Foreword

Last few decades had witnessed widespread development in the technologies for capture as well as the culture of aquatic organisms' world over. There is tremendous advancement in post-harvest technology in the field of fisheries. Improvement in pre-process handling, processing, packaging and transportation are quite appreciable, even in the developing countries like India. Being a commodity of high economic value earing substantial quantum of foreign exchange, the fish and fishery products receive utmost care and importance and the scope for further development in this sector is quite promising. The policy of importing the raw material from other countries for processing, which in turn helps in utilization of the under utilized built-up capacity of the processing industry, will open up a new possibilities.

Aquarium Fish culture and its trade is neglected in India, though the fish keeping in home or public aquariums is the second most popular hobby in the world. India has wide resources of various colorful indigenous species which have tremendous market value in foreign markets. Billons of foreign currency can be earned by trading ornamental fishes.

Human resources development in this sector is being well attended by a chain of fisheries colleges, functioning under the State Agricultural Universities, Fisheries Institutes Under the Govt. of India. Asutosh College, Kolkata also plays a pioneer role in the field of fisheries science. Department of Industrial Aquaculture and Fisheries (B.Voc studies)of the college, plays the role to give the education on fisheries science.

Preface

Fisheries are a vital sector contributing substantially to the Indian Economy. It is a major provider of employment, next only to the agriculture, and the much needed inexpensive wholesome protein food to the masses. It is therefore, no wonder that fisheries has given due importance in the developmental activities in India. Fisheries is a multidisciplinary field Even with the best of infrastructure in terms of facilities and technology, the success of operations will depend on the qualified manpower behind them. This fact has been very well understood and necessary infrastructure has been developed by way establishing several teaching and training Institutions over the country. But lack of infrastructure, training to the students is widely felt, especially based on Indian conditions and contexts. We have visited Central Institute of Brackish water aquaculture(CIBA) for excellent training programme. This field visit has intensified our knowledge .

Acknowledgement

I am indebted to several persons of my college for conducting the training programme at. I am thankful to the Principal (Dr. Dipak Kar) of Asutosh College, who allowed us to go to get the training programme. I am thankful to Dr. Bidisha Sen Maitra (Coordinator of Industrial Fish and Fisheries). I am deeply thankful to Dr. Mukti Chanda Paul,Prof. Dola Roy and Prof. Vincent Souvik Gomes of our Department for the entire field visit. I wish to extend my thanks to Prof . Basudha Basu for the assistance .I also wish to place on record my thanks to the Central Institute of Brackish water aquaculture(CIBA) for excellent training programme. I wish to express my gratitude to all the teachers and stuffs and contributors of the training Institutions and Asutosh College for their kind cooperation in all aspects.

ASUTOSH COLLEGE, BHASA CAMPUS, WESTBENGAL

REPORT ON CIBA FIELD VISIT ON BRACKISH WATER AQUACULTURE

DATE-17/05/2022

INTRODUCTION ON ICAR(Central Institute of Brackish Water Aquaculture) ,KRC(Kakdwip Research Centre)

- CIBA is a research institute at kakdwip it was established in 1968.
- This brackish water aquaculture is economic engine of Indian fisheries sector.
- Export potential is very high therefore the revenue generation is huge.
- Almost 10 lakh metric ton brackish water production per year from 40 million of total aquaculture production.

Major culturable species:-

1.) Med fish
2.) Parshe
3.) Vannamei
4.) Mystus gulio
5.) bhetki
6.) Chapra
7.) pabda
8.) Spotted scat

Contribution of CIBA to brackish water aquaculture:-

- Standardize the breeding of med fish in captivity.
- Standardize the large scale seed production of striped-way mullets . This way mullets are omnivore.
- Kerala state fish ,they are mouth brooders.
- Spotted scat
- Shrimp
- Tiger shrimp- zero water exchange throughout the culture.
- Pinius Indicas selective breeding.

Multi-trophic Aquaculture - Oysters

- Integrated farming with livestock to make it more sustainable
- Plankton plus they made feed with fish waste bring from the market and hydrolysed them and mixing them with plankton to make a feed called plankton Plus.
- Small scale aqua-feed plant:-
  They also help to those private enthusiast farmer who want a small scale aqua-feed plant.

Challenges faced during the brackish water aquaculture:-

1) Less input on seed and feed.

2) Connectivity problem.

3) Disease outbreak.

4) Shrimp farming not sustainable.

5) Local market not established.

6) Proper medications.

7) Aqua cleaning are not present.

Representative of CIBA:-

On date 17/05/22 we went to CIBA with the support of our respected Dola Ma'am and Souvik Sir in the presence of our Honourable Dr. Debashis Dey , the officer-incharge of CIBA.

CIBA – The Brackish water farm

Brackish water fishes - These fishes which have the salinity range in between 0.5 to 30 ppt and live in backwater estuaries and coastal waters. Example-mullet, milk fish, asian sea bass, etc

- CIBA is the fish culturing hub. Tides here play a vital role in the rearing of fish . When high tide happens the water is allowed to enter the farm through the inlet canal and it is collected in huge reservoir .

- Water inlet canal

- At first the water is treated with some chemicals to make the water free from bacteria and pathogens thus the water becomes suitable for fish culturing process.
- There are very huge varieties of fish, like some fishes are adapted to live on the surface and they are called surface feeders ,example – catla(eats phytoplanktons) , whereas some are adapted to live at the bottom of the water and are called bottom feeders .
  Accordingly to their survivability, who live at upper surfaces their meal are light and those who live at the bottom their meal are heavy .

Aquatic feeds:-

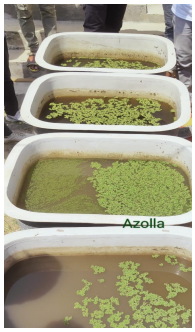
i.)Natural live feed.

ii.)Formulated feed

i.) Natural live feed:

A.) Planktons B.) Periphyton

C.) Macrophytes D.) Benthos



- **Culture of azolla**

ii) Formulated feed:

- After we went into the feed mill, we saw varieties of machines being used for feed making process.
- At first we were briefed about different machines such as Boiler , Grinder , Processing unit , Pelletizer .

GRINDING MACHINE

MIXING MACHINE

FEED PELLETIZER MACHINE

i) Dry feed: 8-10% moisture – Further classified into five categories:

a) Pellets - Sinking or floating.

b) Flakes - Flat in shape. It floats at first and then sinks slowly. It is available in different colours.

c) Freeze dried feed - Kept for longer time without degradation of nutritional value. These are available in cubes which adhere to glass tank. Fishes nibble at it as it dissolves.

d) Tablet form - It can be stuck at different water levels.

e) Granular or crumble feed - Small particle suitable for larvae.

ii) Moist feed: It can be prepared daily and fed to fishes. The moisture content of the feed is 35%. It cannot be kept longer period due to their high moisture content.

iii) Semi-moist/paste feed: For baby fishes, this can be given by squeezing through mess.

Preparation of dry feed:

Using rice bran (protein 9%) and groundnut oil cake (protein 45%) a fish diet with 27% protein can be prepared as follows:

Feed ingredients

↓

Sieved through 300 micron mesh

↓

Mixing

↓

Addition of water 30 - 35%

↓

Dough

↓

Cooking for 15 minute in pressure cooker

↓

Cooled

↓

Oil + Vitamin + Antioxidant + Growth promotion + Antibiotics + Colouring agent sprayed over the feed.

↓

Remixing

↓

Pressed through Pelletizer (2mm)

↓

Drying

Water Quality testing:-

1.) SALINITY TEST OF SAMPLE WATERS:-

Principles:

Salts in water commonly include ions such as Ca2+ , Mg2+ , Na2+ , K+ , Cl- , So2- , Hco3- , CO3 2- ,Chloride ions are one of the major inorganic anions in water. Salinity means total dissolved solids in water. Conductivity measurement is thought to be more accurate estimation of salinity of water samples, but, for convenience, salinity is commonly measured by chloride estimation.

Chlorinity is a measure of chloride content, by mass, of sea water. It is defined as the amount of chlorine (grams) in 1 kg of seawater (bromine and iodine are assume to have been replaced by chlorine). Chlorinity and salinity are both measure of salinity or saltiness of water under study. The relationship can be expressed as, salinity is equivalent to 1.80655 times the chlorinity.

This procedure depends on the rule of constant proportion. There is a constant ratio of dissolved chloride to total dissolved salts in all sea water. Chlorides make up about 55% of the total salts (salinity) in seawater. Therefore if we know the chlorinity (the mass of chloride present) we can determine the overall salinity:

Salinity (g/L) =1.80655 X Chlorine (g/L) ppt

Determination of salinity by chemical titration (Argentometric method)

A silver nitrate (AgNo3) solution of known concentration is used to precipitate out the chloride in a water sample. Silver nitrate react with chloride ion to form white precipitate of AgCl. An indicator of chromate ion is used to indicate the complete precipitation of Cl- as AgCl. When all of the chloride ion is exhausted, the chromate ion reacts with silver ions and produces silver chromate Ag2CrO4, which is red. When the instant a permanent brick-red tinge appears in the solution(one that doesn't Vanish with mixing), the addition of silver nitrate is stopped.

[If the test sample contains thiosulphate, thyocyanate, cyanide, sulphide or sulphite, they do interfere with the determination of salinity. They should, accordingly, by oxidized to non-interfering substances. For this purpose takes suitable amount of sample in a conical flask and dilute to 150ml with water. At 25ml of h2o2 (3%) and boil for 15minutes. Further, add10 ml of h2o2 and boil for 5 minutes. If the sample is high turbid or coloured, add 3ml of aluminium hydroxide suspension to the measured quantity of sample. Stir the mixture thoroughly and keep it for few minutes and filter. Wash the precipitate with distilled water. Collect both the filtrate and washings for the determination of salinity.]

Chemical reaction:-

$Ag^+ + Cl^- \rightarrow AgCl$

$2Ag^+ (excess) + CrO_4^{2-} \rightarrow Ag_2CrO_4 \downarrow$ (ppt)

Materials required:-

Apparatus:
1) Measuring cylinder (100ml),
2) Conical flask (100ml)
3) Pipette (10ml)

4) Burette (50ml) and burette stand
5) pH paper

Reagents:
1) 0.0141 N silver nitrate solution,
2) Potassium chromate indicator and
3) 0.14 N sodium chloride solution.

- Preparation of 0.0141 N *silver nitrate solution*: Dissolve 2.395g AgNO3 in 200ml of distilled water. Add more water to make up the volume up to 1 litre. Keep it in brown bottle in darkness.
- Preparation of 5% potassium chromate indicator solution: Dissolve 5g of K2CrO4 in 100ml of distilled water.
- Preparation of 0.14 N sodium chloride solution: Dissolve 8.18g NaCl in 200 ml of double distilled water, then make up the volume up to 1 litre.

Standardization of AgNO3 solution:

Take 40 ml of 0.014 and NaCl solution in a 100 ml conical flask and add 1ml of K2CrO4 indicator solution. Titrate this against 0.0141 N AgO3 solution. A white precipitate of AgCl will form. Continue the titration process until and unless the precipitate as well as the solution turns brick-red. Record the amount of silver nitrate consumed. Calculate the actual normality (N) of silver nitrate solution as follows:

$$\text{Normality (N) of AgNO3} = \frac{\text{40ml NaCl sol. X 0.14 (Normality of NaCl)}}{\text{Vol. of AgNO3 required for titration(ml)}}$$

$$\text{Normality (N) of AgNO3} = \frac{5.6}{\text{Vol. of AgNO3 required for titration (ml)}}.$$

[Note# As silver nitrate is the secondary standard solution , strength (Normality) of the solution changes with time, therefore it is always necessary to check standardize the strength of AgNO3 solution during the experiment.]

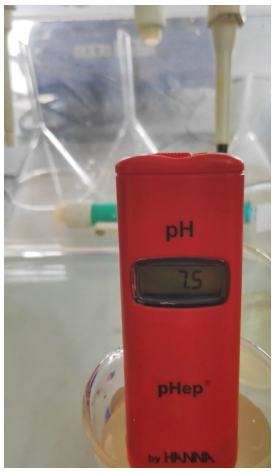
Method

1) Take 100ml of filtered water sample in a conical flask and determine the pH using pH paper. Ideally it should be between 7.0 and 8.0. Adjust the pH, if necessary, by adding a few drops of NaOH or H2SO4 to raise or to lower the value of PH respectively.
2) Fill up the burette with 0.0141 N AgNO3 solution.
3) Add 1 ml of K2CrO4 indicator solution to the water sample.
4) Titrate the water sample against AgNO3 solution until the appearance of a persistent brick-red colour.
5) Record the volume of silver nitrate added. Repeat the procedure at least three times.
6) Determine the chlorine concentration.
7) Convert the chlorinity values to salinity by multiplying by 1.80655.

Results:-

Sample no.	Salinity(ppt)	Remarks
1.) Water collected from tap water	0.32ppt	Fresh water (Less than 1ppt)
2.)Water collected from the culturing water	10.54ppt	Brackish water (0.5-30)ppt

2.) Determination of pH of water sample:-



Preparation for measurement of PH water :

Take the sample water in a beaker. Measure the pH of the sample at least three times with the help of the pH meter as described below.

Handling of pH meter:

1.) Set the temperature nob taking data from the thermometer.

2.) Take a known sample and set the pH meter on the defined value.

3.) Was the electrode.

4.) Deep the electrode with into the sample water.

5.) Read the pH value for from pH meter.

6.) Repeat the process three times and write in the table.

Caution :

i.) Do not touch the electrode with fingers.

ii) Carefully handle the electrode.

iii) Always clean the electrode with blotting paper before and after the use.

Result: Record the values of PH in table as given below and give remark ,i.e., alkaline/acidic.

No. of reading	Reading	Remarks
1.)	8.1	Alkaline
2.)	7.6	Alkaline

Remarks :pH is a measure of how acidic/basic sample is. pH range between 0 to 14, with 7 being neutral pH, less than 7 indicates acidic, where as a PH value greater than 7 indicates basic nature of the sample.

3.) Estimation of Dissolved oxygen (Winkler's Method)

Principle:

Wrinkler's method for determination of dissolved oxygen content in water is based on oxidation- reduction reaction MnSO4 reacts with alkali to form white precipitation of Mn(OH)2 which in the presence of O2 gets oxidized to form a brown precipitation. In the strong acid medium Mn++ is reduced by iodide ions which gets converted to iodine, equivalent to the original concentration of O2 in the sample. The Iodine, thus formed can be titrated against standard thiosulphate solution by using starch as an indicator.

Reactions:

$$2KOH + MnSO_4 \rightleftharpoons K_2SO_4 + Mn(OH)_2 \downarrow \text{ (White precipitation)}$$

$$2Mn(OH)_2 + O_2 + H_2O \rightleftharpoons 2Mn(OH)_3 \downarrow \text{ (brown precipitate)}$$

$$2Mn(OH)_3 + 3H_2SO_4 \rightleftharpoons Mn_2(So_4)_3 + 6H_2O$$

$$Mn_2(So_4)_3 + 3KI \rightleftharpoons MnSo_4 + k_2So_4 + I_2 \uparrow$$

$$2Na_2S_2O_3 + I_2 \rightleftharpoons Na_2S_4O_6 + 2\,Nal$$

Reagents :

1.) Alkaline potassium iodide(KI)

2.) Manganese sulphate(MnSO4)

3.) 0.025 N Sodium thiosulphate(Na2S2O3)

4.) Concentrated H2SO4

5.)Starch solution (1%)

- Remove the cap of the bottle. Slowly lower the bottle into the water, pointing downstream until the lower lip of the opening is submerged.
- Allow the water to fill the bottle gradually.
- Slowly turn the bottle upright and fill completely.

Procedure:

(A) Qualitative estimation-

1.) Water sample is to be collected in an narrow mouthed 100 ml BOD bottle, preferably in the early morning.
2.) Sample bottle should be closed by a stopper and brought to the laboratory immediately for analysis.
3.) Remove the stopper carefully and 1 ml of Manganese sulphate and 1 ml of alkaline potassium iodide reagent by pipette.(if the sample volume is more than 250 ml add 2 ml of each reagents).
4.) Allow 1 minute for precipitation.
5.) Place the stopper in the mouth of sampling bottle and invert the bottle for 2 to 3 times for a thorough mixing of reagents.
6.) A precipitate will form which settle at the bottom of the bottle.
7.) A whitish precipitation indicates a little amount of O2; a light brown precipitation indicates lower amount of dissolved O2 while a deep or reddish brown precipitation means a moderate to high O2 content.

(B)Quantitative estimation

1.)1 ml of concentrated H_2SO_4 is added (2 ml for a sample volume over 250 ml)
2.) The sample bottle is shaken well to dissolve the precipitation.
3.) Transfer 50 ml of the sample to a conical flask and place it against a white back ground (e.g. a filter paper).
4.)Add 2 to 3 drops of 1% starch solution, a blue colour appears.
5.) Titrate the solution with 0.025 N sodium thiosulphate solution, drop by drop till the blue colour disappears.
6.)Repeat the process three times.

Precautions:

1. Care should be taken to avoid exposure of sample to air while collecting the sample.
2. The sample should not be agitated before fixation.
3. The surface of the sample exposed to air during titration should be kept as small as possible.
4. The sample should be agitated during titration.
5. Starch solution (indicator) and N/44 $Na_2S_2O_3$ should be freshly prepared.

Significance of dissolved O2 concentration

1. Dissolved O2 concentration is one of the most important parameters of water quality assessment. It reflects the physical and biological process occurring in water.

2. It is the measure of the environment factors affecting aquatic life, and of the capacity of water to receive the organic matter without causing hazard.

3.) Little dissolved O2 value indicates very high organic pollution of water sample.

4. Almost all plants and animals are O2 for respiration. So dissolved O2 value gives an idea of total plant present in water, and also help in evaluation of gross production of water body.

5. Dissolved O2 content also help to find out the BOD (biological oxygen demand) value indicating the pollution status.

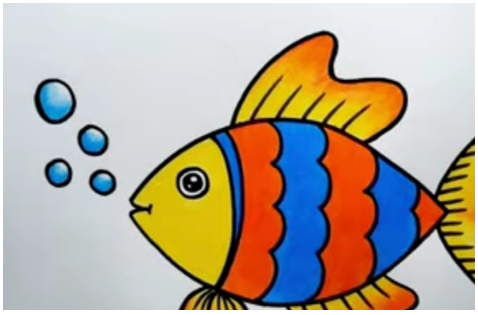
6.) The concentration of O2 will also reflect the process that is occurring weather aerobic or anaerobic Low O2 concentration are usually associated with a heavy concentration of organic matter.

7.) Level of O2 concentration is a limiting factor in distribution of aquatic organism.

8.) Usually dissolved O2 concentration in tropical fresh water condition is 5-7 mg/litre.

Acknowledgement :

I am thankful to my teachers and Dr. Debasis De officer-in-charge of CIBA for giving us this golden opportunity . We spent some quality time and learn increase our knowledge try new things, from some problem to convert as a opportunity it is like a boon it become so fun and had a good experience .Thanking you

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Plankton
Technology to convert fish waste to wealth
CIBA
Breeding and Seed Production of
Mystus gulio in Captivity
Venue : KRC, Kakdwip
13 - 18 May, 2022
Organised by
KRC of ICAR-CIBA
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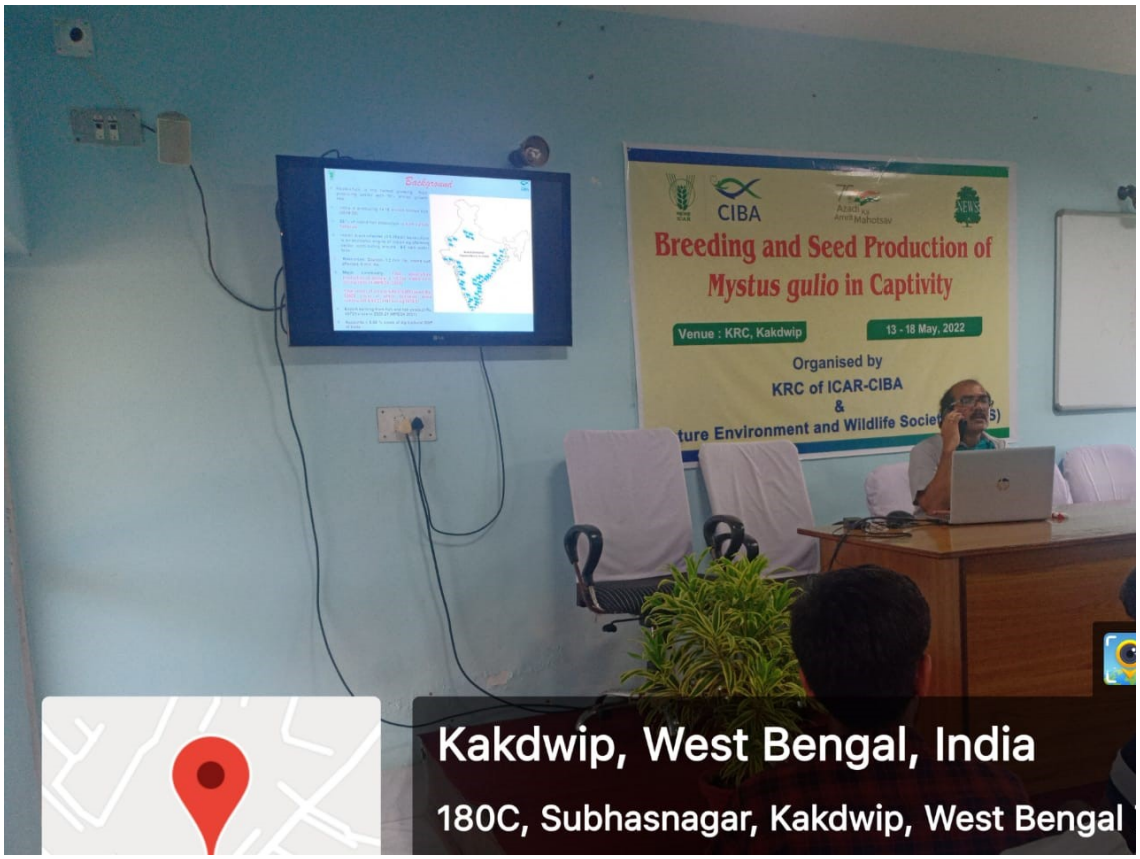
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কেন্দ্রীয় নোনা জলজীব পালন অনুসন্ধান সংস্থা
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