

# Introduction to Fish Health

## Environmental and Nutritional Fish Diseases in Cultured Freshwater Fishes

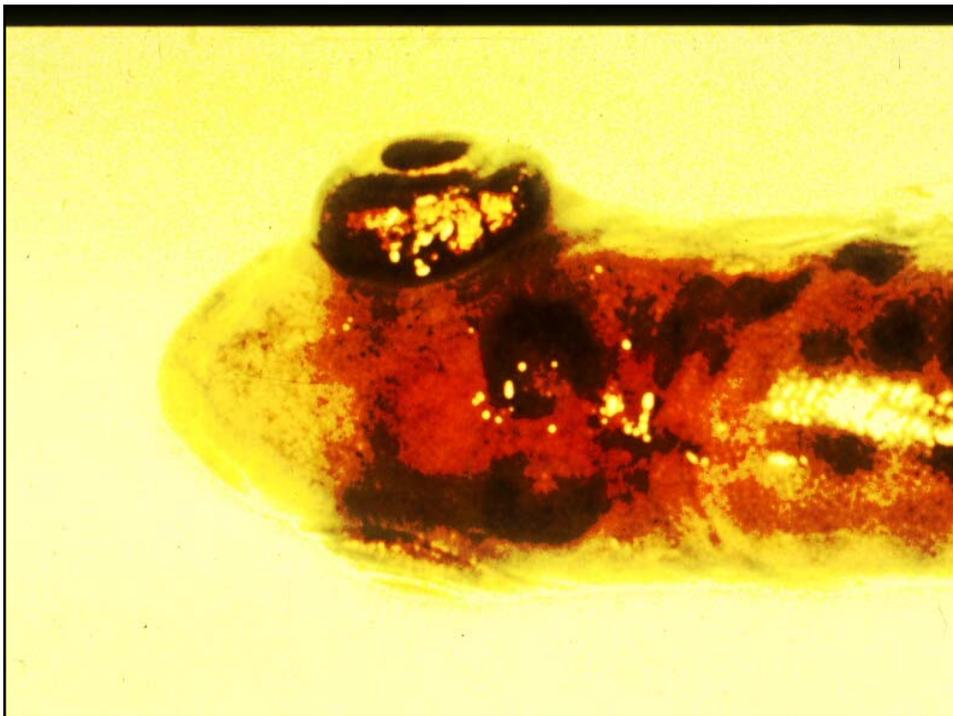
### Environmental Fish Diseases

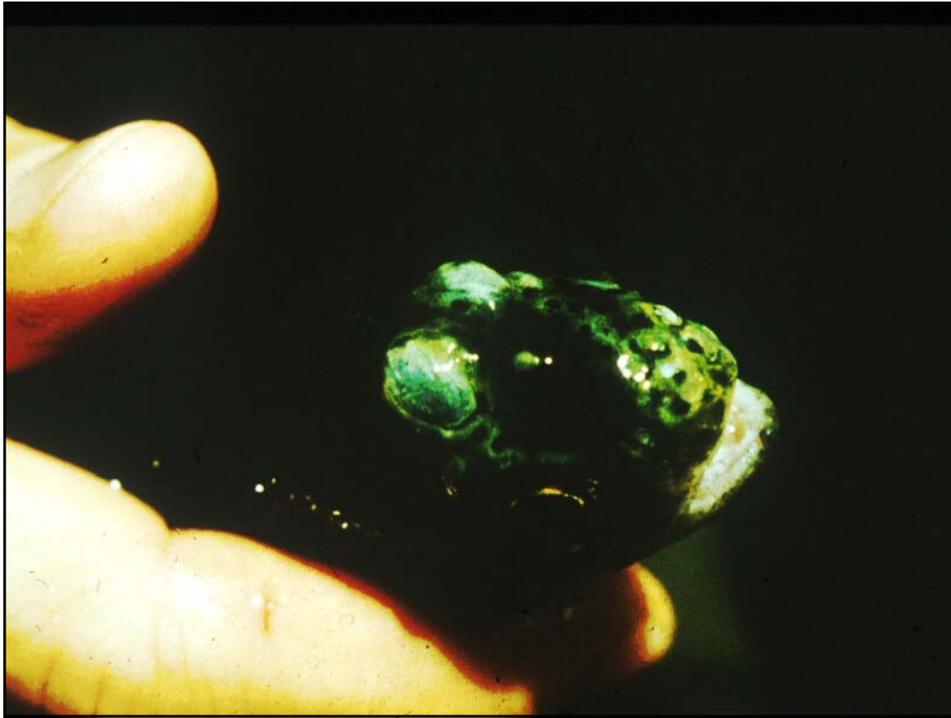
- Gas Bubble
- Nephrocalcinosis
- Blue-Sac
- White Spot or Coagulated Yolk
- Cataracts
- Soft-Egg or Soft-Shell
- Sun Burn
- Brown Blood

## Gas Bubble Disease

- Gas bubble disease results when water becomes supersaturated with oxygen or nitrogen gas.
- A total gas saturation between 105 and 140 % produces chronic gas bubble disease. At 140% and above the disease is acute.
- Gas supersaturated water results when:
  - strong sunlight (rapid photosynthesis) high oxygen production.
  - Faulty water systems which suck air into water lines.
  - Vortexes at water intake systems.
  - Water plunging into a pool at high velocity.
  - Heating water with a heat exchanger.
- The disease is characterized by formation of gas bubbles in the eyes, gills, fins, skin, and mouth.

- The most common lesions occur in the gill tissue where gas bubbles block respiration, ammonia excretion, and osmoregulation.
- Elimination of any of the mentioned mechanical problems in the water system should control the disease. If not, a degassing column with coke rings or an oxygen injection system may be required.





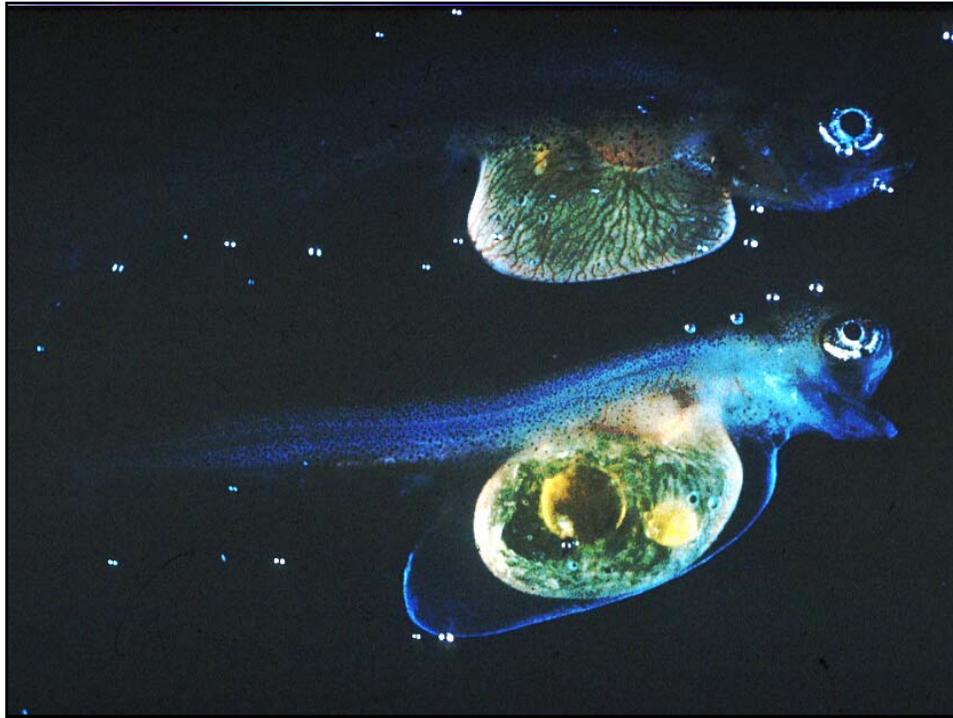
## Nephrocalcinosis

- Nephrocalcinosis is a chronic, degenerative, inflammatory disease affecting the kidneys of trout.
- It is common in rainbow and brook trout and has been reported throughout the United States.
- Mortality rates are low, but stressing affected fish can result in massive mortalities.
- Sign of the disease is white chalky material in the kidneys with tubular dilation and degeneration of the nephrons.
- Cause of the disease is unknown, however high carbon dioxide, magnesium deficiency, selenium toxicity and a diet low in minerals have all experimentally produced the condition..



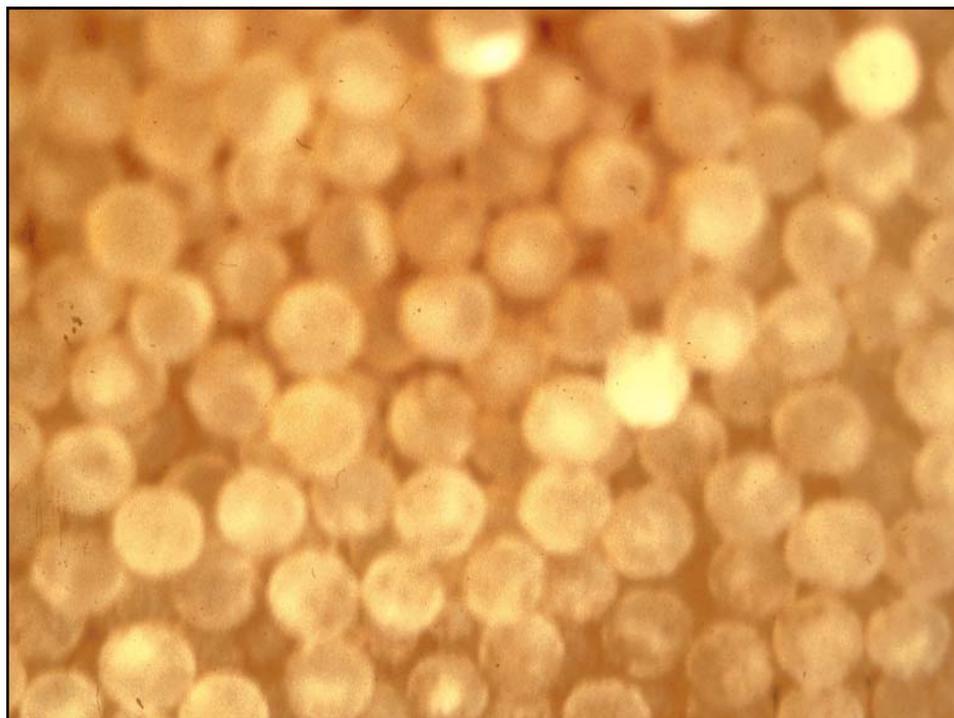
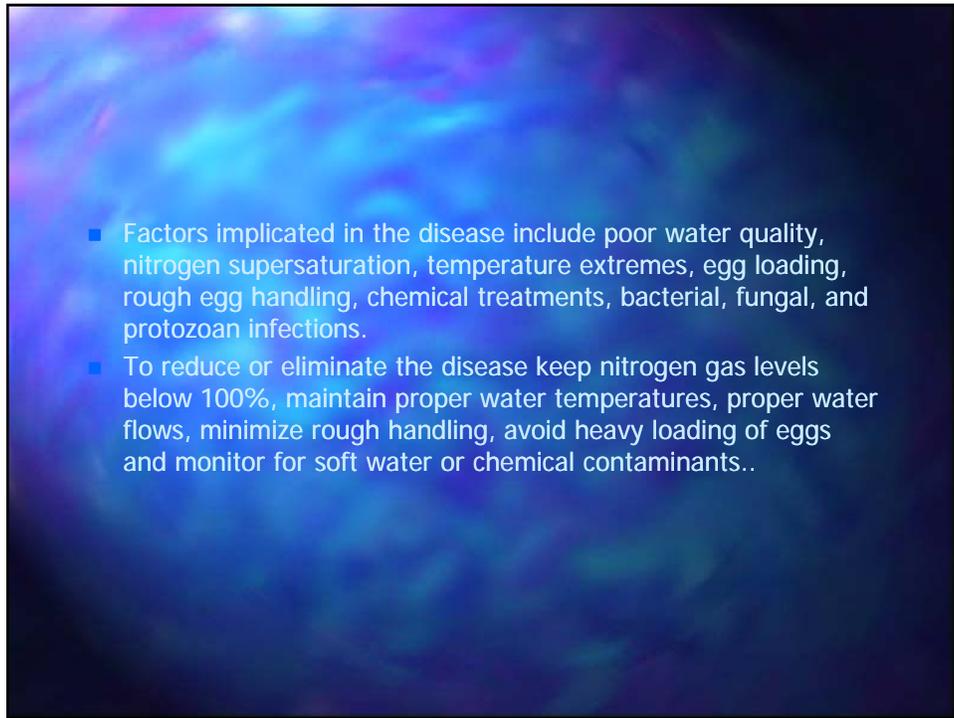
## Blue-Sac Disease

- Commonly observed in salmonid sac fry.
- Affected fry show an abnormal accumulation of fluid over part of, or the entire yolk sac.
- Accumulated fluid takes on a bluish hue.
- Exophthalmia is commonly observed in affected fry.
- Growth is retarded and fry are paler than normal sac fry.
- Blue sac fry are lethargic and gather in quiet areas such as centers of trays and lower ends of rearing troughs.
- Cause of disease is not known, however infectious agents, physiological factors, hereditary, physical and chemical parameters have been suggested..



## White-Spot or Coagulated Yolk

- White-spot disease affects late stages of incubating salmonid eggs and sac fry.
- The disease appears as white spots in the normally orange-colored yolk.
- These spots are located on the surface of the yolk sac and are clumps of denatured yolk.
- Spots enlarge with time and coalesce on the surface of the egg and the egg dies from lack of oxygen.
- Sac fry become pale with the fins turning white and eroding.
- The yolk sac is never absorbed and the fry die.
- Saprolegnia is a secondary fungal infection commonly observed.





## Cataracts

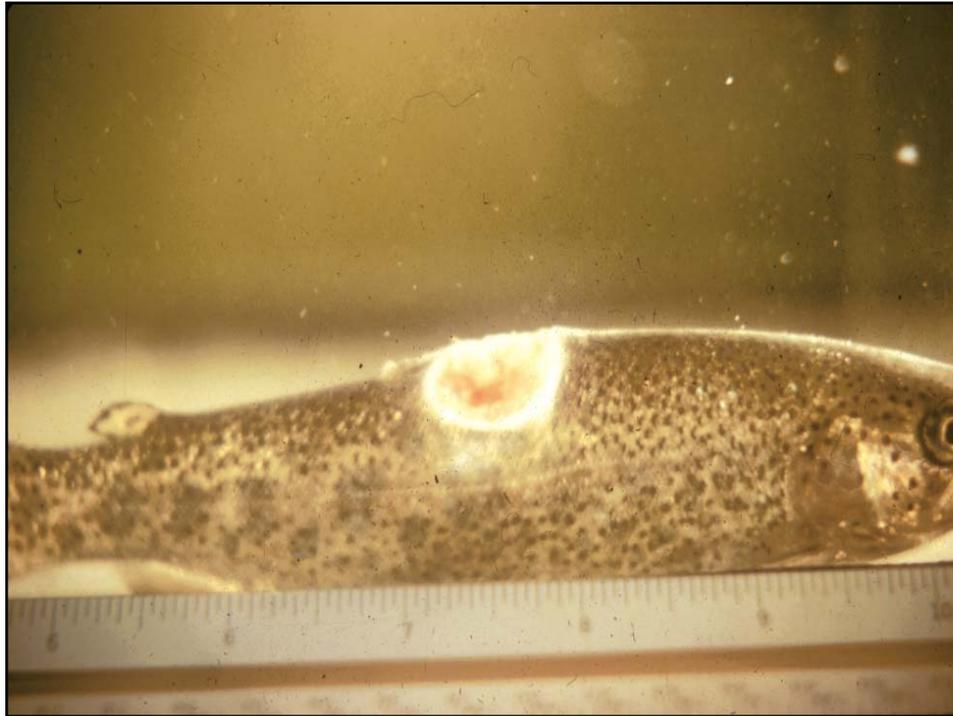
- Cloudiness or opacity of the crystalline lens of the eye, often leading to blindness.
- This is due to ultra-violet light intensity.
- The fish lose the capacity to evaluate distances.
- As a result of this anomaly the fish is unable to feed.
- Fish lose weight and become anemic and may cause death.

## Soft-Egg or Soft-Shell Disease

- Soft-egg disease is an abnormal condition found in incubating fish eggs.
- Affected eggs become soft and flaccid during incubation.
- This disease is thought to be caused by an amoeba.
- Strict sanitary measures and frequent disinfection of hatchery equipment are the best methods for avoiding the disease.
- The disease occurs infrequently, but some hatcheries have had periodic losses over several years.

## Sun Burn

- Sunburn is a condition of salmonids that is characterized by a peeling or sloughing of the outer layer of the skin.
- Lesions usually occur on the dorsal skin surfaces, between the head and dorsal fin.
- The condition occurs when fish in clear and/or shallow water are subject to high levels of ultraviolet radiation.
- Niacin is important in protecting the skin, which also makes this condition a nutritional problem.
- Placing sunshades over ponds or decreasing intensity of sunlight in other ways can eliminate the problem..



## Brown Blood Disease

- Brown blood disease is caused by the build up of nitrites in the water through winter feeding.
- Ammonia produced by the catfish is generally broken down by nitrifying bacteria. During winter the ammonia accumulates in ponds, because the water is too cold, and bacteria are dormant.
- In spring bacteria which convert ammonia to nitrites are more active than bacteria which convert nitrites to nitrates.
- As a result nitrites become dangerously high in the water and brown blood disease develops in the catfish.
- A nitrite ion enters the bloodstream and binds with a red blood cell and prevents it from carrying oxygen to the body.
- Use salt at a ratio of 6:1 chloride to nitrite to prevent or reduce the disease..





## Nutritional Fish Diseases

- Nutritional Gill Disease
- Sunburn
- Aflatoxicosis
- Fatty Infiltration of the Liver
- Lordosis/Scoliosis
- Cataracts

## Nutritional Gill Disease

- A condition affecting the gills of fish causing a swelling (hyperplasia) of the proximal portions of the gill filaments.
- Typical gill disease bacteria or parasites are absent.
- Fish with this condition exhibit a loss of appetite, are less active.
- Fish tend to congregate near the water inlet and have “flared” operculums (gill covers).
- Cause of disease is due to pantothenic acid deficiencies in the diet.
- Dry pelleted feeds which have been stored for extended periods and exposed to high temperatures are to blame.
- The disorder is reversible, although recovery may be gradual..





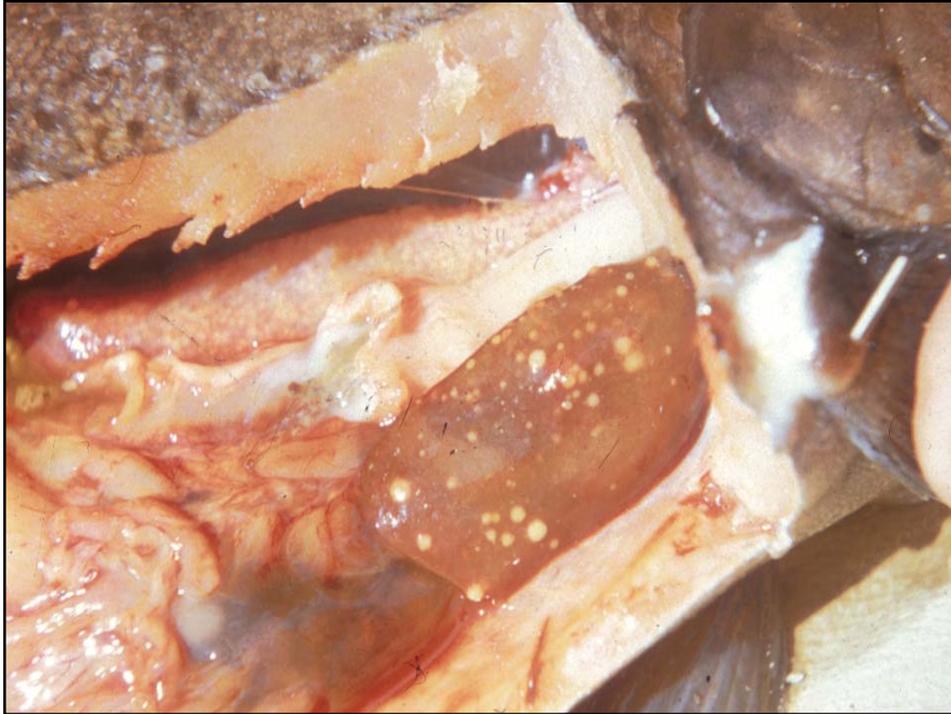
## Sun Burn

- A condition found only in salmonids.
- Characterized by a peeling or sloughing of the outer layers of the skin.
- Lesions usually occur on the dorsal skin, between head and dorsal fin.
- Outbreaks occur when fish in clear water are subjected to high levels of UV light.
- Dietary deficiencies of niacin contribute to the disease.
- Place sunshades over ponds to eliminate the problem.
- Sun burn can be a "portal of entry" for invasive bacteria or fungal spores..



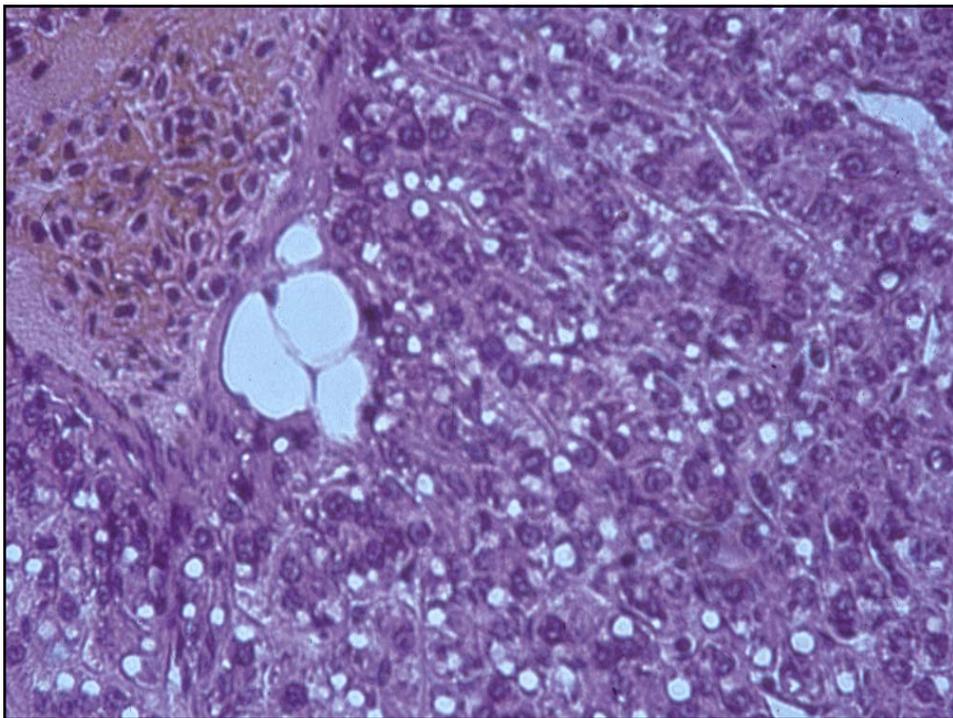
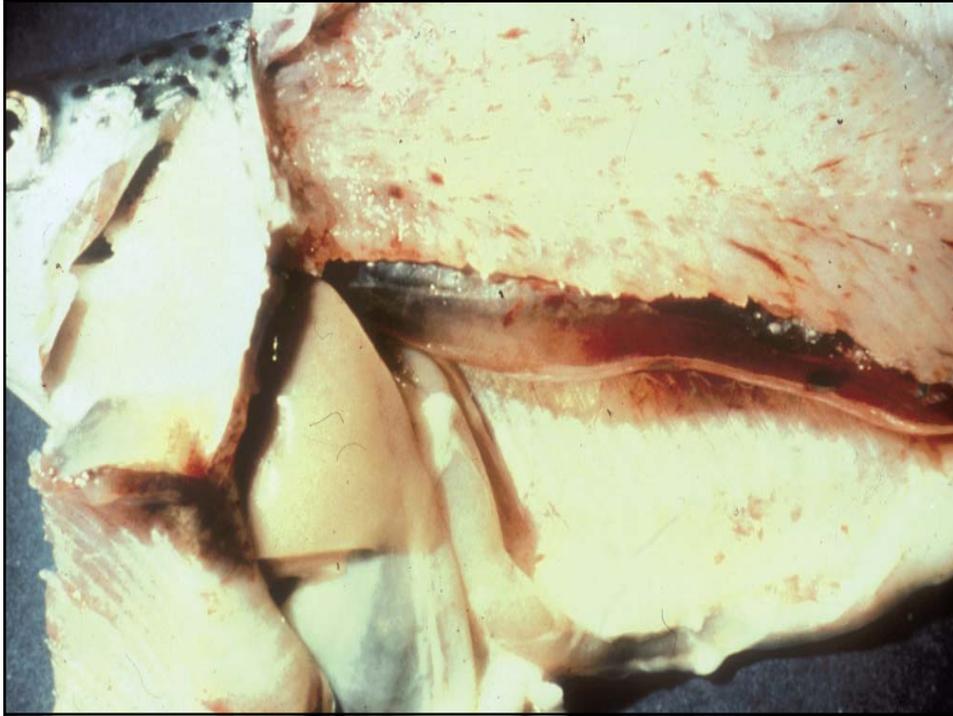
## Aflatoxicosis

- Aflatoxicosis is caused by the contamination of feedstuffs by the fungus, *Aspergillus flavus*. The toxins produced by the fungus are collectively known as aflatoxins.
- The fungus is enhanced by moist conditions and warm temperatures. Aflatoxins have been known to produce liver hepatomas in trout.
- There are no early external signs of the disease.
- Tumors can be recognized as small gray-white or yellow nodular lesions within the liver.
- There are no treatments for affected fish. Remove damaged feed and keep feed sacks in cool, dry room..



## Fatty Infiltration of the Liver

- Feeding of high fat diets may result in this condition.
- The liver of trout with this condition are yellow to pale orange in color, swollen and sometimes greasy in appearance.
- Retention of body fluids often accompanies this condition and is due to altered liver functions.
- Histologically, there are intracellular fat droplets which are absent in normal trout livers.
- Treat condition by eliminating high dietary fat intakes, especially if they exceed 18-20% of the diet..



## Lordosis and Scoliosis

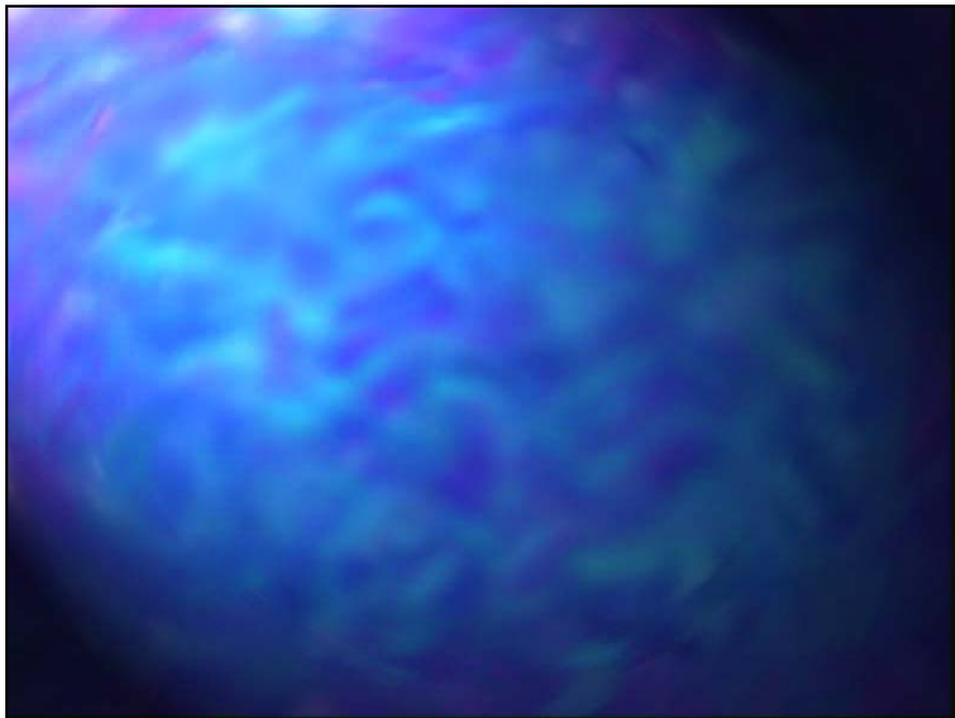
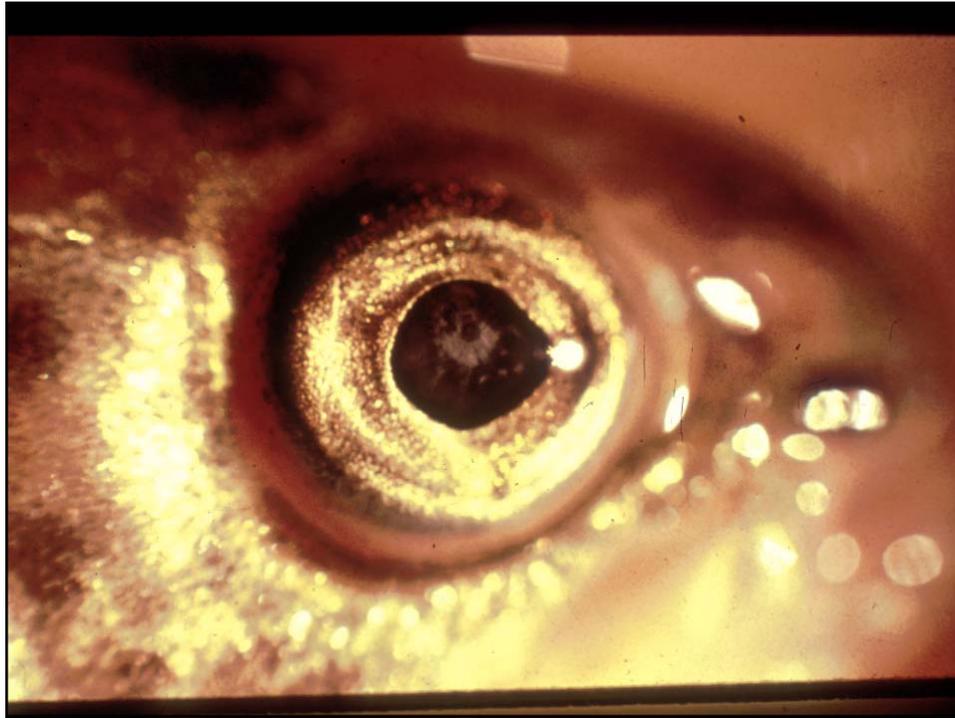
- Curvature of the spinal column in trout and salmon.
- Condition is caused by a lack of vitamin C in trout diets.
- Fish can survive with this condition in a hatchery environment; however once stocked survival decreases due to the erratic behavior of the fish.
- Increase vitamin C in the diet. Curvature of the spine is not reversible. It is best to destroy these fish than stock them in a stream or lake.





## Cataracts

- Cloudiness or opacity of the crystalline lens of the eye, often leading to blindness.
- This is due to a deficiency of vitamin B12.
- These fish lose the capacity to evaluate distance.
- As a result the fish lose the ability to attack prey or find food in the natural environment.
- May lose the ability to avoid predators.
- Fish lose weight and death is possible.



## Trout Feeds

- Dry, semi-moist, and moist diets.
- Open and closed formulated diets.
- Floating (extruded) and sinking pellets.
- Pellet size for size/age of fish.
- Feeding rates and frequencies.
- Feeding techniques.



## Dry Pelleted Feeds

- Dry feeds are available all the time in any quantity.
- These feeds give lower feed conversions and feed costs.
- There is less waste and contamination of the rearing water.
- Provide additional efficiency in lower costs in handling and storage.
- Convenience of using automatic feeders.

## Moist and Semi-Moist Feeds

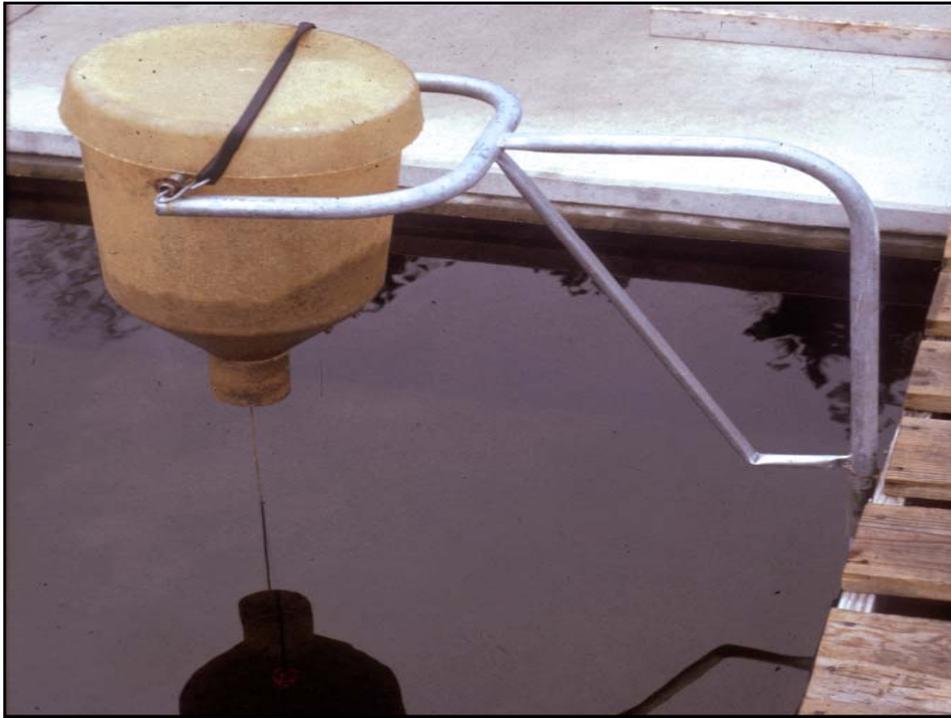
- Moist feeds contain 30-35% water and semi-moist 15-20% after processing.
- Mold inhibitors and refrigeration must be used to protect moist and semi-m feeds against spoilage. This increases the cost of manufacturing, shipping, and storage.
- Beneficial in feeding fish that do not accept dry feeds.
- These feeds have been used successfully as an intermediate stage in converting fish from natural food to dry feeds.
- Converting malnourished fish back on to dry feeds.
- Salmon producers are the major users of moist and semi-moist feeds.

## Open and Closed Feeds

- Open feeds have the complete formula disclosed. Typically they have been developed by Federal and State agencies.
- The producer/hatchery manager knows exactly what is in the feed including vitamins.
- The feed will be consistent from one production season to the next, because the same ingredients are used.
- Competitive bidding is possible to make the feed.
- The feed can be monitored by a QA/QC program.
- Buyer assumes full responsibility for feed performance.

## Closed Formulated Feeds

- Closed formulated feeds is not disclosed to the buyer. These feeds are considered "brand name" products.
- The manufacturer is responsible for the formulation.
- The diet may be lower in cost due to large quantity production and ingredient substitution.
- The manufacturer is liable for poor results with diet.
- The buyer has no control over the feed quality due to ingredient substitutions or formulation changes.



## Floating and Sinking Pellets

- Floating pellets allow for the hatchery manager to see the fish, especially in pond culture.
- Some fish species may feed better at the surface.
- Sinking pellets get to the fish immediately.
- Sinking pellets do not show the fish in pond culture.
- More waste can occur in sinking pelleted feeds. Once on the bottom fish may not feed on the pellet.

## Pellet Size, Feeding Rates and Frequencies

- The size of feed pellets is critical, because if it's too large, the fish will not be able to ingest the pellet until it partially dissolves, wasting feed, nutrient leaches, and polluting the water. If the pellet size is too small it's lost or not enough is fed to larger fish.
- Starter granule to 3/16 pellet (2000+ fish/lbs - 10 ≤ /lbs).
- Feed pellets that are 1/40 of the length of fish.
- A fish which is one inch long should be offered a feed pellet that is no longer than 0.025 inch in diameter and length.
- The most common error in feeding fish is to under or over feed them.

- The quantity of feed required is expressed in terms of % body weight per day.
- The metabolic rate per unit weight of fish decreases as the fish grow larger, the % of body weight to be fed per day also decreases.
- For a given fish size, the amount of food increases with increasing water temperatures; for a given water temperature the amount of feed decreases with increasing fish size.
- Feeding tables provide a general guide for determining the amount of feed to give fish.
- Factors affecting feeding rates; species, water temperature, spawning, photo period, densities, and disease.

## Handling and Storage

- Fish feeds are unique in that they contain high levels of both proteins and fats in order to meet the nutritional requirements of the fish.
- They are perishable products which require special handling and storage procedures.
- Fish feeds are soft and fragile and care must be taken to avoid rough handling which will create "fines".
- "Fines" are defined as dust or undersized particles, not utilized by the fish and can increase feed conversions, water pollution, and source of gill irritation.
- Don't throw bags or drop them.
- Don't walk or stand on bags.
- Don't forcibly stack bags.

## Storage and Time

- Store feed bags (dry pellet) in dry well ventilated and cool place. Humidity less than 75%.
- Humid conditions can cause molds and pellets to crumble.
- Wet conditions can cause insect problems.
- Heat causes oxidation and loss of vitamins, especially vitamin C.
- Storage time is 90 days for dry and moist feeds and 60 days for semi-moist feeds. (FROM DATE OF MANUFACTURER)
- Moist feeds must be kept frozen until ready to use.
- All stored feeds should be protected from rodents and any contaminants.



## Feeding Tips

- Feed fish seven days per week to provide maximum growth and maintain health.
- Feed the gain, or increase the amount of feed as the fish increase in size.
- Don't feed pellet sizes too large or too small.
- Don't over or under feed fish.
- Feed fish as many times per day as necessary in order to distribute the feed to all fish.
- Don't feed fish immediately before a stressful situation.

## If a nutritional deficiency is suspected;

- Collect information on diet, size and type of feed, storage and feeding procedures, age of diet, abnormalities in the diet such as texture, odor, color, etc.
- Clinical signs, symptoms and behavior of fish.
- Age of fish, time on feed, environmental conditions.
- Analysis of the feed for component deficiencies.
- Send affected fish to fish health laboratory for diagnostic work.
- Confirm by histological examination.

