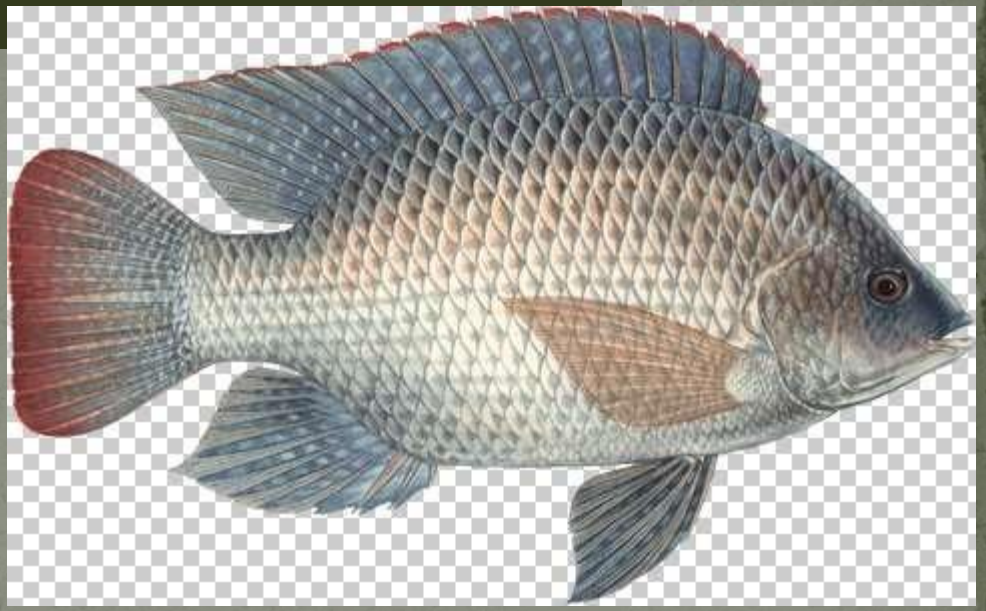
Protein requirement in teleost

Protein level in aquaculture feeds generally average

- **18-20% for marine shrimp**
- **28-32% for catfish**
- **38-42% for striped bass**
- **32-38% for tilapia**



Protein requirements usually lower for herbivorous fish and omnivorous fish than carnivorous fish.

Protein requirements are higher for fish reared in high density than low density systems

Protein requirements are **higher for smaller fish**.

As fish grows larger, their protein requirements usually decrease.

Protein requirements also varies with

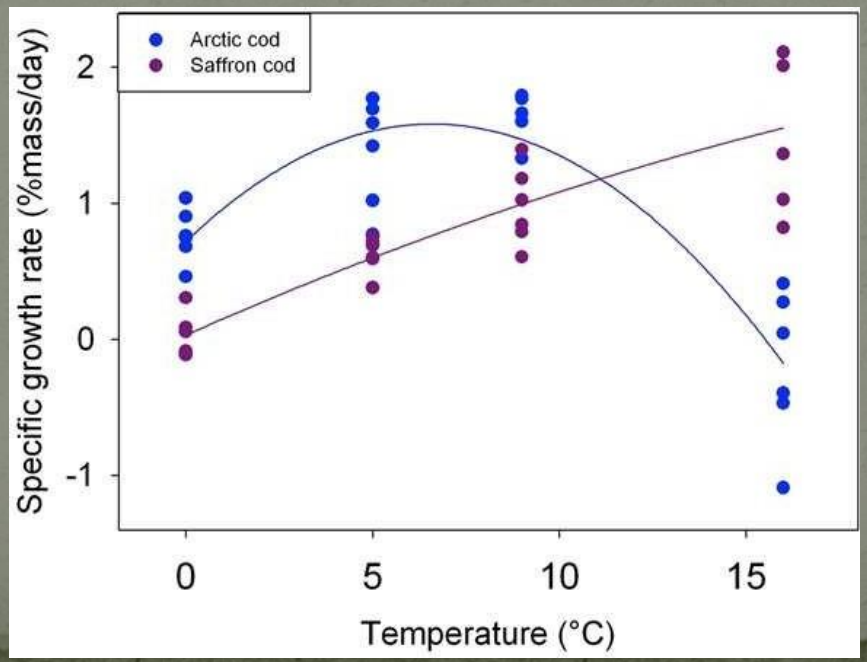
- **rearing environment**
- **Water temperature**
- **Water quality**
- **Feeding rates of fish**
- **Genetic composistion**

- Carnivorous fish needs 40-50%
- Omnivorous fish needs 25-35%

- Warm period and tropical climate require lesser protein and carbon and vice- versa

- **Linear relationship between dietary protein requirement and Specific Growth Rate exists**

- **Warm water fish have faster SGR than temperate fish**



Factors affecting protein requirement

- Size and age
- Fertility of the culture systems
- Levels of anagement and intensification
- Seasons
- Geographic location

Protein sources – Predominantly used

Animal proteins

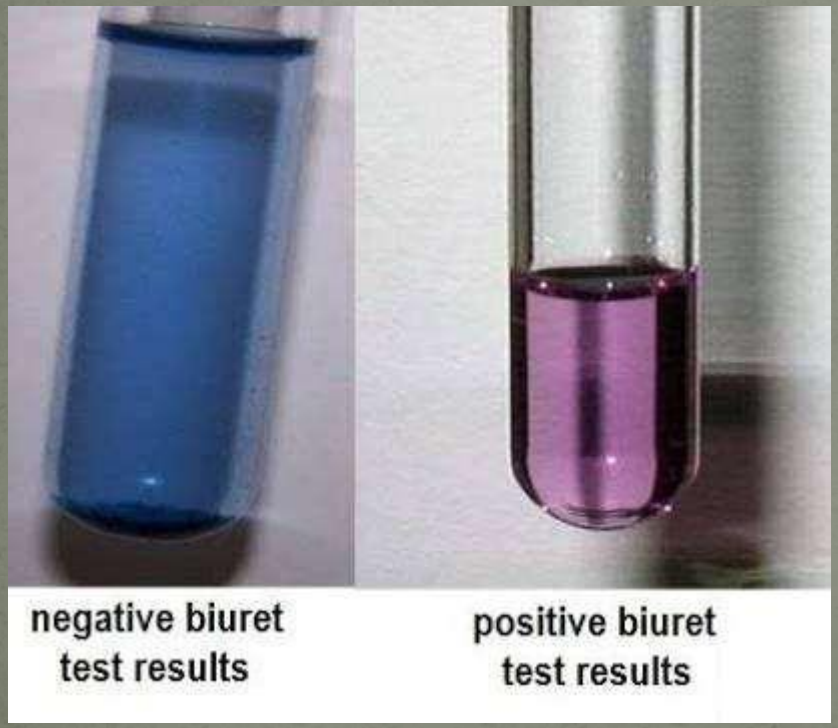
- Fish meal
- Squid meal
- Clam meal
- Mussel meal
- Crab head meal
- Prawn head meal
- Squilla meal
- Silkworm pupae
- Poultry waste meal
- Slaughter house waste

Plant sources

- Soybean meal
- Wheat products
- Yeast
- Cotton seed meal
- Peanut meal
- Corn glutens meal
- Rice bran
- Wheat bran
- Ground nut oil cake
- Tapioca flour

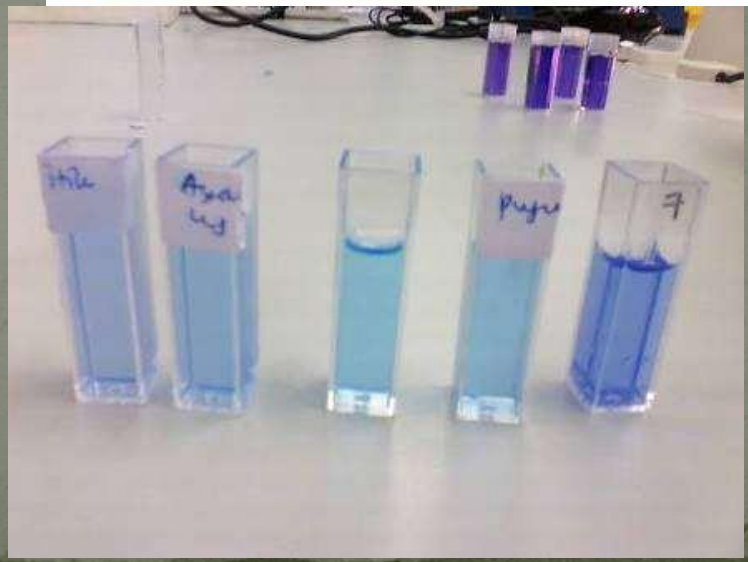
Protein estimation

- Kjeldhal method-higher protein
- Biuret method
- Folin- lowry's method



negative biuret test results

positive biuret test results



Nutritional value of proteins

Used as guide to the effectiveness of a particular protein sources in supplying animals required

3 main methods

- **PER**
- **NPU**
- **Essential amino acid index.**

PER-Protein Efficiency Ratio

Relates weight gained to g of crude protein fed

$$\text{PER} = \frac{\text{g wet wt gain}}{\text{g crude protein fed}}$$

- This method makes no allowance for protein used for maintenance
- But **widely used as method of determining appropriate protein sources for fish diets**

NPU-Net Protein Utilization

most satisfactory method.

NPU= biological value × digestibility

Several technical difficulties occur when determining biological value and digestibility.
This was rewritten as

<u>Apparent net protein utilization (Apparent NPU)</u> Defined as the percentage of ingested protein which is deposited as tissue protein.

$$\text{Apparent NPU} = \frac{Pb - Pa}{Pi} \times 100$$

where Pb is the total body protein at the end of the feeding trial, Pa is the total body protein at the beginning of the feeding trial, and Pi is the amount of protein consumed over the feeding trial

Essential Amino Acid Index

EEA index = geometrical average of 10 essential amino acid

This is used only if the AA requirement for the given sp is known