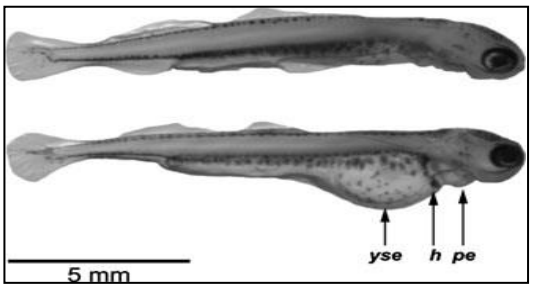
## Blue-Sac Disease (BSD)

It is infected fry salmonid fish, caused by the accumulation of metabolic wastes and reduced dissolved oxygen and excessive buildup of ammonia nitrogen. **The clinical signs** are exhibit an abnormal accumulation of fluid bluish in color at the posterior of the yolk sac, the increased fluid caused that the fry cannot swim normally and the fry may have exophthalmia, coagulated yolk and petechial hemorrhages of the head and mortality early in larval development. Blue sac disease can be **prevented by** water chemistry control so that accumulation of nitrogenous wastes does not occur.



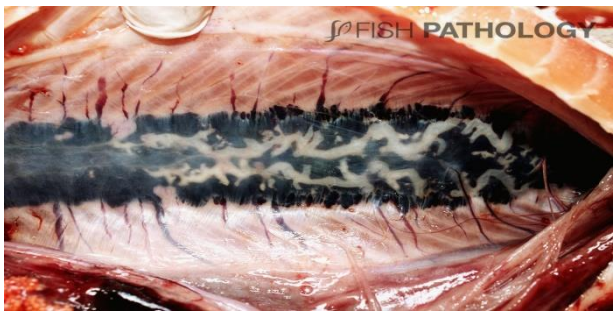

**White fish fry/ the bottom fry shows signs of blue-sac disease, including yolk sac (yse) pericardial oedema (pe), and subcutaneous hemorrhages (h)**


## Nephrocalcinosis (NC)

Is a chronic disease which is characterized by degenerative changes and deposition of calcium and magnesium salts within the urethras and collecting ducts of farmed and wild fish, it is similar to kidney stones in humans and animals. A number of environmental and dietary factors have been associated with the disease in cultured fish species, such as high levels of dissolved carbon dioxide in the water or unbalanced levels of diet calcium or magnesium, overcrowding and low water flow.

Fish with Nephrocalcinosis (**clinical sings**) may appear normal or show sings of abdominal swelling, skin petechia, exophthalmus. In some fish there is increase in skin pigmentation, internally inflammation of stomach and the kidney become swollen and grey in color with an irregular surface and a white deposit in the urethras**.**

To avoid this disease **(prevent)** must be reduce the carbon dioxide level in water by increasing the amount of aeration.




**Gross appearance of nephrocalcinosis. The kidney is swollen and grey with an irregular surface and white mineral deposits in the ureters**

## *Fish diseases associated with physic-chemical Properties of water:

### Asphyxiation / Hypoxia

This case is caused by very low levels of dissolved oxygen **(DO)** in bond water, the affected fish gather at the water inlets and outlets, also fish swim at water surface and show rapid opercular movement, therefore Monitoring of DO levels and provide aeration is the best solution.

### Alkalosis

This is coming when water becomes too basic, that means the pH increases to a level higher than the fish can tolerate. Affected fish show corroded skin and gills and milky turbidity of the skin. To prevent it must monitor pH level, and maintain the pH in a range optimal for the species.

### Acidosis

It is caused by a drop in the pH to a level too low for the species, affected fish show rapid swimming movements and gasping, increased mucus secretion and death occur very quickly, yellow to orange to brown discoloration of the gill. for controlling; monitor pH levels, apply lime to pond bottom before stocking.

## 2- Nutritional diseases (Nutritional deficiency diseases)

The primary cause of many diseases may be defective nutrition, they can be very difficult to diagnose. Nutritional deficiencies signs of farmed fish may occur when fish are fed nutrient deficient diets or raised in a low nutrient-input culture system.

### Essential amino acid deficiency (Protein deficiency)

The important clinical sings are; loss of appetite, Reduction of growth rate, Anemia, scoliosis, lordosis, fin erosions and cataracts, Mortality.

### Mineral deficiencies

as most trace elements are obtained both from the dietary ingredients and from the culture water, The deficiency signs have been reported; poor feed conversion and bone mineralization; magnesium- whole-body hypercalcinosis; and manganese- reduced growth and skeletal abnormalities, decrease in blood parameters.

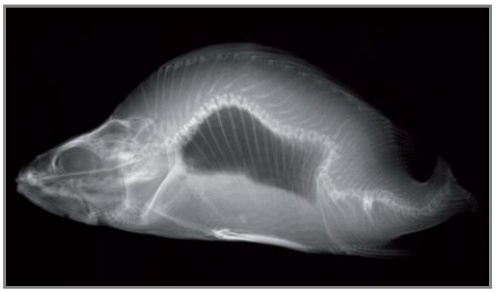
### Vitamin deficiency

Vitamins obtained from natural food in fertilized ponds, endogenous vitamins, they are some vitamins that produced by microbial biosynthesis of some vitamins in the gut.
Symptoms of vitamin deficiency are as following:

| Vitamin | Symptoms of deficiency |
|---|---|
| Ascorbic acid | Skeletal deformities poor wound healing |
| Thiamine | Poor growth and nervous symptoms |
| Riboflavin | Cataract and corneal opacity, Pigmentation abnormalities, Poor growth, Fin erosion |
| Pantothenic acid | Clubbing of gills filaments loss of appetite, poor growth, exudates on gills |
| Folic acid | Poor growth, lethargy, dark coloration, anemia |
| Pyridoxine | Nervous disorders, anemia loss of appetite, rapid breathing |
| Vitamin A | Blindness, poor growth |
| Vitamin E | Muscular dystrophy, anemia, poor growth |
| Vitamin K | Reduced blood clotting time |

For treatment these diseases depend on provision of fish with right kind of food with sufficient quantity according to diagnosis of the types of deficiency of nutritive components.

**3- Genetic abnormalities:** include conformational oddities such as lack of a tail or presence of an extra tail. Most of these are of minimal significance.



**Rainbow trout (*Oncorhynchus mykiss*)/ with multiple hemorrhages (bleedings) in the dorsal muscles**