

## **COURSE: INTRODUCTION TO AQUACULTURE (FIS 309)**

UNITS: 2

LECTURER: DR. S.O. OBASA

### 1. Food supply

**Definition of food in the aquatic culture environment:** Food in the aquatic culture system refers to the organisms which serve as food for cultured fish.

**Examples of food:** Major are the plankton, made up of 1) Phytoplankton (floating microscopic, unicellular plants). 2) Zooplankton (floating, microscopic unicellular animals). 3) **Others are:** multi-cellular plants like floating and submerged plants and multi-cellular animals like insect larvae, insects and crustaceans.

### **Supply**

This is basically by the introduction of lime and fertilizer into the rearing pond and/tanks. This boosts the growth of the unicellular green plants (green algae) upon which the endemic unicellular animals and other phytophagous feeders feed.

For the culture of a desired food organism, the culture medium should be inoculated with the desired organism.

### 2. Selection of culture species.

Criteria for selection

1. Ability to accept artificial feed
2. Ability to breed in captivity
3. High growth rate
4. Should be marketable
5. Must be hardy

### 3. Introduction of exotic species and implications.

**Definition of exotic species.** They are species that are not indigenous to the local environment.

**Some examples of exotic species that were introduced into the Nigerian culture environment are:** The Chinese carp, *Cyprinus carpio*, mirror carp, koi carp, Indian carps like Mrigal (*Cirrhinus mrigala*), *Catla catla* and rohu (*Labeo rohita*).

### **Conditions under which exotic species can be introduced**

1. Must be able to occupy a niche in the environment without upsetting the environment.
2. It must be able to coexist favourably with other endemic species.
3. Must be able to reproduce in the new environment
4. Must be able to adapt to the physical and chemical parameters of the new culture system.
5. Must not be a vector to any parasite

6. Must have been quarantined before introduction..

COURSE: ORNAMENTAL FISHERIES AND AQUARIUM DESIGN (FIS505)

Unit: 2

LECTURER: DR. S.O. OBASA.

1. Ornamental fish

Identification of different classes of ornamental fish

2. Breeding

3. Management

Day to day management of the components of the aquarium like:

1. The fish
2. Aquarium plant
3. The water
4. Glass tank

4. Nutrition

1. Feeding of the aquarium fish and feed characteristics
2. Different types of feeds for aquarium fish
  - i. Dry feed preparation
  - ii. Vegetable food
  - iii. Living food,

COURSE: FISH NUTRITION (FIS 302)

Unit: 2

LECTURER: Dr. S.O. Obasa

1. Nutrient sources and practices consideration in feeding

Definition of nutrient. This is the absorbable substance released as a result of digestion of food or feed by an organism.

Examples are: protein, carbohydrate, fats and oil, vitamin and mineral salts.

Sources are the feed ingredient containing the nutrients. Examples are:

<b>Ingredient</b>	<b>Nutrient</b>
Fish meal	Protein
Soybean meal	Protein
Groundnut cake	Protein
Cotton seed cake	Protein
Maize	Carbohydrate
Sorghum	Carbohydrate
Millet	Carbohydrate
Vegetable oil	Fat and oils
Pork lard	Fat and oils

Protein sources are ingredients with protein content from 20% and above.

Protein is classified into 2 parts based on sources. They are animal source and plant source.

## **2. Feed formulation**

Definition. Calculation of different ingredients to be mixed together to form a balance ration.

Requirements of feed formulation.

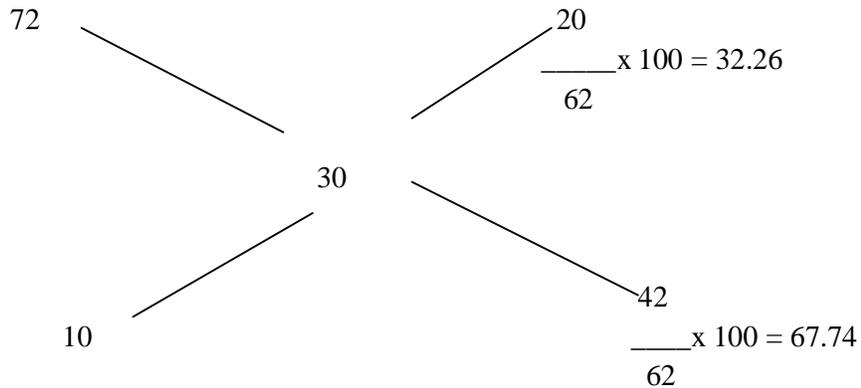
1. The nutrient requirement of the fish should be known.
2. The nutrient composition of the ingredients should be known.
3. Cost of ingredient should be known
4. The ingredients should be available and
5. The minimum and maximum levels of inclusion of ingredients should be known.

There are many methods.

1. Pearson's square
2. Least cost and
3. Algebraic.

### **Example 1.**

Using the Pearson's square method, formulate a ration (100 kg) containing 30% crude protein (CP), using fish meal (72% CP) and maize, (10%CP). Calculate each ingredient contribution by weight and by protein.



Contribution of fish meal by weight = 32.26

Contribution of maize by weight = 67.74

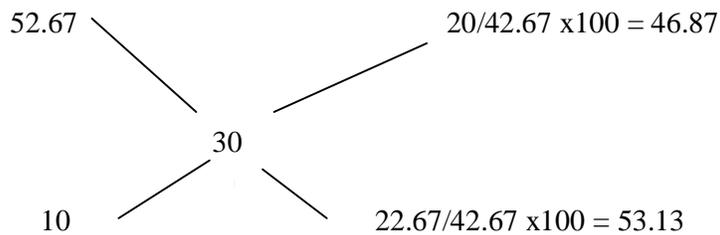
Total		———	
		=	100.0
“	“ fish meal by protein =		32.26/100 x 72 = 23.23
“	“ maize “ “ =		67.72/100 x 10 = 6.77
			Total = 30.00 %

### Example 2

Formulate a ration containing 30% CP using fish meal (72%CP), soybean meal (43%CP) in the ratio 1:2. Use maize (10%CP) as energy source..

(Ratios are assigned when using more than one source of nutrient).

Fish meal 72% CP	Ratio 1	1x72 = 72	
Soybean meal 43%CP	Ratio 2	2 x 43 = 86	
	———	———	
	3	158/3 = 52.67	





COURSE: Fish Physiology and Adaptation. (FIS 314)

Unit: 2

Dr. S.O. Obasa

Natural environmental adaptation

1. of fish migration,

(a). Definition of fish migration.

It is vertical (from the deep to the surface) or horizontal (onshore/offshore and upstream/downstream) movement within an aquatic environment or between different aquatic environments.

(b). Different kinds of travels by fish.

I. Potamodromy/limnodromy.

ii. Oceanodromy.

iii. Catadromy.

Iv. Anadromy.

V. Diadromy.

vi. Amphidromy

Travels in named example of migratory fish (The freshwater eels, *Anguilla*).

Factors influencing migratory travels.

2. Feeding habits.

Major types of feeding habits in fish

i. Predation

ii. Grazing

iii. Straining

iv. Sucking

v. Parasitic.

COURSE: FISH NUTRITION AND FISH FOOD TECHNOLOGY

LECTURER: Dr. S.O. Obasa

UNITS: 3

1. Feed formulation

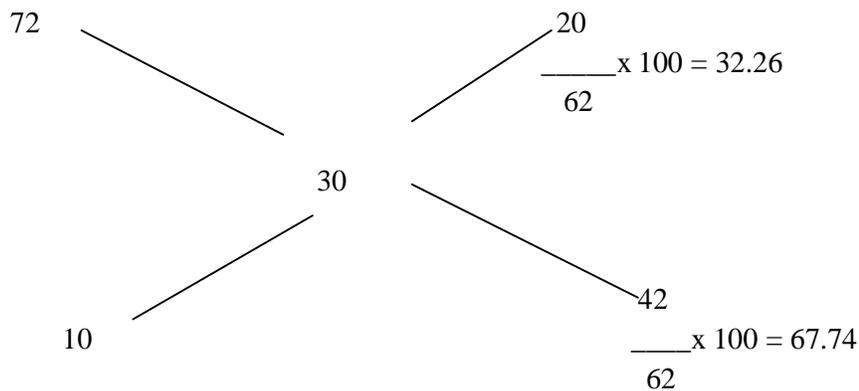
i. Definition. Calculation of different ingredients to be mixed together to form a balance ration.

ii. Requirements of feed formulation.

- iii. Different methods of feed formulation.
  - Pearson's square
  - Least cost and
  - Algebraic.

Example 1.

Using the Pearson's square method, formulate a ration (100 kg) containing 30% crude protein (CP), using fish meal (72% CP) and maize, (10%CP). Calculate each ingredient contribution by weight and by protein.



Contribution of fish meal by weight = 32.26  
 Contribution of maize by weight = 67.74

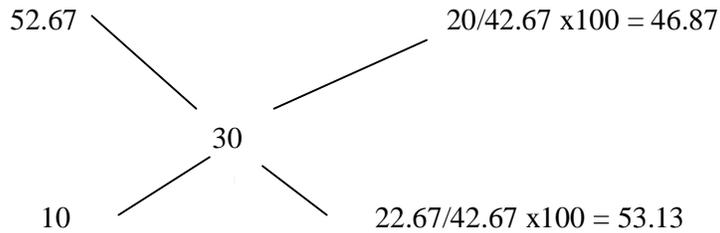
Total		= 100.0	
“	“ fish meal by protein =		32.26/100 x 72 = 23.23
“	“ maize “ “ =		67.72/100 x 10 = 6.77
			Total = 30.00 %

Example 2

Formulate a ration containing 30% CP using fish meal (72%CP), soybean meal (43%CP) in the ratio 1:2. Use maize (10%CP) as energy source..  
 (Ratios are assigned when using more than one source of nutrient).

Fish meal 72% CP    Ratio 1    1x72 = 72

$$\begin{array}{r} \text{Soybean meal } 43\% \text{ CP Ratio } 2 \\ \hline 3 \end{array} \quad \begin{array}{r} 2 \times 43 = 86 \\ \hline 158/3 = 52.67 \end{array}$$



Protein sources contribution by weight = 46.87

Individual source =  $46.87/3 = 15.62$

Fish meal =  $15.62 \times 1 = 15.62$

Soybean meal =  $15.62 \times 2 = 31.24$

Maize = 53.13

Contribution by protein:

Fish meal =  $15.62/100 \times 72 = 11.25$

Soybean meal =  $31.24 \times 43 = 13.43$

Maize =  $53.13/100 \times 10 = 5.31$

Total =  $\frac{\quad}{\quad} = 29.99$  or 30.00%.

### 3. Different methods of feeding.

#### 1. Point/spot feeding.

This is when feed is dispensed to fish at a point or spot in the culture system.

Advantages and disadvantages

#### 2. Broadcast feeding.

This is when feed is dispensed to fish by spreading or broadcasting in the culture system.

Advantages and disadvantages.

#### 2. Mechanical feeding

Feeding equipments

Stationary feeding equipment e. g. Demand feeder

Mobile feeding equipment e. g. Automatic feeder.

## Mode of feeding

1. Feeding at percentage body weight.
2. Feeding to satiation.

COURSE: ADVANCED FISH NUTRITION (FIS 504)

UNITS: 2

LECTURER: Dr. S.O. Obasa

### **1. Advanced principles of fish nutrition;**

#### **i. Requirement for energy.**

- \*Sources of energy in fish feeds.
- \*Differences in energy need between fish and other farm animals.
- \*The implications of feeding fish with feed that has excess or deficient energy.

#### **ii. Protein requirement.**

- \*Functions of protein in fish.
- \*Sources of protein in fish feeds.
- \*Factors affecting protein requirement in fish.

#### **iii. Vitamins and minerals.**

- \*Introduction (Definition and brief explanation of vitamins).
- \*Classification of vitamins i.e. water soluble and oil soluble; macro and micro vitamins.
- \*Functions of different vitamins in fish.
- \*Functions of various in fish and livestock.

#### **iv. Non nutrients feed components;**

- \*Introduction (Definition and brief explanation of non nutrient feed component).
- \* Sources and effects of non nutrient feed components on fish.

### **2. Feed formulation.**

- i. Definition. Calculation of different ingredients to be mixed together to form a balance ration.
- ii. Requirements of feed formulation.
- iii. Different methods of feed formulation.  
Pearson's square  
Least cost and  
Algebraic.

### Example 3

Formulate a ration containing 30% CP using fish meal (72%CP), soybean meal (43%CP) in the ratio 1:2. Use maize (10%CP) as energy source..

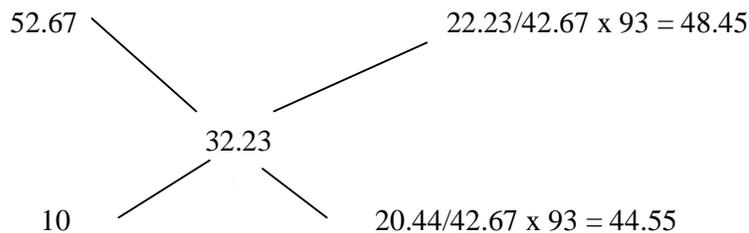
(Ratios are assigned when using more than one source of nutrient). Fixed ingredients are: vegetable oil =5%, vitamin premix = 1%, di-calcium phosphate (DCP) = 0.5% and salt = 0.5%. Calculate the amount contributed by each ingredient by weight and protein.

Fish meal 72% CP	Ratio 1	$1 \times 72 = 72$
Soybean meal 43%CP	Ratio 2	$2 \times 43 = 86$
	<hr style="width: 100%; border: 0.5px solid black;"/>	
	3	$158/3 = 52.67$

The target protein in the centre of the square will change due to the addition of the fixed ingredients.

$$= 100 - 5.0 + 1.0 + 0.5 + 0.5 = 93$$

$$= (30 \times 100) / 93 = 32.23$$



Protein sources contribution by weight = 48.45

Individual protein ingredient =  $48.45 / 3 = 16.15$

Fish meal =  $16.15 \times 1 = 16.15$

Soybean meal =  $16.15 \times 2 = 32.30$ .

Maize = 44.55

Protein contribution

Fish meal =  $16.15 / 100 \times 72 = 11.63\%$

Soybean meal =  $32.30 / 100 \times 72 = 13.89\%$

Maize =  $44.55 / 100 \times 10 = 4.46\%$

Total =  $11.63 + 13.89 + 4.46 = 29.98$  or 30%