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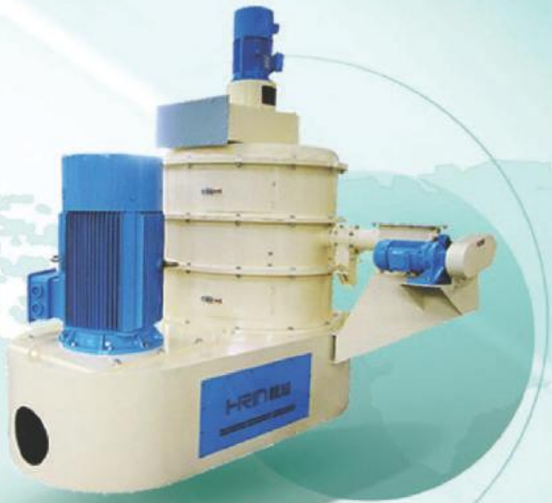
Inside...

US Duty hike unlikely to hit Indian Shrimp Exports: ICRA

Professional Feed Machinery Manufacturer



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M. A. Nazeer

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CONTENTS

ADVERTISERS' INDEX

From the Editor...

M.A. Nazeer

Dear Readers,

The August 2018 issue of ***Aqua International*** is in your hands.

In the News section, you may find news about - In a major effort to increase the domestic fish production in the state, the Central Marine Fisheries Research Institute (CMFRI) will implement a Rs.15 Crore worth project helping fish farmers to launch 500 cage farming units in Kerala.

By blaming fish from AP, local wholesalers and retailers "drastically" increased prices of locally sourced fish, a top office-bearer of the state fish traders' association said on 23 July 2018.

Fish traders and suppliers in Andhra Pradesh have held local politics of Assam, Nagaland and Goa responsible for allegations that fish from the state was contaminated with formalin.

Minister promises action against those using the carcinogen, As many as 11 out of 30 samples of fish species purchased from Chinthadripet and Kasimedu, the two major fish markets in Chennai, on two different days, have tested positive for formalin, a cancer-inducing chemical used illegally to preserve fish. The fish were tested by scientists of the Tamil Nadu Dr. J. Jayalalithaa Fisheries University.

Mr Radha Mohan Singh, Union Minister for Agriculture and Farmers Welfare visited the Mandapam Regional Centre of the ICAR-Central Marine Fisheries Research Institute (CMFRI), Tamil Nadu recently. While interacting with the scientists, he stressed the need for the effective implementation of various technologies developed by the institute time to time. Referring to the concept of increasing marine fish production of the country as well as upgrading the living standards of fishermen, the minister said that government will give major thrust to promote mariculture and sea cage farming activities in India.

"Antibiotics are used in animal husbandry for many decades globally and these are essential for maintaining the health, hygiene and welfare of the animals both in the industrialized and backyard scenarios" Mr B Soundararajan, Chairman, CLFMA of India said.

Recently, concerns were raised on the use of antibiotics in livestock farming globally and also in India.

India was the largest exporter of frozen shrimp to the US in 2017 with 32% share after some south Asian producers like Thailand suffered due to diseases in fish farms. Pavethra Ponniah, vice-president and sector head, ICRA, said: "We do not anticipate any material impact on volume of shrimp exports from India to the US, because of the hike in ADD.

Earlier last month, National Fisheries Development Board (NFDB) celebrated the National Fish Farmer's Day with a two-day fish festival at the YMCA Complex, Beach Road. N John Samuel, Consultant at NFDB, who was managing the fest said, "We got an overwhelming response, at least two tonnes of fish meat were consumed in eight to ten hours.

The US's move to introduce measures to prevent illegal, unreported and unregulated (IUU) fishing and misrepresented seafood from entering the country is likely to help Indian shrimp exports because new regulations will hurt exports from Vietnam, India's main competitor.

In the Articles section, article titled **"Change in colour of fish and its mechanism"** by Himanshu Bhattacharyya, Nilanganakalita,Mukesh Kumar, Imtiaz Ahmed, discussed Fish includes the most brightly colored species, particularly those inhabiting coral reefs and other shallow tropical waters.The pigmented cells that give coloration to the skin of fish and other vertebrates and invertebrates are called 'chromatophores'. Body coloration in many poikilothermic animals, particularly in fish is flexible and can be adjusted at the individual level. Physiological color change is mediated through rapid sympathetic adrenergic nervous regulation and/or slower hormonal control. Melanophore-stimulating hormone (MSH), synthesized in the pars intermedia, increases chromatophore intracellular CAMP levels, triggering chromatosome dispersion on a black background.

Another Article **"Ocean Farming - A secret weapon to Mitigate Global Warming"** by Ezhialrasi.V Angela mercy. A and Bavithra.R, discussed Ramping up of food production without increasing greenhouse gas emissions is vital to survive in the coming decades. Land-based food production is entering an era of crisis. Ocean farming offers immense potential to mitigate climate change. Seaweed and shellfish - Two gifted organisms of Mother Nature to fight against climate change. If ocean farming is carefully conceived it could be a vital part of reversing course and building a greener future. Continued research is needed for different techniques in different contexts to bolster the effectiveness and economic viability of future ocean farming.

Readers are invited to send their views and comments on the news and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of Aquaculture industry. Keep reading the magazine regularly and update yourself. Wish you all fruitful results in your efforts.

M. A. Nazeer
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NRS GROUP

Aqua International

Our Mission

Aqua International will strive to be the reliable source of information to Aquaculture industry in India.

AI will give its opinion and suggest the industry what is needed in the interest of all in the industry.

AI will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

AI will recognize the efforts and contribution of individuals, institutions and organizations for the development of Aquaculture industry in India through annual Awards presentation.

AI will strive to maintain quality and standards at all times.

CMFRI to Increase Fish Production in Kerala

Rs 15 cr project to offer technical support and subsidy for 500 cage farming units in state

Kochi: In a major effort to increase the domestic fish production in the state, the Central Marine Fisheries Research InstiAtute (CMFRI) will implement a Rs 15 cr worth project helping fish farmers to launch 500 cage farming units in Kerala. The farmers will be offered subsidy and technical support to carry out the cage culture under the scheme, which is funded by the National Fisheries Development Board (NFDB), Hyderabad. The programme assumes significance in the wake of discussions on the quality of fishes coming into Kerala from other states.

Harvested Fish (Representative Image)

According to the programme, 40% of the total expense will be given as subsidy to the farmers who can conduct farming individually or in groups. Women and those from the SC/ST category will get 60% subsidy. The programme will be implemented in coastal districts of the state. Species such as sea bass, pearl spot, cobia, pompano and red snapper will be farmed in cages with a size of 4 metre each width and length and 3 metre depth.

The farmers from the coastal districts can register now at the Mariculture Division of CMFRI to become the part of the scheme. The applicants should be capable of carrying out the farming in water resources that are at least three metre depth during low tide. Approval will be given only after the CMFRI team reviewing the spot and various conditions of the water resources for farming including environmental factors.

In addition, three Aqua One Labs will be set up in the state to help farmers for the smooth conduct of the cage farming. The Lab will provide services such as water quality check, sediment analysis, seed transportation, disease management, etc. 50% of the total cost will be given as subsidy to those eligible to set up the Aqua One Labs. Details of the requirements for setting up the Lab are available in the CMFRI website (www.cmfri.org.in). CMFRI will also manage setting up of a small scale fish feed mill by providing subsidy.

The programme is aimed at improving the living standards of those living in the coastal regions of the state, besides ensuring the availability of quality and fresh fish across the state.

Andhra Pradesh fish traders blame 'local politics' for ban on supply from state

On 23 July 2018, the Meghalaya government issued a 14-day ban on sale of fish supplied from outside the state after some samples tested positive for formalin, PTI reported. (Express Photo by Karma Sonam Bhutia/File)

By blaming fish from AP, local wholesalers and retailers "drastically" increased prices of locally sourced fish, a top office-bearer of the state fish traders' association said on 23 July 2018.

Fish traders and suppliers in Andhra Pradesh have held local politics of Assam, Nagaland and Goa responsible for allegations that fish from the state was contaminated with formalin.

"In Assam, the cost of locally cultured rohu and catla has gone up from Rs 150 per kg to Rs 600-800 after the Assam government imposed a 10-day ban (on fish from AP)," U Krishna Prasad, president, AP Fish Traders and Packers Association, said. "Aquaculture has started in Assam also but locals are not getting good price because the quality of AP fish is better and has high demand. Due to local politics, they started rumours about poison in AP fish to stop import, so that local fish farmers benefit from increased prices."

On Monday, the Meghalaya government issued a 14-day ban on sale of fish supplied from outside the state after some samples tested positive for formalin, PTI reported.

In an effort to reassure

Formalin is a colourless solution of formaldehyde in water, used chiefly as a preservative for biological specimens.

governments of North-eastern states that formalin is not used in AP, and to help the officials there to test fish arriving from AP, the state Fisheries Department has procured dozens of kits — known as CIFTest-Rapid Detection Kits — developed by Central Institute of Fisheries Technologies, Kochi, and supplied them to inspectors there.

he AP association has thrown a challenge for anyone to prove presence of formalin in any fish container from AP that is opened in their presence.

Krishna Prasad said, "All fish-packing units in AP use very advanced packing and sealing technology. The fish packed in ice in insulated containers remain fresh for up to 10 days. We don't have to use any preservatives. All these claims of formalin in AP fish are false. They are painting the entire aquaculture industry with one brush and mixing both freshwater and sea fish samples."

Several traders from AP accompanied a multi-disciplinary team comprising veterinaries, fisheries officers, and food safety standards officials from AP on a visit last week to West Bengal, Assam, Nagaland, Meghalaya and Goa and inspected fish consignments arriving from the state.

CMFRI organises skill development programme on open sea cage culture

Tuticorin Research Centre of the ICAR-Central Marine Fisheries Research Institute (CMFRI) conducted a three-day training programme recently on open sea cage culture and mariculture. The training, which was the second phase training under the skill development programme funded by the National Fisheries Development Board (NFDB), was attended by 50 selected fishers from Thoothukudi district.

Ms BalaSaraswathi, Assistant Director, State Fisheries Department, Thoothukudi District inaugurated the programme. She appreciated the efforts of ICAR-CMFRI and NFDB for promoting open sea cage culture and mariculture activities in the district.

Ms Bala Saraswathi, Assistant Director, State Fisheries Department, Thoothukudi District, Tamil Nadu releasing training notes

Dr P. P. Manojkumar, Principal Scientist & Scientist-in-charge, Tuticorin Research Centre, ICAR-CMFRI, welcomed the gathering and Dr I. Jagadis, Principal Scientist, briefed about the training programme. Training materials and training notes (in Tamil) were released by Ms BalaSaraswathi. The Officials from State Fisheries Department, staff of ICAR-CMFRI, and sea cage farmers attended the programme.

During the technical session, Dr I. Jagadis, Principal Scientist, Shri. C. Kalidas, Scientist, Dr L. Ranjith, DrP.Rameshkumar, Scientist, Mandapam RC of ICAR-CMFRI, Smt. M. Kavitha, Scientist, Shri. D. LingaPrabu, Scientist, Mr M. Saravanan, Technical manager, RGCA, Sirkazhi, and Mr K. Vijayapandiyan, District Development Manager, NABARD, delivered lectures on various topics related to mariculture and open sea cage farming.

The programme also included field visit to model sea cage farm in Sippikulam andpractical demonstration

Group photos of the participants and trainers

ofsite selection for sea cage farming, GI cage fabrication, cage culture of sea bass, lobster, pearl oysters and seaweeds, etc.

The training programme was co-ordinated by C. Kalidas, Dr L. Ranjith, and D.LingaPrabu. In the valedictory session, Shri. Amal Xavier, Joint Director of Fisheries (Regional), State Fisheries Department, Thoothukudi District gave away the certificates to the participants.

Fish samples in Chennai test positive for formalin

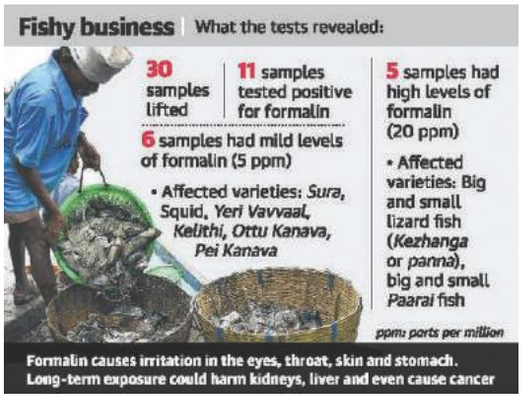
Minister promises action against those using carcinogen

As many as 11 out of 30 samples of fish species purchased from Chinthadripet and Kasimedu, the two major fish markets in Chennai, on two different days, have tested positive for formalin, a cancer-inducing chemical used illegally to preserve fish.

The fish were tested by scientists of the Tamil Nadu Dr J. Jayalalithaa Fisheries University exclusively for The Hindu.

A low-cost formalin detection kit developed by researchers of the State-run university was used to test the samples purchased by The Hindu for ascertaining if they contained the carcinogen that is used widely as a preservative and disinfectant.

The tests were conducted



on July 4 and July 8, the days when the fish were purchased.

Only one of 13 samples of fish purchased last Wednesday from the Chinthadripet, Velachery and Neelankarai markets tested positive at the university's referral laboratory in Madhavaram.

However on Sunday as many as 10 of the 17 fish samples purchased from Chinthadripet and Kasimedu markets tested positive for the carcinogen, causing alarm.

Formalin causes irritation in the eyes, throat, skin and stomach. In the long run continued exposure causes harm to the kidneys, liver and can even cause cancers.

This is the first time samples of fish in Tamil Nadu have tested positive for formalin.

Food Safety and Standards Authority of India (FSSAI) officials have been undertaking tests at fish markets and harbours across the State to test for formalin following a scare in neighbouring Kerala that fish sourced from here were chemically contaminated.

Fisheries Minister D. Jayakumar said use of formalin as a preservative cannot be allowed at any cost. He said tests had been conducted in Thoothukudi and other places based on information received by the department but none of those samples had any formalin.

Samples to be lifted

"Since The Hindu has brought the [Chennai] test results to our notice, we will lift samples [from fish markets] and conduct tests. We will not hesitate to take strict action against those indulging in such acts," Mr Jayakumar said.

Both big and small lizard fish or panna or kezhanga and paarai (Malabar trevally) were found to have formalin content of above 20 ppm (parts per million). Other varieties such as sura, octopus, eri vavvaal, ottu kanava, peikanava and kelithi had formalin of around 5 ppm.

For the test, a two gram piece of meat from the fish was taken and put inside four ml of diluent and shaken so that the formalin will get into it. Then this diluent was poured into the bottle containing the reagent that turned yellow revealing that it had tested positive.

"It is a very sensitive reagent and can detect up to 0.5 milligram per kilo. The actual test takes only 10 minutes," explained Felix, Vice Chancellor of the University.

Fish industry experts said that formalin or formaldehyde is sprayed on the fish or injected into the fish or the fish is dipped into the solution. This helps keep the fish fresh for a longer time. Usually people who buy fish check the gills for freshness, if it is red it denotes freshness, when formalin is used the gills remain red for longer periods. In some cases, fishermen also apply kumkum to retain redness.

Courtesy: The Hindu, July 9, 2018.

Union Agriculture Minister Visits CMFRI

Mr Radha Mohan Singh speaking at the interactive meeting with the scientists at the Mandapam Regional Centre of CMFRI

Mr Radha Mohan Singh, Hon'ble Union Minister for Agriculture and Farmers Welfare visited the Mandapam Regional Centre of the ICAR-Central Marine Fisheries Research Institute (CMFRI), Tamil Nadu recently. While interacting with the scientists, he stressed the need for the effective implementation of various technologies developed by the institute time to time. Referring to the concept of increasing marine fish production of the country as well as upgrading the living standards of fishermen, the minister said that government will give major thrust to promote mariculture and sea cage farming activities in India.

He expressed his willingness to have a coordinated effort to double farmers' income through integrated approach and added that scientists should work hand in hand with the field level beneficiaries to attain the goal.

CMFRI Director Dr A Gopalakrishnan and scientists with the Union Minister

Mr Radha Mohan Singh also felt the need for organizing hands-on-training on marine ornamental fish keeping and rearing to the self-help groups from coastal districts of maritime States.In addition, seaweed farming and Integrated Multi-Trophic Aquaculture (IMTA) which are highly prospective should be popularized, he said.

The minister reviewed the progress of research and development activities being carried out by the CMFRI Centre.Dr A. Gopalakrishnan, Director, ICAR-CMFRI

CMFRI Director Dr A Gopalakrishnan explaining the methods cage fish farming to the Union Minister Mr Radha Mohan Singh at the Mandapam Regional Centre of CMFRI

explained the achievements and progress made by the institute in promoting mariculture as an alternative livelihood option for the fisher-folk. The meeting was also attended byDr J. K. Jena, Deputy Director General (Fisheries Science), ICAR; Ms I. Rani Kumudini, IAS, Chief Executive, NFDB, Hyderabad;Dr Paul Pandian, Fishery Development Commissioner, DAHDF, New Delhi; Mr S. Natarajan, IAS, District Collector, Ramanathapuram and Dr G.S. Sameeran, IAS, Director of Fisheries, Govt. of Tamil Nadu.

The minister also visited various facilities of the Centre viz., marine finfish hatchery complex, national marine brood bank and sea cage farm. During the visit, he had an interaction with the fishermen self help groups involved in sea cage farming and distributed seeds of silver pompanoand cobia for sea cage farming.

Mr Radha Mohan Singh chaired the inter session meeting of the consultative committee of the Agriculture Ministry on Marine Fisheries and Mariculture in India held at Rameshwaram, Tamil Nadu.

CLFMA warns unnecessary scaremongering on antibiotics will impact Indian protein security

MUMBAI : CLFMA of India, the apex association representing India's dynamic livestock sector reiterates the critical role of antibiotics and emphasizes the urgent need for in promoting awareness on judicious use.

"Antibiotics are used in animal husbandry for many decades globally and these are essential for maintaining the health, hygiene and welfare of the animals both in the industrialized and backyard scenarios" B Soundararajan, Chairman, CLFMA of India said.

Recently, concerns were raised on the use of antibiotics in livestock farming globally and also in India.

"WHO describes antibiotics as precious tools for the veterinarians for prevention, control and treatment of diseases in animals and also for promoting growth. When used responsibly and judiciously, antibiotics contribute enormously to produce sufficient quantities of safe, quality, nutritious and affordable food. Hence, there is no need for unnecessary scaremongering tactics used by some with vested interests and ostensible credibility. This is misleading the consumers through unscientific claims and half-truths" Soundararajan stressed.

CLFMA of India, the apex association representing India's dynamic livestock sector reiterates the critical role of antibiotics and emphasizes the urgent need for in promoting awareness on judicious use.

CLFMA regularly participates in the meetings organized by the Government and continues to contributes to the dialogue. With demographic and economic transformation, Indian consumers increasingly seek better health through food. They are getting more demanding and their preferences are evolving much faster than ever before. CLFMA also contributes to the global discussions on the issue of antibiotics as a member of the task force on Antimicrobial Resistance (AMR) under International Feed Industry Federation (IFIF), which works together with organizations including FAO.

He further added "We are working closely with a wide array of stakeholders both nationally and internationally. While genuine concerns about misuse, overuse and subsequently, resistance issues are understandable, several myths, opinions and unfounded claims undermine the critical role of antibiotics in the broader context of food and nutrition security. Further, regulatory and policy decisions now a days, are increasingly getting influenced by public perception. Hence, besides busting myths, sharing correct information about the benefits of using antibiotics promoting awareness are the needs of the hour in India and globally".

CLFMA acknowledges this is not just an issue of usage of antibiotics per se but one that has much larger implications in terms of animal productivity; costs of food production; incomes; profits; and ultimately livelihoods of the farming community. Besides promoting judicious use, suitable and affordable alternatives must be explored. Restricting the ability of veterinarians to control animal diseases

will only result in reduced production and poor food safety and quality.

"Ultimately farmers will bear the brunt due to reduced production and consumers also will get impacted due to increase in food prices. The ultimate economic and social consequences on people's health, nutrition and welfare when the country is experiencing "protein inflation" would be nothing short of a disaster. Hence, it is important to note that at least two hundred million Indians still cannot afford three square meals a day and not to push animal protein beyond their reach" Soundararajan added.

He concluded by saying "It's the time for all those who are concerned about India's food and nutritional security need to stand up and raise a unified voice against these scare-mongering tactics by those with vested interests. Further, policy makers and regulators must put their feet down firmly and decide to take a well-balanced, neutral and science-based view while evaluating any tools, or technologies including antibiotics and not bow down to the unscrupulous forces that have the only objective of disrupting the food industry without any scientific basis. We strongly urge that media must take a morally righteous stand and must verify the facts and truth before publishing any unfounded claims. Finally, scientists, researchers and other industry stakeholders must speak the language of the consumer and take steps to enhance the consumers' understanding of how food is really produced and why they shouldn't believe everything that is projected in media. It is a shared responsibility".

US duty hike unlikely to hit Indian shrimp exports: ICRA

The hike in anti-dumping duty on Indian shrimp exports to US in the final review by the US Department of Commerce (USDoC) is unlikely to have a material impact on Indian exports, says rating agency ICRA.

During the twelfth final review notified recently, the USDoC hiked the weighted-average anti-dumping duty (ADD) imposed on Indian export of shrimp to the US from 0.84% to 1.35%. This, however, is lower than the preliminary rate notified in March 2018 of 2.34%.

India was the largest exporter of frozen shrimp to the US in 2017 with 32% share after some south Asian producers like Thailand suffered due to diseases in fish farms.

Pavethra Ponniah, vice-president and sector head, ICRA, said: "We do not anticipate any material impact on volume of shrimp exports from India to the US, because of the hike in ADD. Given that the Indian shrimp export industry is a price taker, impact of this ADD hike will have to be absorbed across the supply chain, especially by the farmers."

The two mandatory respondents selected for the current review were Devi Fisheries (Devi) and

the Liberty Group and the countrywide ADD is arrived based on the value-weighted-average ADD levied on the two mandatory respondents. Devi and Liberty group together account for approximately 7% of the processed shrimp volumes exported from India during FY2017.

The US government imposed an anti-dumping duty on frozen warm-water Indian shrimps in 2004 saying that it was hurting US shrimp farmers. The Coalition of Gulf Shrimp Industries (COGSI), an association of shrimp farmers, has been fighting aquaculture shrimp imports into US, claiming that artificially low-priced imported shrimp from seven countries including India have suppressed and depressed domestic prices, eroded domestic sales, destroyed US jobs and eliminated the operating margins of domestic producers.

The effect of the anti-dumping duty from 2004 was dramatic on Indian exports. Indian shrimp exporting companies to US fell to less than 75 from 228 at the time of imposition of the punitive duties.

"However, with the global industry witnessing sharp decline in realisations since November 2017, because of demand-supply mismatches, improvement in base price for the Indian shrimp farmers and processors would be critical for ensuring that Indian farmers continue to stock their ponds in the ensuing season. The final review of Vietnam's ADD is also a monitorable as Vietnam competes with India in the global markets; Vietnam preliminary review (notified in March 2018) came in at a staggering high 25.39%," Ponniah added.

ICRA reports that during the period FY14-18, total Indian shrimp exports grew at a CAGR of approximately 20% in terms of volume. This growth was fuelled by the increase in exports to US and Vietnam. The export contribution from Vietnam surged from 16.1% (FY2014) to 25.4% (FY2018) owing to weak local production dynamics in Vietnam, coupled with strong demand. Vietnam continues to be the second largest export destination for Indian shrimp.

Frozen shrimp maintained its position as the key contributor to India's seafood export basket, accounting for 41.10% in quantity and 68.46% of the total dollar earnings from the total exports of 13,77,244 tonnes valued at $7.08 billion.

Fish culture activities got a fillip in India and the trade in fish seed expanded at the end of World War II

Breeders and Growers wish fisheries and aquaculture professionals of the country on the occasion of 'National Fish Farmers day'

Breeders and Growers (a team of Young Entrepreneurs functioning in the Business of Shrimp Farming and Seafood Trade of India based at Mumbai) wish all Fish Farmers, Seafood Professionals, Aquapreneurs, Fish Entrepreneurs, Researchers of the country a Very Happy 'National Fish Farmers Day'.

When the whole country was grappling with food and protein shortage at the end of World War II, fish culture activities got a fillip in India and the trade in fish seed expanded. An important development during that time was the establishment of Central Inland Fisheries Research Institute (CIFRI) at Barrackpore in 1947 by the government of India, where fisheries officers from different states were trained which was known as Inland Fisheries Training Centre and now as CIFE Kolkata Centre. With this establishment, several small ponds around Howrah constituted a network of nurseries that turned to be the centres of supply chain of fry and systematic marketing became possible with the establishment of Fish Seed Syndicate. But the 'Blue Revolution' in India started with the development of seed production technology through induced breeding (Hypophysation) by Prof. Dr. Hiralal Chaudhuri under the guidance of Dr. K.H. Alikunhi as Head at the erstwhile 'Pond Culture Division' of CIFRI at Cuttack, Odisha (presently Central Institute of Freshwater Aquaculture, CIFA, Bhubaneswar) during late fifties. The major carp culture sector owes its present flourishing status to Prof. Chaudhuri, who ushered in the system of 'Induced Breeding of major carps' through administration of carp pituitary extract in the breeding of major carps and also standardised the system.

It was on July 10, 1957, the first success in induced breeding was achieved at Angul in Odisha by Dr. Chaudhuri with the support from Dr. Alikunhi. The spawn that was produced out of this experiment was successfully raised into fry and later into fingerling. This pioneering work over years has led to aqua-explosion in the country principally through quality major carp seed production and supplies to fish farmers for culture from hundreds of hatcheries that sprang in the country based on induced breeding technology. In order to commensurate this day on which such a momentous breakthrough that dramatically transformed the fish cultural sector in India, the Government of India in 2001 declared 10th July as 'National Fish Farmers' Day'. The Central Institute Fisheries Education (CIFE), Mumbai, the premier fisheries education institution in India, was the first to celebrate the Fish Farmers' Day on July 10, 2001. Since then, all fisheries research, education and extension institutes have been observing this historic day with great enthusiasm.

Facts of Fisheries and Aquaculture: India and Globe

- India's Seafood Export touched to US$ 7.08 billion (Rs 45,106.89 crore) for the First Time during Financial Year of 2017-18. This is the New Record in Seafood Export Performance of India.
- Rank of India among Global Seafood Exporters in 2016: 06 (US $5546 million, contributed 3.9 percent to the World Total of Seafood Exports)
- India is on second rank in Global Inland Capture Production in 2016 (14,62,063 Tonnes Production Estimate as per FAO)
- Total global fish production in 2016: 171 million tonne
    1. Share of that from marine capture fisheries: 79.3 million tonnes
    2. From freshwater capture fisheries: 11.6 million tonnes
    3. From aquaculture: 80 million tonnes
- Amount of production consumed by humans as food globally (2016): 151.2 million tonnes
- Amount of production lost to spoilage a/o thrown away after landing and prior to consumption: 27 percent of all landings (2016)
- First-sale value of all fisheries and aquaculture production in 2016: US $362 billion
    4. Share of that from aquaculture: US $232 billion
- Number of people employed in fisheries and aquaculture (2016): 59.6 million
    1. Percentage of those who are women: 14 percent
    2. Region with the most fishers and fish farmers: Asia (85

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- *Helps remove toxins*
- *Controls ammonia levels*
- *Improves shrimp health with essential nutrients*
- *Boosts pond's natural productivity*

percent of the total)

- Number of fishing vessels on the planet (2016): 4.6 million
  1. Largest fleet by region: Asia (3.3 million vessels, or 75 percent of the global fleet)
- Percent of global fish production that enters international trade (2016): 35 percent
- Value of fish production exports (2016): US $143 billion
- Net export revenues for developing countries (US $37 billion) exceeds revenues from their exports of meat, tobacco, rice and sugar combined (2016)
- World's largest fish producer and exporter (2016): China
- World's largest consumer market of fish and fish products (2016): 1. The European Union. 2. The United States 3. Japan
- Most unsustainable fisheries (2016): Mediterranean and Black Sea (62.2 percent overfished stocks), the Southeast Pacific (61.5 percent), Southwest Atlantic (58.8 percent)
- Most sustainable fisheries (2016): Eastern Central, Western Central, NE, NW and Southwest Pacific (all <17 percent of overfished stocks)
- In per capita terms, Food Fish Consumption globally stands at 20.2 kg in 2015 and preliminary estimates for 2016 and 2017 point to further growth to about 20.3 and 20.5 kg respectively.
- In 2015, fish accounted for about 17 percent of an animal protein consumed by global population.
- Fish provided about 3.2 billion people with almost 20 percent of their average per capita intake of animal protein.
- The highest per capita fish consumption, over 50 kg, is found in several small island developing states (SIDS) particularly in Oceania.
- Fish on Rank 1 in Global Marine Capture Fish Production in 2016: Alaska pollock (34,76,149 tonnes) (where as Anchoveta and Skipjack Tuna were in 2nd and 3rd rank respectively).
- Major Species in World Aquaculture Production Wise (Finfish)(2016)
  1. Grass carp (Ctenopharyngodon idellus) (11 percent contribution to the Finfish Total)
  2. Silver carp (Hypopthalmichthys molitrix) (10 percent contribution to the Finfish Total)
  3. Common carp (Cyprinus carpio) (08 percent contribution to the Finfish Total)
  4. Nile tilapia (Oreochromis niloticus) (08 percent contribution to the Finfish Total)
  5. Bighead carp (Hypopthalmichthys nobilis) (07 percent contribution to the Finfish Total)
- Major Species in World Aquaculture Production Wise (Crustaceans)(2016): Whiteleg shrimp (Penaeus vannamei) (53 percent contribution to the Crustaceans Total)

Venkataramana joins Hi-Tech Pharma Group

V. Venkataramana, Senior General Manager, Hi-Tech Pharma

Hyderabad: Mr V. Venkataramana, first batch Poultry Science Graduate from Lal Bahadur College, Warangal served A.P. State Meat & Poultry Development Corporation, VSN - Balaji Hatcheries Group, Suguna Foods Group and S R Group for the last 37 years in different capacities. He did his M.B.A. through IGNOU, New Delhi.

Venkataramana joined as Senior General Manager, his earlier colleague Mr N.V. Ramana Reddy, Managing Director, Hi-Tech Pharma Group to assist in expanding Hi-Tech Pharma Group activities to greater heights. Hi-Tech Pharma manufactures healthcare products for poultry, aquaculture and other veterinary sectors with sales network in different parts of the country.

Technological Support and Launch of Table Top Fish Descaling Machine at Sea Food Delivery and Retail Outlet by CIFT

ICAR-Central Institute of Fisheries Technology, Cochin has developed a motor operated table top fish descaling machine (5 kg capacity) for easy removal of scales. This machine can remove scales from almost all species/sizes of fishes ranging from marine

Dr Ravishankar C.N, Director, ICAR-CIFT inaugurating the sea food delivery and retail outlet

to freshwater species like Sardine, Tilapia, Rohu etc. The body of machine is made up of stainless steel (SS) square tube and the rotating drum is fabricated with food grade steel (SS 304). It has a the 0.5 hp AC motor with proper belt reduction mechanism to achieve required drum speed of 20-30 rpm. The total cost of the descaling machine is about Rs 35,000/- excluding GST which is affordable for small scale and retail fish processors/ sellers/vendors. The table top descaling machine was launched by ICAR-CIFT at the sea food delivery and retail outlet, The Town Harbour, Madom Junction, Edapally, Cochin on 11 June, 2018. In addition, ICAR-CIFT provided technological support for sea food processing and packaging. The sea food delivery and retail outlet was formally inaugurated by Dr Ravishankar C.N, Director, in presence of Dr George Ninan, I/c ABI, ICAR-CIFT and other staff members of ICAR-CIFT, Cochin.

Breeding innovations hold key to shrimp farming's future

One needs only to mention erratic shrimp prices, disease outbreaks and supply shortage and it becomes clear that the shrimp-farming sector is in dire shape.

Global Aquaculture Alliance (GAA) President George Chamberlain believes the future of shrimp aquaculture lies primarily in breeding innovations.

"I want to make the case with you that there's nothing we can do in any aspect of aquaculture that has the cumulative benefit year after year as breeding. I would say it is the primary driver of improvement," he told the audience at Aquavision 2018 in Norway.

Shrimp diseases such as early mortality syndrome and Enterocytozoon hepatopenaei (EHP) "slowed down the industry's growth to a crawl," he said, and impact prices. "Shrimp prices are very volatile due to high prices when there's a disease outbreak and a shortage in supply, and a plunge in prices when there's a recovery."

Chamberlain said breeding innovations would be key to addressing the industry's challenges.

A shrimp farmer in China. Innovations in breeding would be key to addressing the industry's challenges, believes GAA president George Chamberlain

"In breeding it's reasonable to expect a 10-percent improvement every generation. If you're a feed supplier for example, you would be lucky to get a 2-percent improvement each year and can't probably do it every year. I would say that's true in every aspect of the value chain, such as processing, hatchery etc. So breeding is super important."

Breeding today is focused on "agronomic traits," characteristics that farmers want, he added. These include traits for growth, resistance to multiple pathogens, reproductive performance and soy tolerance, to name a few. "In the case of shrimp, vaccines don't work per se since they don't have an antigen antibody system, so genetic resistance is an incredible tool. The Ecuadorians have certainly demonstrated that," Chamberlain said.

CIFT Refrigeration Enabled Mobile Fish Vending Kiosk to Aid in Backwater Tourism

Fish vending kiosk on display

A unit of the refrigeration enabled fish vending kiosk developed by ICAR-CIFT was launched at M/s Paradise Resorts, Kumarakom recently. The kiosk is first of its kind as it is intended for the tourists in houseboats. The fresh backwater fishes will be displayed in the kiosk, with the provisions for real-time cutting, cleaning and cooking operations. The inauguration of the unit was done by Dr C.N. Ravishankar, Director, ICAR-CIFT in presence of representatives of Kumarakom Grama Panchayath and hotel management. In his brief, Dr Ravishankar emphasized on the potential of fisheries sector and its impact on health and livelihood of people. Dr Manoj P. Samuel, Principal Scientist and Head, Division of Engineering, ICAR-CIFT, explained the working of the refrigeration enabled mobile fish vending kiosk and its benefits to fisher folks and entrepreneurs. He also briefed on the activities of ICAR-CIFT in general and its association with public.

The mobile refrigeration enabled fish vending kiosk was developed by ICAR-CIFT to improve the unhygienic handling and marketing practices of fresh fish. The special feature of the kiosk is its fish storage cum display

facility and a well-insulated refrigeration system. In this unit, a consumer can see the fishes directly through transparent cover and select according to their choice of purchase. Under ideal operating conditions, the unit can extend the shelf life of fish for 4 to 5 days and increase marginal benefit to fish vendors.

Have your fillet!

Where is my fish ? People wait for their fish fillet and fried prawns

Earlier last month, National Fisheries Development Board (NFDB) celebrated the National Fish Farmer's Day with a two-day fish festival at the YMCA Complex, Beach Road. N John Samuel, Consultant at NFDB, who was managing the fest said, "We got an overwhelming response, at least two tonnes of fish meat were consumed in eight to ten hours."

People thronged the stalls and each one had a lingering fear that the stock might run out before their turn. There were five stalls set up by the local cooperative societies, local restaurants and Bengal's State Fisheries Development Corporation.

All the stalls were equally popular, with the highlights being fillet fish, fish fry and fish biryani. Fish enthusiasts of the city came with their family for a feast. Ram Bahadur, a former marine officer said, "People used to prefer sea fish because freshwater fish maybe genetically modified. But even the sea isn't safe from pollution. As a result, people have started looking into aquaculture."

Apart from the food festival that was hosted to promote freshwater fishes, there was also an exhibition which displayed processed consumables and other value-addition products.

Vietnam's loss is India's gain as US regulates illegal shrimp imports

The US's move to introduce measures to prevent illegal, unreported and unregulated (IUU) fishing and misrepresented seafood from entering the country is likely to help Indian shrimp exports because new regulations will hurt exports from Vietnam, India's main competitor.

The key market for global seafood producers, the US, has introduced the Seafood Import Monitoring Programme (SIMP), covering 13 species, including shrimp.

SIMP becomes applicable for shrimp on December 31 this year. The programme mandates additional data requirements to trace the supply chain of seafood from the point of harvest to the point of entry into the US.

For the period ended March 2018, 2,433 aquaculture farms totalling 12,509 hectares of farmed area in India were registered under the Coastal Aquaculture Authority (CAA).

"Most of Indian shrimp exports to the US and EU are from registered farms; however, shrimp exports to Vietnam (for forward shipping to America after value addition) come both from registered and unregistered farms and thereby hampers Vietnam's re-export prospects to the US (owing to the lack of traceability). This is expected to support a shift in shrimp exports from Vietnam to India," said Pavethra Ponniah, vice-president and sector head, ICRA Ltd.

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Change in colour of fish and its mechanism

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INTRODUCTION:

The skin or integument in fish is the outer layer which has unique qualities such as a diversity of colors due to 'chromatophores', which is pigmented cells and serves vital roles in the survival of species. Fish includes the most brightly colored species, particularly those inhabiting coral reefs and other shallow tropical waters. Often, there is countershading in which a dark upper surface provides camouflage when viewed from above; a pale lower surface blending with bright surface water (Burton, D., 2011).Animals such as fish, cephalopods, amphibians and reptiles can change their body colour which having criticalroles such as photoprotection, thermoregulation, social signaling and predator avoidance (Sugimoto, 2002; Stuart-Fox and Moussalli, 2009; Leclercq et al., 2010). Fish can alter their skin coloration to become cryptic against the visual background which is one way to avoid predators (Ruxton et al., 2004). Common examples include the rapid and active background matching of octopuses (Hanlon, 2007; Hanlon et al, 2009).

Fish able to change color in response to different types of stimuli. Some species such as European minnow, Phoxinusphoxinus, and flatfish (order Pleuronectidae) inhabiting shallow clear water can change color rapidly on different backgrounds. Photo-cycle illumination periodicity may also induce change in coloration of various species, e.g., brightly colored neon tetra (Paracheirodoninnesi) and regal tang fish (Paracanthurushepatus)skin colourdim at night. During breeding, Atlantic salmon (Salmo salar), Pacific salmon (Oncorhynchussp.), and stickleback (Gasterosteussp.) display gender-related nuptial color change. Stress is another factor that inducescolor change in various species (Burton, D., 2011).The colouration of fish skin is a unique feature which has long been of interest to biologists. Social connection of fish are usually dependent on skin colour, which is commonly used as a means towards predator evasion (camouflage, bartesian mimicry and palatability signal), prey capture (camouflage, aggressive mimicry) and conspecific communication (mating and agonistic signalling, shoaling preferences) (Cheney et al. 2008; Mills and Patterson 2009).

Skincolors can be pigmentary or structural, or a combination of both, resulting in the huge intraspecific and interspecific range of hues and patterns. Pigmentary colors are due to selective absorption of specific wavelengths of incident light by pigments contained within organelles. Structural coloration is associated with the physical nature of intracellular and extracellular surfaces that are reflective and cause interference or scattering of light. Iridescence depends on reflected wavelength phase shifts and phase interactions, perceived colors changing with the angle of viewing; in contrast, scattering involves shorter wavelengths and is caused by very small particles, producing colors which are not influenced by the angle of viewing(Burton, D., 2011).

Highlight Points

- **Fish includes the most brightly colored species, particularly those inhabiting coral reefs and other shallow tropical waters.**
- **The pigmented cells that give coloration to the skin of fish and other vertebrates and invertebrates are called 'chromatophores'.**
- **Body coloration in many poikilothermic animals, particularly in fish is flexible and can be adjusted at the individual level.**
- **Physiological color change is mediated through rapid sympathetic adrenergic nervous regulation and/or slower hormonal control.**
- **Melanophore-stimulating hormone (MSH), synthesized in the pars intermedia, increases chromatophore intracellular CAMP levels, triggering chromatosome dispersion on a black background.**

CHROMATOPHORES:

The pigmented cells that give coloration to the skin of fish and other vertebrates and invertebrates are called 'chromatophores'. Therefore, chromatophores can be subdivided into those that absorb light (pigmentary) and those that reflect light (structural), and then further subdivided according to the pigment they contain.

Nature	Chromato-phore	Pigment	Colour
Light ab-sorb-ing	Melanophore	Melanins	Black, brown
	Xanthophore	Carotenoids	Yellow, orange
	Erythrophore	Pteridines, Carotenoids	Red, orange, yellow
	Cyanophore	Pteridines	Blue
Light reflect-ing	Leukophore	Purine, uric acid	Whitish
	Iridophore	Purine platelets	Iridescent

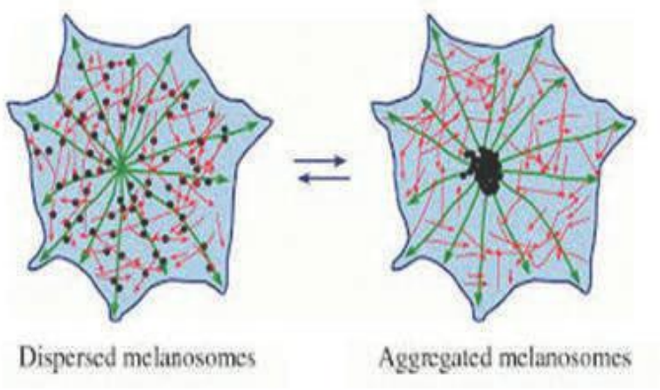
Evidence of colour change in fishes:

Body coloration in many poikilothermic animals, particularly in fish is flexible and can be adjusted at the individual level. A significant experiment on guppies found that color patterns often develop as adaptations to environmental surroundings, in which it frequently resulted in obscure coloration (Endler, 1980). There are many advantages of colour change in fishbecause it allows rapid adjustments and flexibility at the individual level depending on the situation. It is used for background matching (Kelman et al., 2006) as well as for communication and sexual display (Skold et al., 2008). Studies on pipefish have shown that the color ornaments of the females are shut off if a predator enters the mating area, clearly indicating the advantage of an adjustable body

appearance and the risk of a colourful display (Fuller and Berglund, 1996). In cichlids of the species Astronotusocellatus, males defeated in combat become black with white barring, which signals suppression (Beeching, 1995).

Mechanism of colour change in fish:

Color change in fish chromatophores results from moving the pigment within a cell that stays in the same shape and size as well as in changes in angles of light reflecting crystals in iridophores and leucophores. Temporary color change is caused by changes in the number of chromatophores in the skin (Sugimoto, 2002), patterns can be modified within minutes by reflective changes in iridophores and through aggregation or dispersion of the pigment-containing organelles inside the chromatophores (Burton, 2002; Sköld et al., 2002; Mähtiger et al., 2003). Such temporal pigment dispersal increases body pigmentation while pigment aggregation results in less body pigmentation (Svensson



et al., 2005). Reduction in black body pigmentation due to melanophore pigment aggregation commonly also results in greater skin transparency (Fujii and Oshima, 1994).

Varieties of color change found in fish:

Colour change mechanisms are usually divided into physiological and morphological types (Bagnara& Hadley, 1973). Physiological colour change involves the movement of existing pigment within chromatophores (pigment cells) or muscular movement of pigment cells and can occur over very short time periods. Morphological colour change, on the other hand, involves synthesis or degradation of pigments and therefore takes place over a relatively longer time period.

MORPHOLOGICAL COLOUR CHANGE:

In poikilothermal vertebrates, long-term adaptation to an illuminated white or black background usually leads to the morphological color change that consists of an increase or a decrease in the number of pigmentary inclusions in the chromatophores (Parker, 1948;Bagnara and Hadley, 1973). Morphological colour changes are defined as occurring from deviations in skin pigment concentrations and in the morphology, density and distribution of chromatophores in the three-dimensional organization of the integument (Chavin 1969). Such colour changes are comparatively slow, occurring within days and weeks, with a more fundamental and long-lasting impact on external coloration. Usually, such morphological changes are considered to be preceded by prolonged physiological color changes. The adaptation of animals to a white or a black background soon results in the aggregation or the dispersion, respectively, of dark pigmentary inclusions (melanosomes) in the melanophores and, thereafter, a decrease or increase in the amount of pigment takes place.

TYPES OF MORPHOLOGICAL COLOUR CHANGES:

a. Ultimate morphological colour changes:

It is defined as colour changes takes place during the transition between two life-stages phenotypically adapted to their natural environment such as the larvae/juvenile, juvenile/adult, immature/nuptial metamorphosis. For instance in salmonids, the parr/smolt and immature/nuptial adult transformations are characteristic ultimate morphological colour changes associated with diadromous migration and share strong resemblance between species of this family regardless of individual environments. A few examples are European eel, American eel (Anguilla rostrata, Anguillidae) and Japanese eel (Anguilla japonica, Anguillidae), which have a silvery-white belly and a dark back when sexually mature compared with the yellowish-white belly and dorsal green–brown shades when immature (Pankhurst and Lythgoe 1982).

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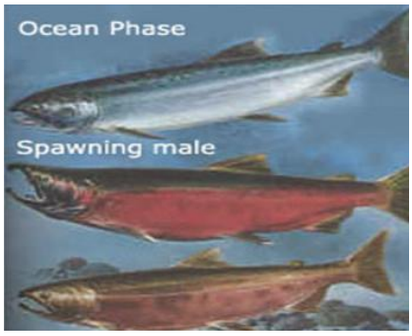


b. Proximate morphological colour changes:

It is defined as the morphological variations of a given life-stage skin colour in response to occurring variations in biotic and abiotic environmental factors. This adaptative mechanism allows adjustment of the skin colour of an organism developmental- stage in the face of varying environmental conditions in its ecological niche. In addition, each of these life-stages could undergo proximate morphological colour changes in response to occurring alteration e.g. nutrition and surrounding light conditions.Nutrition influence the skin pigmentation in fish. In many species visibly accumulating carotenoid compounds in the integument, expression of the wild-type phenotype can be impaired when fed an artificial diet. UV radiations have damaging properties on many biological molecules such as DNA and proteins (Zagarese and Williamson 2001). Whitefish larvae (Coregonuslavaretus, and Coregonusalbula, Salmonidae) were shown to increase skin melanin concentrations when exposed to artificially high UV-B radiation from 2 weeks post-hatching. Background adaptation is extensively studied mechanism of proximate morphological colour change and is a frequent phenomenon in teleost species as reviewed by Sugimoto (2002). When brook trout exposed to a light background, their carotenoid pigment mobilized from the skin to the flesh, a process reversed following return to their original dark background (Peterson et al. 1966).Social interactions and intra-specific communication is also a major factor that influences colour changes in teleosts. Male Haplochromisburtoni changing from being non-territorial to territorial grow brighter colours while the opposite is observed when returning to a non-territorial condition (Korzan et al. 2008).

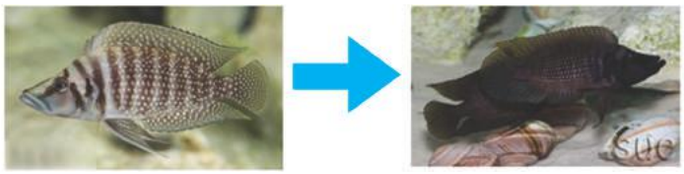
PHYSIOLOGICAL COLOUR CHANGE

The rapid spectacular changes of animal coloration are due to changes in the state of integumentary chromatophores. This rapid change is called physiological color change and refers to synchronous movement of pigment organelles within pigmented cells in the skin called chromatophores as well as in changes in angles of light reflecting crystals in iridophores and leucophores (Fujii and Oshima, 1994; Fujii, 2000; Aspengren et al., 2009). Physiological color changes occur in a matter of minutes or hours. As pigment granules migrate, the animal assumes the general coloration of the integumentary cells. Some physiological changes in color are slow, predictable and rhythmic. Others are rapid and may provide the animal with a new integumental color in a matter of minutes. These rapid changes in color appear to have several adaptive functions. Rapid chromatophore-mediated color changes are important in background matching where they serve to camouflage the animal from predators.

The external coloration of teleosts encompasses a variety of interests, which reflects their own diversity and plasticity. The 'eye-bar' of territorial male Haplochromisburtoni(Cichlidae) suddenly disappears when beaten by a rival and is soon followed by prompt retreat (Muske and Fernald 1987). Within a day on a white background, Australian snapper (Pagrusauratus, Sparidae) (Doolan et al. 2009) becomes light coloured and commercially more valuable. Red sea bream (Pagrus major, Sparidae) cultured under direct sun-light produces more melanin, i.e. suntans, and loses its market value (Adachi et al. 2005). In a few months, brownish Atlantic salmon (Salmo salar, Salmonidae) parrbecomes a shiny silvery smolt physiologically adapted to open-seawater environment Female guppy (Poeciliareticulata, Poeciliidae) prefers males with more intense skin redness, driving through generations the development of such ornamental features (Grether et al. 2005).

Factors affecting colour change in fish:

In teleosts, physiological color change is mediated through rapid sympathetic adrenergic nervous regulation and/or slower hormonal control. There is considerable interspecific variation in the extent of neural and hormonal regulation of teleost physiological chromatic change. Melanin Stimulating Hormone (MSH) is the master regulator of skin darkness. Adaptive color variants in mammals and higher vertebrates occurred when melanocortin-1 receptor (MC1R) fuses with MSH and (ACTH) Adreno-Cortico Steroid Hormone (Rosenblum et al., 2004). MSH regulates both the morphological and physiological colour change in fishes and



leads to dark coloration of skin (Sugimoto, 2002). MSH play a pivotal role in the distribution of melanin pigment in the skin melanophores in exothermic animals and renders an obscure colour change (Baker et al. 1984).

Melanophore-stimulating hormone (MSH), synthesized in the pars intermedia, increases chromatophore intracellular cAMP levels, triggering chromatosome dispersion on a black background. Darkening is associated with increased plasma MSH and pituitary MSH cell activation. Another hormone, melanin-concentrating hormone (MCH), hypothalamic in origin but stored in the pars nervosa, aggregates melanosomes on a white background by decreasing melanophorecAMPsignaling. Long-term MCH treatment on a black background inhibits melanin increase. MCH also inhibits MSH secretion.

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(More reference can be provide on request.)

AI Awards 2018

Categories of *Aqua International National Awards 2018:*

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3. Best Corporate Shrimp Farmer Award
4. Best Corporate Fish Farmer Award
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11. Best New Initiatives in Aquaculture Award
12. Best Aquaculture Scientist Award
13. Best Shrimp Hatchery Award
14. Best Fish Hatchery Award
15. Best Marketing Man in Aquaculture Award
16. Best Shrimp Hatchery Feed Supplier Award
17. Best Aquaculture Products Promotion Award
18. Best Young Entrepreneur in Aquaculture Award
19. Best Executive with Long Service Award
20. Best Aquaculture Aerator Award
21. Best Aquaculture Equipment Award
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24. Best Aquaculture Healthcare Products Manufacturer Award
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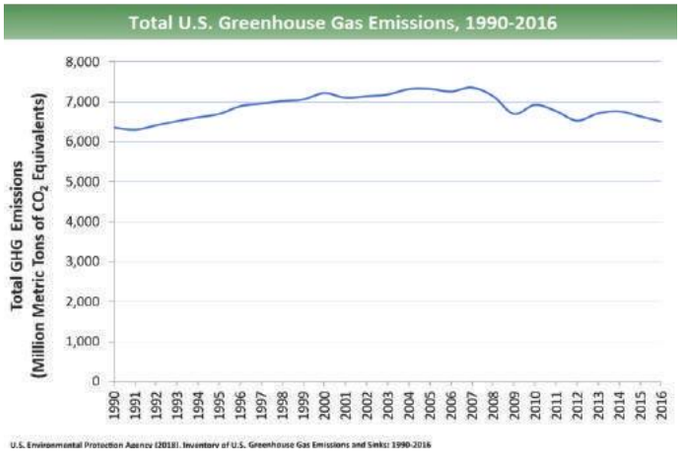
Ocean Farming - A Secret Weapon to Mitigate Global Warming

Ezhialrasi.V Angela mercy. A and Bavithra. R
Tamilnadu Dr. J. Jayalalithaa Fisheries University, Tamil Nadu

The global environment is going through a period of rapid change, the pace of which is unprecedented in our geological history. The life on the planet is being threatened by elevated temperatures and ocean acidification associated with the release of greenhouse gases. The natural greenhouse effect of these gases makes the earth warmer. In spite of the controversies regarding whether the cause of global warming is anthropogenic or natural, climate change has been occurring across the globe with several devastating impacts. Global average temperature increases and carbon dioxide within the ocean begins to reach saturation. The ability of ocean to absorb carbon will alter significantly. At some point in the future the removal of carbon from the ocean may needs some consideration. So, there is a need of the hour calls for development of resilient strategies to adapt and mitigate with climate change impacts. Rather than finishes the anchor crops like seaweeds and shellfishes are considered as a two gifted organisms of Mother Nature to fight climate change.

Global Warming and Green House Gases

Global Warming is the increase of Earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide emissions from burning fossil fuels or from deforestation, which trap heat that would otherwise escape from Earth. This is a type of greenhouse effect. The atmospheric gases primarily responsible for the greenhouse effect are known as "greenhouse gases" and it includes water vapor, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The most prevalent greenhouse gas is CO_2. Fossil fuel combustion is the number one anthropogenic source of carbon dioxide. Methane is the second most common greenhouse gas, but it is much more destructive. The EPA reports that methane has 20 times more impact on climate change over a 100-year period. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluuorinated gases like Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons and halons). These gases are typically emitted in smaller quantities, but they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases.



Carbon Sequestration

It can be defined as the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere or to prevent, carbon emissions produced by human activities from reaching the atmosphere by capturing and diverting them to secure storage.

Seaweed Farming

Seaweed is one of the fastest growing plants in the world. It covers nearly 9% of the world's oceans. Although seaweed communities occupy only a very small area of the coastal region, they are essential because of their biotic components, valuable ecosystem services, and high primary productivity (Mann, 1982). It grows at 30 to 60 times the rate of land-based plants and absorbs five times more carbon dioxide than it are proved to be an excellent bio-remediating agents and are capable of improving water quality by uptake of dissolved metals, ammonia, nitrates and phosphates.

Highlight Points

- **Ramping up of food production without increasing greenhouse gas emissions is vital to survive in the coming decades.**
- **Land-based food production is entering an era of crisis.**
- **Ocean farming offers immense potential to mitigate climate change.**
- **Seaweed and shellfish - Two gifted organisms of Mother Nature to fight against climate change.**
- **If ocean farming is carefully conceived it could be a vital part of reversing course and building a greener future.**
- **Continued research is needed for different techniques in different contexts to bolster the effectiveness and economic viability of future ocean farming.**

As primary producers in the marine ecosystem, seaweeds fix abundant CO2 through photosynthesis. It is estimated quantitatively that seaweeds are also capable of sequestering dissolved CO2 at the rate of 80.5 mg g -1 wet weight day -1. While their rate of emission through respiration is only about 10 mg g -1 wet weight day -1 as majority of brown and green seaweeds are capable of utilizing the respiratory emission of CO2 within the cells for photosynthesis. So it can be more effective for CO2 capture and sequestration from the environment and thereby it help to mitigate global climate change process.

Mass cultivation of seaweeds farming increases, the scope to balance the anthropogenic C emissions shall also increase. By seaweed farming CO2 can be transformed and become more valuable products through photosynthesis as well as it can be an opportunity to enhance the rural livelihoods. The rate of carbon sequestration by seaweeds would be different, influenced by Seaweed species and the environmental conditions where they were cultivated.

Different seaweed variants have different capacity on carbon sequestration.

The annual production rate of Laminaria hyperborea is up to 3 kg Cm-2 (Abdullah and Fredriksen, 2004). Muraoka (2004) reported the algal carbon Capture rates, it is of>3 kg C m-2 year-1. Turan and Neori (2010) documented that nearly 0.7 million tonnes of carbon can be removed from the sea each year within commercially harvested seaweeds. Muraoka (2013) reported that several important genera of seaweed along the coasts of Japan included Laminaria, Ecklonia, Sargassum, Gelidium, and others indicated different carbon sequestration rate: 1156, 562, 346, 103 thousand ton C year -1. Erlania and Radiarta (2015) studied the use of seaweed for carbon sequestration and reported that among 4 species of seaweed (Kappaphycus alvarezii var. Tambalang and Maumere, K. striatum and Eucheuma denticulatum) E. denticulatum had the highest carbon sequestration rate and k. striatum had the lowest. Standing crop of seaweeds in the Indian coastal waters (2,60,876tonnes) comprising 14% agar and carrageenan yielding red seaweeds, 16% algin yielding brown seaweeds and 70% green seaweeds.

Additional Carbon Sequestration Potential from Seaweed

The seaweed grown to mitigate emissions would need to be harvested to ensure that the carbon is not simply recycled back into the air. Conversion of seaweeds into products like bioethanol, biofuel and biochar shall also scale up the carbon sequestration. Since the existing production of seaweed is less than that of the current industrial demand and applications, the option of venturing with seaweed farming as climate resilient strategy shall be in tune with the 'No Regrets' policy. In order to enhance climatic resilience, existing seaweed farming of Indian coastal waters has to be extended to a greater extent with identification of suitable farming zones along the coastal states.

Shell Fish Farming

One method for achieving the removal of carbon from the ocean would be through the ancient practice of shellfish farming. Here, the main focus will be on molluscs rather than shellfish in general (a category that includes lobsters, crabs and other crustaceans) it actually includes filter-feeding marine bivalve molluscs such as mussels, scallops, oysters and clams. The assumption is that if CO2 (or HCO3 or CO3) can be removed from the sea, this will increase the capacity of the sea to absorb CO2 from the atmosphere and will thus help to bring down atmospheric concentrations of CO2.

Hickey (2009) proposed that there is a great increase in oyster farming in order to sequester carbon. He founds that in South Australian current oyster farms, the shells account for an average after subtracting the weight of the meat weight of about 70 grams each. The shell is constructed of calcium carbonate CaCO3. Oysters make relatively Mc Mansion-sized homes for themselves, compared to other shellfish, making them a good contender for carbon sequestration. The main advantage of oyster farming is that unlike other ocean sequestration techniques, the oyster shell permanently removes carbon from the ocean as well as the atmosphere.

Concepts behind Shellfish Sequestration

- The shells of marine molluscs contain calcium carbonate that is derived, directly or indirectly, from CO2 in the sea, the proper disposal of the shells of those molluscs may take that CO2 out of circulation for long periods of time.
- Reducing the concentration of CO2 in the surface layers of the sea will help to reduce the concentration of CO2 in the atmosphere.
- If the proper disposal of shells of marine molluscs is to have a significant impact on concentrations of CO2 within a reasonable time, it will be necessary to increase the quantities of those molluscs by farming them on a much larger scale.
- The shellfish secretes Calcium Carbonate (CaCO3) to form its shell, which means a percentage of its shell, contains Carbon. Because, the shells of shellfishes absorbs Carbon as it grows. It seems likely that molluscs that are growing now in the world's seas are part of the so-called 'biological pump' that removes CO2 from circulation. Those that die in the sea will leave their shells at the bottom where, normally, they will become covered with silt, more shells and other debris so that the CO2 that they contain will be locked up in more-or-less permanent form, in much the same way that CO2 has been sequestered in the past by the build-up of calcareous sediments on the ocean floor that later became chalk and limestone.

Conclusion

Ocean farming is not a modern innovation. It is of thousands of years old culture practice in ancient Egyptians, Romans and China. Today studies has revealed that the ocean farming acts as a powerful carbon sinks and fights against ocean acidification via shellfish and seaweed farming together by filtering nitrogen and phosphorus from the ocean. Hence, there is an urgent need for conservation, protection and diversification of available ocean farming practices to increases the present mitigation rate of global warming.

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(More reference can be provide on request.)

Sodium benzoatein fish preservation – Toxic?

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Introduction

Adulteration in the food items is one of the major concerns in the world. According to the Scientific India Nov, 2015, top 10 food items that are prone to adulteration in India is milk, honey, spices, ice cream, food grains and flour, coffee powder, tomato sauce, tea leaves, vegetable oil and Diwali sweets. One should be happy that fish has not found its place in this list. But, there is a chance that fish may find its spot in the list soon if appropriate measure is not taken. It was reported thatFood and Safety Standards Authority of India (FSSAI) conducted a study in Kozhikode district of Kerala and found that sodium benzoate was used to preserve the fish for longer time. Sodium benzoate is a highly toxic and carcinogenic chemical if it is used beyond the permissible limit.

What is food adulteration?

According to the Food and Safety Standards Authority of India (FSSAI) food adulteration is, "The addition or subtraction of any substance to or from food, so that the natural composition and quality of food substance is affected."Adulteration is either intentional by either removing substances to food or altering the existing natural properties of food knowingly. Unintentional adulteration is usually attributed to ignorance's, carelessness or lack of facilities for maintaining food quality. Incidental contamination during the period of growth, harvesting, storage, processing, transport and distribution of foods are also considered.

What is sodium benzoate?

Sodium benzoate is a synthetic chemical produced when benzoic acid, which is found naturally in some fruits and spices, is combined with sodium hydroxide. Some synonyms for sodium benzoate are: Benzoic acid, sodium salt; Antimol; Benzoansodny; Benzoate of soda; Benzoate sodium; Benzoesaeure (na-salz); Natriumbenzoicum; and Sobenate. Chemical Formula: C_7H_5NaO. US Food and Drug Administration (FDA) and the Canadian Health Protection Branch have pronounced this chemical preservative to be acceptable when consumed in low amounts. In fact, the FDA has granted sodium benzoate GRAS (Generally Recognized as Safe) status, and the so-called safe limit in food is 0.1 percent by weight. In water, the acceptable limit, set by the Environmental Protection Agency, is 5 parts per billion (ppb). But this common food additive, which is found in carbonated sodas, fruit juice products, salad dressings, and fermented foods such as vinegar, wine, and pickles, is not natural nor safe. Sodium benzoate is present at extremely low levels in berries, apples, plums, cinnamon, and several other natural foods. There's nothing scary about the chemical in these items. But when the lab-synthesized sodium benzoate (and its close relative, benzoic acid) are added to foods and to the interior of metal cans that contain beverages or liquid foods, they can have a detrimental effect on health.

Mechanism for food preservation

Sodium benzoate preserves food by having anti-fungal properties, protecting foods from invasion by fungi that cause food to spoil and potentially make you sick. Sodium benzoate works by entering the individual cells in the food and balancing its pH level, increasing the overall acidity of the food. By lowering the intracellular pH of certain foods, sodium benzoate creates an environment in which fungi cannot grow and spread.

Useful in food

Sodium benzoate is primarily added to acidic foods to enhance their flavour. It can be found in foods such as pickles, sauces, jams and fruit juices. Foods that contain vinegar, such as salad dressings, typically contain very high levels of sodium benzoate. Benzene, a precursor to sodium benzoate, can be found in very small amounts naturally in some fruits, vegetables, meats, dairy products and even drinking water.

Sodium benzoate in fish

It is well established fact that fish plays vital role as source of animal protein to millions of people in the world. In addition, fish is an important source of essential vitamins and minerals while also having a low content of saturated fat, carbohydrates and cholesterol.Hence adulteration of any chemical to fish needs to be avoided to safeguard the public health. Food Safety and Standards Authority of India (FSSAI) conducted a study in Kozhikode district of Kerala to find out the presence of Sodium Benzoate and ammonia and found the presence of sodium benzoate in 47 fish samples(Deccan Chronicle, Feb.10, 2017). These chemicals slow down the melting of ice and is used to preserve fish for longer time. The chemicals give a fresh appearance and harden the fish. It was reported that this chemical was used in the fish markets and harbours, where it used to be sprayed or mixed with the fish. Ice factories supplying to fish markets were found to be mixing formalin and sodium benzoate was also being used as a preservative.

Highlight Points

- **Fish is subject to chemical contamination in recent days in India.**
- **Sodium benzoyate is said to be found in fish sample as preservative chemical.**
- **It was found to be sprayed or mixed with the fish in the fish markets and harbours.**
- **Sodium benzoate is a highly toxic and carcinogenic chemical if it is used beyond the permissible limit.**

Side effects

Sodium benzoate, when combined with vitamin C, forms benzene. Benzene is a carcinogen and is known to contribute to the formation of many different types of cancer. It also causes Parkinson disease and other genetic disorder. However, the Food and Drug Administration states that food products that contain

both vitamin C and sodium benzoate express benzene levels that are below the dangerous limit.

Conclusion:

Probably it is difficult to find out the presence of sodium benzoate in fish by sensory evaluation. It can only be tested in laboratory. Recently ICAR - Central Institute of Fisheries Technology (CIFT), Kochi has developed a rapid detection kit to find out the presence of formalin in fish. The kid is very cheap, easy to use and gives the result in two minutes. The same kind of kit should be developed for detecting sodium benzoate in fish. Fishermen and all other stakeholders should be educated and made awareness that fish should not be preserved with toxic chemical such as sodium benzoate and should be preserved only with ice. Stringent rules should be amended to punish the violators.

Pond rearing of *Hilsa ilisha* at Chatterjee Brothers Fish Farm, WB

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Genesis of Chatterjee Brothers fish hatchery

M/s Chatterjee Brothers (Partnership Fish Farm) was established on October 25, 1973 consisting of three partners; Sri Bireswar Chatterjee, Sri Shyama Charan Chatterjee and Sri Tara Charan Chatterjee. It is located at Vill Joypur, Boropukur Area, PS Mogra, Block Chinsurah-Mogra, near Amodghata, Dist. Hooghly and is at a close proximity to Mogra Police Station and NH-2 (GT Road) and 2km from Mogra Railway Station on Howrah-Bardhaman main line. This hatchery/ seed production unit has obtained seed certification and accreditation from Directorate of Fisheries, Government of West Bengal on 5th August 2014.

This farm was established in 1962 by Sri Bibhuti Bhusan Chatterjee, father of the present partners. It was then a nursery-cum-rearing farm and managed with the traditional fish seed production technology. The partners picked up the business and acumen of their father in year 1973. Fish breeding started on a miniature scale at this farm in 1979 from July to September when 0.07 million major carp spawn were produced. In 1980, in collaboration with WB State Fisheries Department, 3.4 million of major carp spawn were produced by hapa breeding process. In 1981, under the technical guidance of State Fishery Department, an eco-hatchery (modified circular carp hatchery on Chinese principle) was constructed in this farm with one spawning pool and one Bangla bundh. For brood fish management and production of spawn, subsidy from the State Government under NABARD III Scheme was received. Another important achievement of this farm that three partners have been able to cover the life risk of spawn, fry and fingerlings of fishes and also cover the loss in transit of the same for the first time in India by the National Insurance Company. Only brood fish insurance was first covered by the United Insurance Company in 1981.

Highlight Points

Chatterjee Brothers fish hatchery is one of the pioneering organization in India dealing with production of quality spawn, fry and fingerlings of Indian major carps, exotic carps, Puntius javanicus and Labeo bata. It is at this place where, in 1981, the first circular carp hatchery was established in a private fish farm in WB. Here performance is purely based on scientific methods. Recently experimental success in breeding and production of fingerlings of Hilsa ilisha could be achieved here in freshwater ponds. Sri Shyama Charan Chatterjee, aged 68, is mainly taking keen interest and initiative in all developmental activities here. He explained the genesis of this farm and artificial propagation activities of H. ilisha to present author on 23/6/2018.

The technology of hypophysation, being new in the country at that time, after a long experimentation for a period of four months, success was obtained in running the hatchery properly on and from 15th August 1981. During April to September 1981, the fish seed farm produced 51.4 million of major carp spawn by bundh breeding and circular hatchery (one spawning pool) breeding process. In 1982, during March to September, the farm produced 209 million major carp spawn in existing hatchery and a double-walled hatchery system as egg incubation chamber. It was a drought-dominated year in WB. During January-March 1983, the partners constructed three reservoirs, two spawning pools, six egg hatching-cum-incubation pools, one Bangla bundh in addition to existing one in the farm. As of year 1984, the farm had got the capacity to produce 1.5 crore of spawn per day during the peak period of fish breeding, i.e., May to July.

During end of February to beginning of October 1984, the farm produced 450 million spawn. In 1985, few batches of fish farmers from different states of India, implemented by Fish Farmers' Development Agency(s), were trained in fish seed production and rearing under programmes sponsored by Government of India. The success of fish seed production continued steadily, rising to production of 562 million spawn during end of February to October 1992, 752 million in 1995 and 595 million in 1998. This successful endeavour has been further improved and the glory/progress has been kept up and sustained with greater success till date. In the end of 1991, items that were purchased and constructed included 3000kg broodfish, 11nos paddle-wheel aerators, a 50KVA Generator set, two 8HP submersible pumps, two mini deep tube wells, one 5 HP motor with pump set. Seven nursery ponds were excavated and four broodfish tanks were desilted in that year.

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Advanced fry of H. ilisha at this farm

Hilsa ilisha 26cm size

Breeding major carps in Bundh

In India, West Bengal and Madhya Pradesh have taken up bundh beeeding of fishes on a commercial scale. Two simple dry bundhs have been established at Chatterjee Brothers fish farm along with their Chinese type spawning and hatching units. These are simple cement structures (cement pond), measuring 75 feet x 25 feet, with a depth ranging from 2 feet at one end to 5 feet at the other. Each bundh has perforated pipes placed across at its two ends, with a big inlet pipe at one end. A layer of sand is put on the bottom before fish breeding. A hump across the middle of the floor prevents the sand in the shallower portion from getting washed in the deeper part. The sand is changed before every breeding. Sri Shyama Charan Chatterjee and technical workers have been able to breed the Indian major carps in these bundhs both with and without pituitary injections. Bundh breeding yields quality spawn as in the case of induced breeding through hypophysation and it is possible to produce a larger quantity of spawn at one time.

This farm is presently maintaining more than 20 tonnes of large-sized brooders of major carps in the latest available technology in the country. It has got an effective water area of 4ha for broodstock maintenance, 5ha for seed nursing and rearing and 2ha for hatchery complex, vegetable crops farm land, night shelter for farmers and trainees, workers' rest home and office. The hatchery system consists of two overhead tanks, spawning/breeding pools, fish collection chambers, incubation-cum-hatching tanks and spawn collection tanks. Except spawn collection tank, all structures are circular and made of brick and cement. Egg incubation tanks have inside diameters ranging from 1.6mt to 5.0mt and water depth of 0.92mt is maintained all through. Water holding capacities of these chambers ranged from 7047lit to 10612lit. Presently there are four broodstock ponds-cum-reservoirs (each 1ha in area), seven nursery ponds (each 25-35 decimal) and four rearing ponds almost similar in size to that of broodstock ponds. There are six big and two small incubation-cum-hatching pools.

Brood fishes inside hapa in spawning pool

Artificial propagation of Hilsa ilisha in early 80s

In West Bengal, different experiments had started from September 1981 to acclimatize the prized fish H. ilisha in captivity by collecting them from rivers with an eye to propagate it so that a pond-reared strain is obtained. This was done here in the pond of Chatterjee Brothers fish farm belonging to the three progressive fish farmers (partners) in collaboration with State Fisheries Freshwater Research Station at Kalyani. Early experiments did not prove much success and most of the fishes died within 20-25 days. In October 1982, the fish could be successfully acclimatized in a newly constructed tank of 200 ft x 40ft. In this tank, a layer of sand was given at the bottom and water was partly filled up from the adjacent river Kunti, a tributary of Hooghly river. Out of 190 H. ilisha liberated, 80 members survived. During April 1983, males were found in oozing condition but there was no gonadal development of the females, probably because of the extreme drought condition prevailing during the last two years.

Author with Sri S. C. Chatterjee

In March 1984, males were found in oozing condition and prominent development in the gonad (ovary) of the females was noticed. It was expected that the fishes will be hypophysed in that year if monsoon is good, in a specially prepared spawning pool fed and filled by naturally-oxygenated river water. Fishes were being fed with diatoms, algae and subsidiary food (rice bran and mustard oil cake). Condition of the fishes was quite healthy, their growth was also good; fishes of size 100-400gm had grown to 300-800gm in a period of 1.5 years. Experiments commenced here during 1981-1982 and terminated during 1984-1985. H. ilisha survived in freshwater ponds here for three consecutive years.

Recent experiments on breeding of H. ilisha

In the first week of March 2018, obtaining inspiration from Dr D. N. Chattopadhyay, Senior Scientist (SS) at ICAR-CIFA Regional Centre at Kalyani, Sri S. C. Chatterjee conducted breeding experiments of H. ilisha in this farm. Brooders as fully ripe and oozing male and female (males 400-500gm, females 1500-1800gm) were collected from river Hooghly and carefully brought to the farm with special arrangement. Milk was added to the water in transportation container so that eyes of the fishes do not come in contact with sunlight and hinder penetration of sunlight into water. Males and females were stripped for milt and ova respectively. In enamel tray, gametes were collected through stripping; the eggs were mixed with the milt immediately and thoroughly to ensure effective fertilization. Ova of H. ilisha, similar to poppy-seeds in size, swell in water to attain the size of eggs of Puntius

sp. In the egg incubation-cum-hatching chambers meant for carps, fertilized eggs of H. ilisha were found to hatch on 13th-14th hour of fertilization.

In second week of March 2018 and in between 110-120th hour of hatching, H. ilisha spawn {5-6mm, cumin seed (Jeera) size} were released into pre-prepared nursery ponds. They fed upon naturally-occurring phytoplankton and commercially-available dust-type feed (Rs 100/- / kg) was provided to the growing stages. On 45th day, it attained 6cm size and as on third week of June 2018, in three months, H. ilisha has attained 10-12cm and are being maintained @ 6000-6500nos./25 decimal water area in rearing ponds for the last two months in this farm. Depth of pond water: 5 feet. Presently 10,000 fingerlings of H. ilisha have been stocked and are being propagated in rearing ponds.

Hilsa ilisha pond at this farm

Sri Chatterjee explained that the fish in sub-adult stage is very calm, sophisticated in nature, move in shoals, will die if touched and hold in palms. Netting should not be done in ponds and the fish must not be stocked with other freshwater fishes. It will die quickly out of water. In nature it breeds during October and in February. He stated that in May 2018, 150 pieces H. ilisha (5-6cm) was sent from Chatterjee Brothers fish farm to farm ponds of ICAR-CIBA at Kakdwip in South 24 Pgs, WB and on the way of transport, only 7 H. ilisha died.

Sri Chatterjee opined that wild-caught H. ilisha can be bred in freshwater farms, fertilized eggs obtained after artificial fertilization can be made to hatch, tender stages can be reared upto fingerlings and further upto table size in farm ponds, but the fish will not attain maturity in confinement. Even if ripe testis develops in the male, development of ripe ovary with matured ova in females is a remote possibility. There is no guarantee that a female H. ilisha will mature in captivity (farm ponds). Such nature/behaviour of H. ilisha is similar to that of other economically-important brackishwater fish Lates calcarifer; which will attain 4-6kg in farm ponds from juvenile stage but will not breed in ponds. The significant feature evident from this fish farm is: Hilsa ilisha of marine water can survive in freshwater ponds. A News on it came out in the Bengali Daily 'Bartaman' on 2nd June 2018. According to Sri Chatterjee, advanced fry or fingerlings of H. ilisha can be catered to progressive fish farmers from here and other farms for stocking in grow-out ponds.

H. ilisha fingerlings received from ICAR-CIFA

To initiate experiments on growth and survivability of H. ilisha in freshwater farm ponds outside research station, in November 2016, Sri Chatterjee obtained early stages of H. ilisha (4-5 inches) from Dr D. N. Chattopadhyay, SS at Kalyani Research Centre of ICAR-CIFA, West Bengal and liberated in his ponds. These fishes, 18-19 months in age as on May-June 2018 and 25-27cm in length (210gm), have grown up to almost table size in this farm, nineteen fishes have survived but has not attained maturity yet. Sri Chatterjee hoped that the fishes may attain maturity by October 2018. Dr Chattopadhyay was kind to provide early stages of H. ilisha to Sri Chatterjee for experimental purpose again in April 2017 (4cm size), May (5-6cm), June (11-12cm) and July 2017 (11-12cm), 62-230 pieces each time. But only less than 50% of the stocked fishes had been found to survive at this fish farm in the last three occasions.

End note

Back in 1984, Dr U. K. Shrivastava and Dr S. Vathsala, Professors at Centre for Management in Agriculture, IIM, Ahmedabad published a Book entitled 'Strategy for development of inland fishery resources in India: Key issues in production and marketing'. In one of the Chapters, they wrote: "Since 1982-1983, Government of West Bengal has introduced portable hatchery on Chinese principle. The Chinese-type cemented circular hatchery was first set up by the Department of Fisheries, Government of West Bengal at Malda. This had been copied and improved upon by private entrepreneur at Mogra in West Bengal (afore-mentioned three partners). They have established the Chinese hatchery on a commercial scale and appear to be doing extremely well. This entrepreneur (wrt Sri Shyama Charan Chatterjee) has been able to breed successfully all the Indian major carps, silver carp, grass carp and Puntius javanicus. He is now attempting to breed the Indian shad Hilsa ilisha".

Present author recently had an intimate conversation with Sri S. C. Chatterjee at this prestigious non-Government fish farm premises. He has been making a great contribution to the development and prosperity of fish seed production in India. Eminent fishery scientists Late Dr Hiralal Chaudhuri and Late Dr K. H. Alikunhi visited this fish hatchery-cum-farm on 4/1/1982 and 6/8/1982 respectively. Sri Chatterjee expressed his gratefulness to Dr D. N. Chattopadhyay and ICAR-CIFA Kalyani Centre for all kind of help and encouragement that was extended to him. It may be mentioned that this farm supplies good quality fish seed in many states of India at Government

View of carp hatchery complex

rate and has attained popularity in the country and even abroad by extending facilities to the trainees for learning latest technique of fish breeding and seed production. Author is grateful to Sri S. C. Chatterjee for providing a description of the activities on fish hatchery, carp pond management and seed rearing of H. ilisha.

Gassen Plus

Bon Ammonia and obnoxious Gasses

Shrimp / Fish performs all their body functions and growth in water. Good quality water and proper D.O. levels determines the success or failure. Good quality water, optimum D.O. level is of prime importance for health and growth of Shrimp / Fish.

Irregular water exchange, excess and leftout feed, dead algae, fecal matter, increases the organic load at the pond bottom. Accumulation of such waste absorbs available oxygen, creating anaerobic condition which leads to pollution of pond bottom. Polluted pond bottom and unhealthy environmental conditions triggers the release of toxic gasses like Ammonia, H_2S, Methane, etc, The toxicity of Ammonia, Hydrogen Sulphide, Methane attributed mainly due to unionized form. As the concentration in water increases, ammonia excretion by aquatic organism diminishes and the level of ammonia in blood and in other tissues increases. Ammonia increases oxygen consumption by tissues, damage gills and reduces the ability of blood to transport oxygen, and increases the disease susceptibility. To eliminate / overcome the above problems 'GASSEN PLUS' Yucca Schidigera, it contains Steroidal"Saponin" which help to reduce ammonia and other noxious gasses such as H_2S, Methane, etc., Microbial enzyme "Urease' Production inhibited by Saponin which leads to an increases D.O. and reduction of BODand COD levels.

Bacterial strains such as Bacillus Subtilis, Nitrobactor, Nitrasomonas, rapidly converts ammonia into Nitrates, Nitrites and finally non-toxic Nitrogen. Hydrogen Sulphide converts into Sulphates, Sulphites and finally non-toxic Sulphur, Methane into Non-toxic carbon. This conversion reduces the obnoxious gasses in the pond bottom. Reduction of this gasses improve the D.O. level in the water and bottom.

COMPOSITION:
YUCCA SCHIDIGERA
ALOEVERA
BACILLUS SUBTILIS
BACILLUS POLYMIXA
BACILLUS LICHENIFORMIS
NITRASOMONAS
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STABILIZERS

DOSAGE : 1 Kg per Acre or consult your Aqua Technician For Specific Usage & Dosage

PRESENTATION: 500 gms &1 kg

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Pedals: 4, 6 & 8

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