – are only sporadic. They are seen more frequently in ornamental aquarium
fish. The fish may have both benign and malignant tumours. Therapeutic care is not
possible and it is most appropriate to dispose of the ill fish.

**References**
323.
242.

- [http://www.vems.hu/vmri/fish_free/Molnar/Surveys/ParassurveyBalaton.PDF](http://www.vems.hu/vmri/fish_free/Molnar/Surveys/ParassurveyBalaton.PDF)
- [http://www.vmri.hu/fish/hal_al.htm](http://www.vmri.hu/fish/hal_al.htm)
- [http://www.vems.hu/vmri/fish_free/Molnar/Egy%E9b/halbetegsegjav.pdf](http://www.vems.hu/vmri/fish_free/Molnar/Egy%E9b/halbetegsegjav.pdf)
- [http://partfal.hu/node/902](http://partfal.hu/node/902)
- [http://diszhal.info/cikkek/halbetegsegek.php](http://diszhal.info/cikkek/halbetegsegek.php)
- [http://www.fishnet.org/sick-fish-chart.htm](http://www.fishnet.org/sick-fish-chart.htm)
- [http://en.wikipedia.org/wiki/Fish_diseases_and_parasites](http://en.wikipedia.org/wiki/Fish_diseases_and_parasites)
- [http://www.plantedtank.net/articles/Common-Freshwater-Fish-Diseases/13/](http://www.plantedtank.net/articles/Common-Freshwater-Fish-Diseases/13/)
- [http://www.wikihow.com/Treat-Fish-Diseases](http://www.wikihow.com/Treat-Fish-Diseases)
- [http://www.petmd.com/fish/conditions#.Ujq_mU3-IMs](http://www.petmd.com/fish/conditions#.Ujq_mU3-IMs)
- [http://www.fish-disease.net/diseases.htm](http://www.fish-disease.net/diseases.htm)
- [http://fishkeeper.co.uk/downloads/jbl/IBL_Teich_Krankheitenfolder.pdf](http://fishkeeper.co.uk/downloads/jbl/IBL_Teich_Krankheitenfolder.pdf)
- [http://freshaquarium.about.com/od/diseaseprofiles/Diseases.htm](http://freshaquarium.about.com/od/diseaseprofiles/Diseases.htm)
- [http://www.dnr.state.mn.us/fish_diseases/index.html](http://www.dnr.state.mn.us/fish_diseases/index.html)
Sources of pictures