

# Importance of live food organisms in Aquaculture

## What is live food:

- Live food is live organisms produced in nature and are considered as **living nutritious capsule** as they contain all essential nutrients.
- Live feeds are able to swim in water column and are thus **constantly available to the larvae**.

## Importance of live food:

Larvae are of two types

- **Precocial** – whose yolk sac is exhausted, appears as semi-adults, fully developed fins, a mature digestive system including functional stomach, **can ingest and digest formulated diets** as a first food.
- **Altricial** – whose yolk sac is exhausted, system is rudimentary, lacking stomach, **incapable of digesting formulated feed**. Altricial larvae therefore appear to require live feed.

# Factors affecting preference of live food

- Mouth size
- Digestibility of larvae
- Acceptability of food item
  - eg. Larvae of tiger prawn prefers Diatoms (Chaetoceros, Skeletonema); larvae of molluscs prefers Phytoflagellates, Isochrysis,

# Limitation with widely collected plankton

- Availability
- Purity
- Acceptability
- Digestibility
- Meeting energy and nutritional requirement

# Fish food organisms

- Fish food organisms are microscopic organisms naturally present in the aquatic environment as primary food for the larvae of fin fish and shell fish. Their size ranges from a micron to few millimeters.
- Animals which are carried along by the moving waters are known as plankton

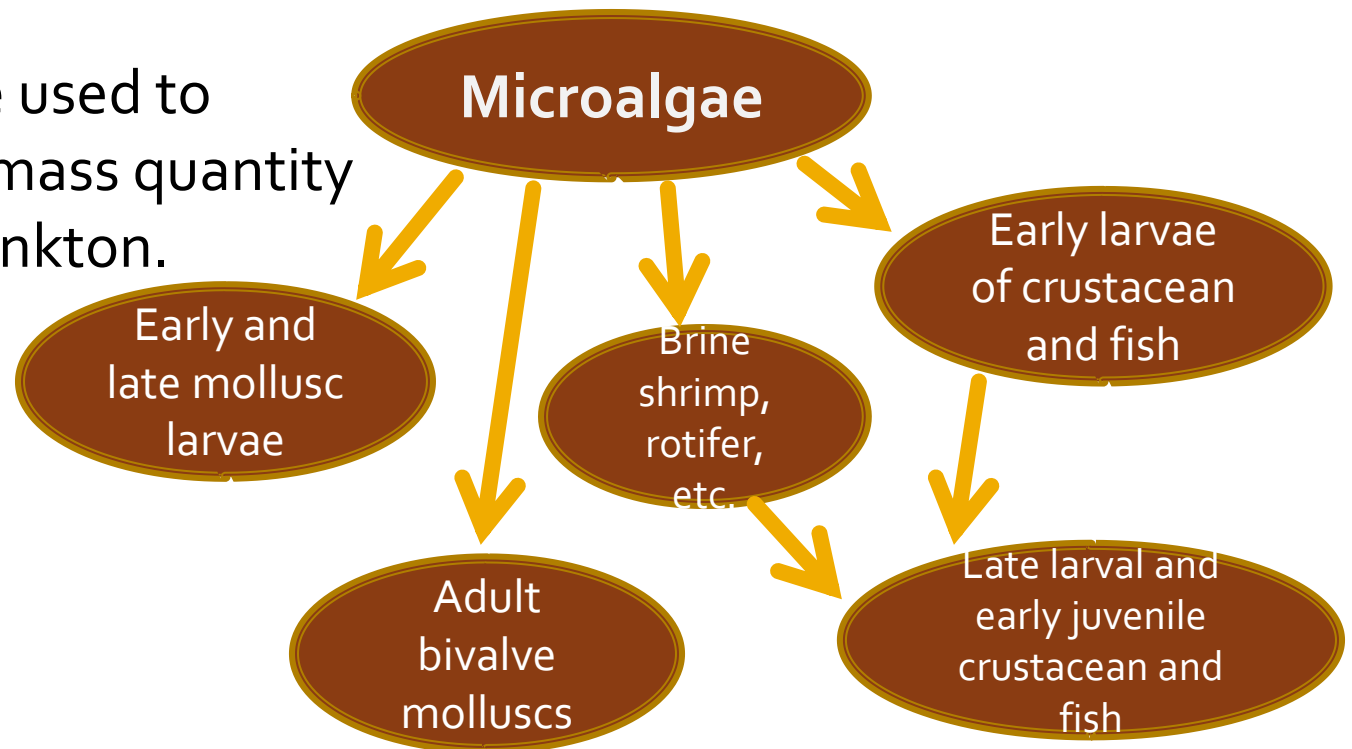
# Fish food organisms

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- Phytoplankton
- Zooplankton
- Periphyton
- Aquatic vegetation

# Phytoplankton / Microalgae

- ❖ Consists of chlorophyll bearing organisms and non-photosynthetic plants or saproplankton.
- ❖ Indispensable food source in commercial rearing of many fishes.
- ❖ Algae are used to produce mass quantity of zooplankton.



# Major classes genera of algae

Class	Genus
Bacillariophyceae (Diatoms)	<i>Skeletonema, Thalassiosira, Phaeodactylum, Chaetoceros, Nitzschia, Cyclotella</i>
Haptophyceae (Brown algae)	<i>Isochrysis, Dicrateria</i>
Chrysophyceae (Golden brown algae)	<i>Monochrysis</i>
Prasinophyceae (Scaled green algae)	<i>Tetraselmis, Micromonas</i>
Cryptophyceae	<i>Chlamydomonas, Cryptomonas</i>
Xanthophyceae	<i>Olisthodiscus</i>
Chlorophyceae (Green algae)	<i>Dunaliella</i>
Cyanophyceae (Blue green algae)	<i>Spirulina</i>
Rhodophyceae (Red algae)	Porphyridium



# Zooplankton

- Comprises of plankters of animal origin.
- They are of many types
  - Protozoa: *Arcella* sp., *Diffugia* sp., *Actinophrys*, *Vorticella* sp.
  - Rotifera: *Brachionus* sp., *Keratella* sp.,
  - Cladocera: *Daphnia* sp., *Moina* sp.
  - Ostracods: *Cypris* sp., *Stenocypris* sp.
  - Copepoda: *Mesocyclops* sp., *Microcyclops* sp.

# Aquatic vegetation

**Floating:** *Eichornia, Pistia, Azolla*

**Emergent:** *Nelumbo, Nymphia, Trapa,*  
*Mariophyllum, Potamogeton*

**Marginal:** *Ipomea, Jussiea, Colocasia, Typha*

**Submerged:** *Hydrilla, Ceratophyllum, Utricularia*

**Filamentous algae:** *Spirogyra, Pithophora*

# Periphyton

- Complex of all sessile biota attached to a substratum in pond plus associated detritus and microorganism
- Periphyton based aquaculture is an environment friendly, economic and sustainable farming.
- Substrate area may be 30% of total water area
- Additional fish yield of 40-70%

# Factor influencing the growth of fish food organisms

- Physical and Chemical parameters of water
  - Light, temperature, depth, turbidity, pH, dissolved gasses and good quality adequate nutrients.
- Productivity of soil

*Proximate  
composition of  
live food*

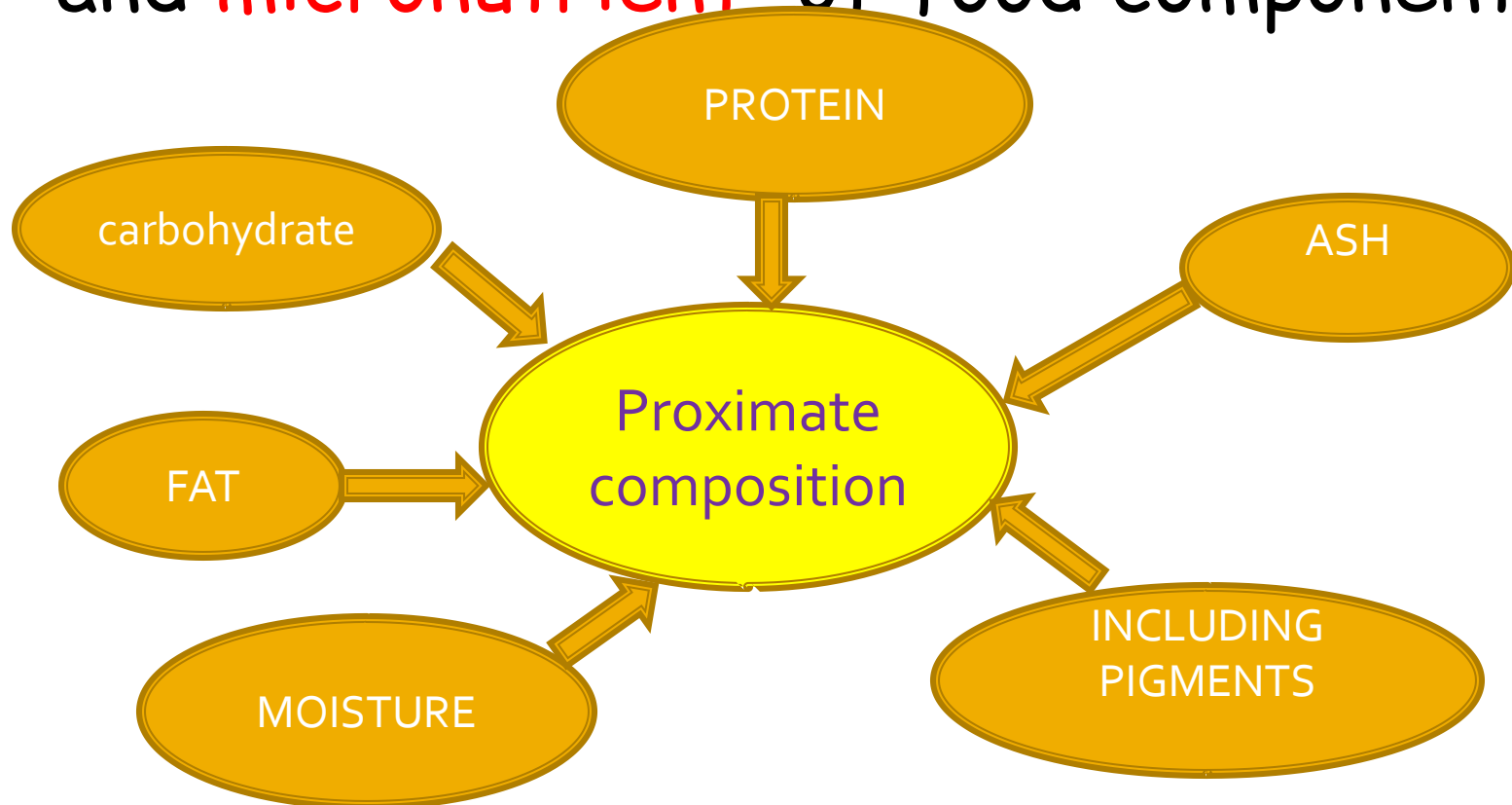
# Introduction

- The cultivation of fish and shellfish larvae under controlled hatchery conditions requires not only the development of specific culture techniques, but in most cases also the production and use of live food organisms as feed for the developing larvae.
- In intensive rearing of larvae of fishes and shellfish feeding constitutes a major factor since the fish obtain their nutritional requirement through food they consumed.

# PROXIMATE COMPOSITION



Quantitative analysis of different macro and micronutrient of food component.



# EARTHWORM PROXIMATE COMPOSITION

Component	% Dry matter.
<i>Protein</i>	46.57
<i>Lipid</i>	8.03
<i>Ash</i>	24.26





# CHIRONOMID PROXIMATE COMPOSITION

Component	% dry matter.
Carbohydrate	18.47
Protein	31.57
Ash	39.75
Fat	10.27



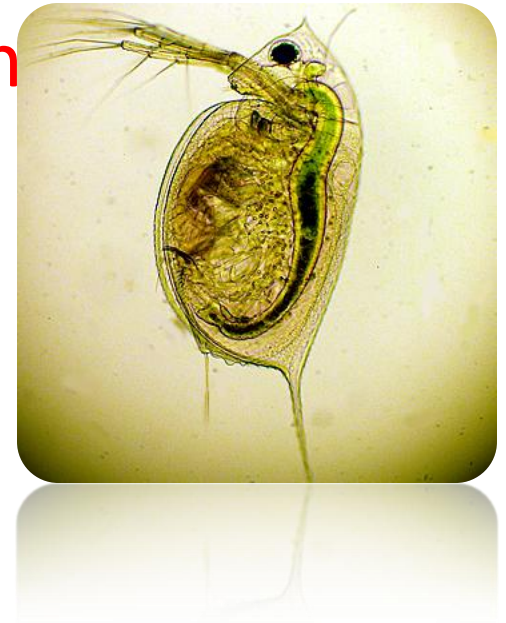
# MOINA PROXIMATE COMPOSITION.

component	% dry matter.
Carbohydrate	37.7
Protein	50
Fat	20.27 (adult) 4-6 (juvenile)
Ash	5.8
Moisture	93.2



# DAPHNIA PROXIMATE COMPOSITION

Component	% dry weight
Carbohydrate	30.9
Protein	43.9
Lipid	11.7
Ash	13.6
Moisture	94.7



Same essential and non essential aa (48.2%).  
Low content essential FA particularly (n-3)HUFA.  
Digestive enzymes : proteases, peptidase,  
amylase, lipase, cellulose.

# ROTIFER PROXIMATE COMPOSITION.

Species : *Branchionus* sp.

Component	% Dry matter.
Carbohydrate	10.5-27
Protein	28.63
Fat	9-28
phospholipids content is	34-43%
Triglycerol with others –	20-55%
Excellent HUFA containing i.e., EPA, DHA and (n-3).	



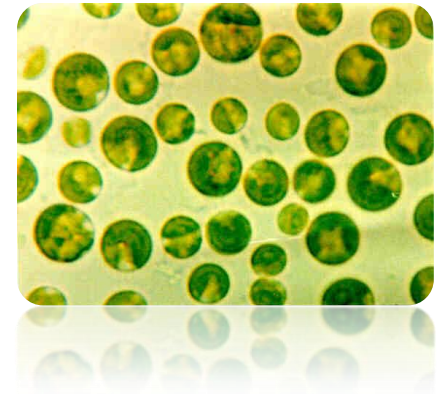
# BRINE SHRIMP PROXIMATE COMPOSITION



Component	% dry matter.
Protein	41.6-47.2 (Instar-I ) 49.7- 62.5 (Juvenile ,adult) 50.2- 69.0 (wild adult)
Lipid	20.8-23.1 (Instar-I) 9.4-19.5 (Juvenile, adult) 2.4-19.3 (wild adult)
Ash	0.5 (Instar-I) 9.0-21.6 (juvenile, adult) 8.9-29.2 (wild adult )

# CHLORELLA PROXIMATE COMPOSITION

Component	% dry matter.
protein	57.5
Fat	12.4
carbohydrate	17.3
Fiber	12.1
Moisture	7.0 (max)
Ash	7.0 (max)



# SPIRULINA PROXIMATE COMPOSITION

Spirulina was established as a 'wonderful future food source' in 1967 ( IAAM ).



Component	% dry matter
Protein	55-70
Fat	5-7
Carbohydrate	19
Fiber	5-7
Moisture	4-9
Ash	9-11

# Contt.....

Vitamine : B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>9</sub>, B<sub>12</sub>, C, D, E.

Rich in : K, Ca, Mg, Cr, Cu, Fe, Mn, P, Se, Na, Zn.

Pigment : Chlorophyll a, Xanthophyll, Canthaxanthin,  
Diatoxanthin,  $\beta$ -cryptoxanthin.



# TUBIFEX PROXIMATE COMPOSITION

Species : *Tubifex tubifex*.

Components	% dry matter
protein	50-60 ( min)
Fat	10 (min)
Fiber	2 (max)
Moisture	4 (max)
Phosphorous	0.1 (max)
Ash	0.1 (max)



# TUBIFEX PROXIMATE COMPOSITION

Specially known for amino acid availability.

Protein amino acid	mg/L
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Lysin	12.0
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Histidine	9.1
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Argenine	8.1
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Alanine	11.7
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# DIATOMS PROXIMATE COMPOSITION

Species : *Cyclotella cryptica*'



Component	dry weight mg/g
Total ash	254
Carbohydrate	360
Lipid	165
Protein	260

# Point to be noted:

- Highest carbohydrate content = **Moina** (37.7)
- Highest protein content = **Spirulina**. (75)
- Highest Fat content = **Adult moina** (27).
- Highest ash content = **Chironomid** (39.75)

# Conclusion

- Live food organisms are still extensively used for rearing larval fish in aquaculture.
- The nutritional quality of these food organisms very much depends upon the conditions of their culture.
- Very often high mortalities of fish larvae were encountered by feeding live food organisms deficient in essential fatty acids (EFA).
- Lipid enrichment techniques were found to be very effective and can be successfully employed to enhance the EFA content of a variety of live food organisms.