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Inside...

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CMFRI to strengthen research networks in Marine Biodiversity, allied areas

Dear Readers,

The February 2019 issue of *Aqua International* is in your hands.

In my Editorial comment in January 2019 issue. I happened to say that Indian aquaculture sector had a setback in 2018 due to poor quality of Shrimp seed, and Hatcheries need to be honest enough to produce and supply quality seed at all times. On this, a few hatchery owners happened to talk to me that some hatcheries like them are producing and supplying quality Shrimp seed. I agree with them that there are some hatcheries who are putting sincere efforts and supplying quality seed. Due to some bad quality seed producers, the good people are also getting bad name which we can identify. I appreciate all those hatcheries who are honest enough and producing good quality shrimp seed.

Aqua International organised its annual event in Surat, Gujarat titled 'Aquaculture Expo 2019' on January 10 & 11 which was a grand success and was appreciated by the Exhibitors and farmer delegates. Aqua International will strive to continue holding quality events which will be beneficial to the industry.

In the News section, you may find news about – In a move to strengthen research networks in marine biodiversity and allied areas, the Central Marine Fisheries Research Institute (CMFRI) has inked a pact with Maharaja's College to carry out collaborative research programmes and to popularise scientific technologies among the public. A Memorandum of Understanding (MoU) was signed by CMFRI Director Dr A Gopalakrishnan and Maharaja's College Principal Dr K N Krishnakumar. The linkage is aimed at boosting research works related to marine fisheries, marine biotechnology, marine biodiversity and mariculture along with various awareness programmes.

Tamil Nadu state government recently indicated that it would be bringing out a brackish water aquaculture policy and is in the process of identifying the potential areas, where aquaculture can be promoted in a big way. The task of area mapping has been entrusted to the Central Institute of Brackishwater Aquaculture. K Gopal, principal secretary to the department of Animal Husbandry, Diary and Fisheries, told on the sidelines of a farmers' conclave organised as part of the World Brackishwater Aquaculture Conference, that rough estimates suggest that there are about 50,000 hectares in the State where aquaculture can be taken up.

Mr Tarun Shridhar, Secretary, Department of Animal Husbandry, Dairy and Fisheries (DAHD&F) under Ministry of Agriculture and Farmers' Welfare, Government of India visited CIFT, Cochin along with Mr K.S. Srinivas, IAS, Chairman, MPEDA, Cochin lauded the research accomplishments of CIFT for its outstanding research in harvest and post harvest sectors in fisheries and suggested for pluralistic convergence of different agencies working in the same line to bring more visibility in the fisheries sector and to check unnecessary wastage of resources due to duplication of work.

In the Article Section, article titled **"Popularization of fresh fish cutting style for value addition in processing industry"** by Subal Kumar Ghosh, Sandeep B. Gore, Ajay T. Tandale and Pritam Tripathy discussed about fish come in all sorts of shapes and sizes and there are a number of common cuts of fish are available.

Readers are invited to send their views and comments on the news, special feature 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 sector. Keep reading the magazine regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Aqua International

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 the stakeholders of 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 the country through annual Awards presentation.

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

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CMFRI to Join Hands with Maharaja's for Joint Research, Awareness Campaigns

CMFRI Director Dr A Gopalakrishnan and Maharaja's College Principal Dr K N Krishnakumar exchanging the document after signing the MoU

Kochi: In a move to strengthen research networks in marine biodiversity and allied areas, the Central Marine Fisheries Research Institute (CMFRI) has inked a pact with Maharaja's College to carry out collaborative research programmes and to popularise scientific technologies among the public. A Memorandum of Understanding (MoU) was signed by CMFRI Director Dr A Gopalakrishnan and Maharaja's College Principal Dr K N Krishnakumar.

The linkage is aimed at boosting research works related to marine fisheries, marine biotechnology, marine biodiversity and mariculture along with various awareness programmes.

According to the MoU, the students of Maharaja's can undergo quality postgraduate research and training in cutting edge areas enjoying the research facilities of the CMFRI. "Both the institutes will also join hands to conduct a series of awareness campaigns in connection with conservation of marine ecology and promotion of scientific temper among the public. Collaborative attempts will be made to popularise various scientific technologies among the coastal communities.The awareness programmes will include the promotion of Foldscope, a portable microscope made of paper in cheaper cost, and campaigns against plastic pollution", said Dr A Gopalakrishnan, Director of CMFRI.

The CMFRI and the Botany department of the Maharaja's College has already launched joint awareness campaign on harmful algal blooms in the Arabian Sea.

Tamil Nadu to Formulate New Brackishwater Aquaculture Policy

K. K. Vijayan, Director, CIBA, told Express that Tamil Nadu has huge Potential and was a Leader in Brackishwater Aquaculture in the past

Eminent Agriculture scientist Dr M S Swaminathan shares a moment with Minister of Fisheries D Jayakumar during the World Brackishwater Aquaculture Conference in Chennai recently.

Chennai: The State government recently indicated that it would be bringing out a brackish water aquaculture policy and was in the process of identifying the potential areas, where aquaculture can be promoted in a big way. The task of area mapping has been entrusted to the Central Institute of Brackishwater Aquaculture (CIBA).

Mr K. Gopal, principal secretary to the Department of Animal Husbandry, Diary and Fisheries, told Express, on the sidelines of a farmers' conclave organised as part of the World Brackishwater Aquaculture Conference, that rough estimates suggest there are about 50,000 hectares in the State where aquaculture can be taken up.

"However, a scientific study has to be carried out to arrive at the exact number. We have asked CIBA to conduct the micro-

> ***"There are about 3.9 million hectares of estuary, and 3.5 million hectares of brackish waters available in India. In addition, 1.2 million hectares of coastal areas and 8.5 million hectares of salt affected areas are available, which are potential areas for aquaculture. Currently, only 1.94 million hectares are under culture, of which 1.67 million hectares are in shrimp farming alone. Out of total $ 900 million global turnover in imports and exports, India's share is only $1.7 million."***

level study in all 13 coastal districts of the State. The initial data set will be ready in six months after which a comprehensive policy will be evolved," Gopal said.

Tamil Nadu is gifted with a long coastline of 1,076 km with hundreds of acres of estuaries, backwaters and salt affected areas, where brackishwater aquaculture can be taken up. Gopal said Coastal Regulation Zone (CRZ) rules do not permit aquaculture activities within two km from High Tide Line (HTL). "Also, we have to approach cautiously as some of the other States faced serious environmental concerns. Besides, Tamil Nadu is vulnerable to sea erosion and seawater intrusion. So, scientific and sustainable practices factoring environmental concerns should be adopted," he said.

Dr K. K. Vijayan, Director, CIBA, told that Tamil Nadu has huge potential and was a leader in brackishwater aquaculture in the past.

"It would take one year to complete the digital mapping. We want to conduct a season-to-season mapping where we can assess water depth, salinity levels and temperature in a particular waterbody. This will give a realistic outlook and help policy-makers take appropriate decision," he said.

Fisheries Minister Mr D. Jayakumar and eminent farming scientist Dr M.S. Swaminathan said fisheries played a key role in achieving nutrition security.

Mr B. Meenakumari, Chairperson of National Biodiversity Authority (NBA), said there are about 3.9 million hectares of estuary, and 3.5 million hectares of brackish waters available in India. In addition, 1.2 million hectares of coastal areas and 8.5 million hectares of salt affected areas are available, which are potential areas for aquaculture. Currently, only 1.94 million hectares are under culture, of which 1.67 million hectares are in shrimp farming alone. Out of total $ 900 million global turnover in imports and exports, India's share is only $1.7 million.

Secretary, DADF, Tarun Shridhar applauds accomplishments of CIFT

New Delhi: Mr Tarun Shridhar, IAS, Secretary, Department of Animal Husbandry, Dairy and Fisheries (DAHD&F), under Ministry of Agriculture and Farmers' Welfare, Government of India visited CIFT, Cochin along with Mr K.S. Srinivas, IAS, Chairman, MPEDA, Cochin. Reminiscing his long association with fisheries sector, the Secretary lauded the research accomplishments of CIFT for its outstanding research in harvest and post harvest sectors in fisheries and suggested for pluralistic convergence of different agencies working in the same line to bring more visibility in the fisheries sector and to check unnecessary wastage of resources due to duplication of work. Citing the excellent contribution of ICAR in introducing the Vannami prawn culture and fish disease surveillance, he urged the stakeholders from both central and state governments for greater collaboration to strengthen the blue economy initiative of the government.

Tarun Shridhar, Secretary, DADF, Govt of India, interacting with scientists

Later, he had an effective interaction with scientists from ICAR-CIFT, CMFRI and CIFNET regarding the marine fishing regulations, responsible fisheries and food safety issues. He advised that MPEDA should take a lead to bring together all the stakeholders in the sector on quarterly basis to discuss about the strategic research developments in fisheries matching with need of the hour. Earlier, Dr Ravishankar C.N., Director, CIFT welcomed the gathering and highlighted the salient research achievements of and their successful dissemination in the field. He sought the intervention of Department of Animal Husbandry, Dairying and Fisheries (DADF) to disseminate users' friendly potential technologies of CIFT across the country with the help of NFDB. Mr Srinivas in his remarks appreciated the contributions of CIFT and CMFRI and assured all possible support for the growth of the fisheries sector. Dr T.V. Sathianandan, Director i/c. CMFRI and Mr A.K. Chaudhary, Director, CIFNET were also on the dais.

Dr Ravishankar C.N. briefing Tarun Shridhar during his lab visit at CIFT

"Machhuara Sammelan – 2018"

Chief Guest and other distinguished guests on the dias

Bilsapur: Festivals and meets are known to be the most suitable mode of publicity since ages all over the world. With the mandate to address the issues on welfare of start reservoir fishmen, a one day fishermen meet "Machhuara Sammelan" was organised at piungly dist, Bilsapur recently by the Department of Fisheries, Himachal Pradesh. Mr Virender Kanwar, Hon'ble Minister of Rural Development, Panchayati Raj, Animal Husbandry & Fisheries, Himachal Pradesh was the Chief Guest whereas Mr Anurag Thakur, Hon'ble Member of Parliament, Mr Jeet Ram Katwal, Hon'ble MLA Jhandutta constituency, Mr Rajendra Garg Hon'ble MLA Ghumarwin constituency graced the function.

Mr Satpal Mehta, Director-cum warden of Fisheries, Himachal Pradesh in his welcome address, paid gratitude to all the dignitaries for sparing their valuable time to attend the event and made the gathering aware of various welfare schemes for reservoir fisheries being run by the department. Director- cum- warden of Fisheries, Himachal Pradesh also elabroted the project proposals submitted to the government of India like Housing for Fisheries, Distribution of boats, nets, life Jackets etc. to the fishermen which are under consideration. He also assured that department will make utmost efforts for the upliftment of all the stakeholders.

Felicitation of the Chief Guest by Mr Satpal Mehta, Director- cum-warden of Fisheries, Himachal Pradesh

Representative of the Gobind Sagar reservoir fishermen raised various demand among which providing financial assistance for purchasing country boats, construction of houses for fishers etc. were major one.

In his address, Chief Guest Mr Verender Kanwar, Hon'ble Minister of Rural Development Panchayati Raj, Animal Husbandry & Fisheries, Himachal Pradesh highlighted that four fish processing units are being established in the state with technical assistance from ICAR- Central Institute of Fisheries Technology, Cochin and emphasized on departmental efforts in the development of fisheries in Himachal Pradesh. Mr Anurag Thakur, Hon'ble Member of Parliament apprised the audience about the departmental activities and initiative taken at the Government of India level to bring Blue Revolution in the country through various schemes.

Fisherman and Fish Co-operative society with highest annual fish catch from Gobind Sagar reservoir were also honoured for their achievement. In addition gill nets were distributed to the fisher folk of general as well as scheduled caste categories under state scheme.

Chief Guest addressing the gathering

More than one thousand fisher folk attended the meet enthusiastically. This was a modest effort to make people aware of the departmental activities and endeavours especially in reservoir fisheries.

Chief Guest presenting an award to fisherman with highest annual fish catch from Gobindsagar resrevoir

International Workshop Gets Underway at CMFRI

Delegates from 12 Afro-Asian member countries of AARDO attended the workshop

Kochi: An international workshop on fisheries and aquaculture got underway at the Central Marine Fisheries Research Institute (CMFRI) recently with a call to formulate game-changing policies to develop the fisheries sector in Afro-Asian countries. The 15-day workshop is aimed attraining officials from 12 member countries of the African Asian Rural Development Organisation (AARDO).

Speaking on the inauguration of the workshop, Dr Manoj Nardeo Singh, Assistant Secretary General of the AARDO said agriculture would need to produce 60% more food globally by 2050 and 100% more in developing countries using the same limited available natural resources.

In order to meet growing demand for food and nutritional security, the developing countries in Afro-Asian regions would require to formulate comprehensive policies and develop adequate technologies in fisheries sector, he said.

"Fisheries and aquaculture can generate food, nutrition, income and livelihoods for hundreds of millions of people around the world. Fish and seafood are important source of nutrition and health for many coastal communities", he said.

K S Srinivas, Chairman of Marine Products Export Development Authority (MPEDA), who inaugurated the workshop said the focus of exports should be expanded into many African countries too. "Europe, US, Japan and China apart, there is ample scope for marine product export to African nations and other Asian countries", he said.

Dr T V Saththianandan presided over. Dr Imelda Joseph and Dr Boby Ignatius spoke on the occasion.

As many as 14 participants from Oman, Lebanon, Taiwan, Morocco, Syria, Tunisia, Libya, Zambia, Malawi, Mauritius, Sri Lanka and Bangladesh are attending the 15-day workshop. The trainees will be imparted training in areas such as marine fisheries assessment, fish stock estimation, marine fisheries environment, impact of climate change on fisheries, responsible fisheries and mariculture activities like cage farming, along with practical sessions. They will be provided opportunity to visit harbours to have experience in real time data collection.

The African Asian Rural Development Organisation (AARDO) is an inter-governmental organisation in the field of agricultural and rural development with its headquarters in New Delhi. Currently 33 member countries from Africa and Asia are part of AARDO.

K. S. Srinivas, Chairman of MPEDA inaugurating the international workshop at the CMFRI

Delegates from various Afro-Asian countries during the inauguration of the international workshop at the CMFRI

Natural Hatcheries to Boost Inland Fisheries

Kochi: To address the lack of hatcheries for spawning of fingerlings (2-8 cm in length), the fisheries department has decided to give fingerlings directly to fish farmers in the district. The farmers can cultivate the fingerlings in small ponds till they reach an average size to put in large waterbodies

Instead of investing in hatcheries, the fisheries department is now focusing on interested farmers who can turn themselves into hatchery specialists. "We have initially identified select fish farmers who will cultivate them. These fingerlings can be sold directly by the farmer or can be given back to the department. But from the next financial year, the fingerlings will be given to whoever wants them," said Ignatious Mandro, joint fisheries director, Aquaculture.

The fisheries department was forced to look into the issue as farmers have started cultivating exotic species such as African Pacu as it is easy to get their fingerlings for not more than one rupee a piece; exotic species have the risk of eating local species and eating into their feeds. Official said good quality fingerlings were available of only species such as Gift Tilapia while carp is no longer economically viable. "The feed that they get is also not of much value," an official said

Meanwhile in ponds and canals, low-value fishes are being nurtured and it is being operated as a side business. Even officials agree that under the department's subsidy schemes, fishlings of 1-2 cm size are being given and they cannot survive the natural waters. "Around 90% of them die. Ideally, they should be given fingerlings of 8cm length which can be put in ponds. They have to give more impetus to the distributions of fish seed (fingerlings) and fish feed," an official said.

Scientists at the Centre for Inland Fisheries Research Institute (CIFRI) said farmers are not aware of the catastrophe created by cultivating banned fish species. "The seeds are easily available, cost is much low and the growth rate is faster. But it would be good for the fishermen to cultivate local species Unlike marine sector where there is more production because it is more organized, inland fishers are scattered and there are more anthropological issues such as pollution, constructions, habitat loss and decline in the open water area, affecting the inland fisheries," said CIFRI scientist Rani Palaniswamy.

The inland fisheries have been dominated by farming which has been promoted by Agency for Development of Aquaculture, Kerala (ADAK), Marine Products Export aDevelopment Authority (MPEDA) and Fresh Water Fish Farmers Development Agencies (FFDAs).

More than 78% of the total area under shrimp culture culture is distributed in Ernakulam district and almost 70% of the total aquaculture production of the state is also contributed by Ernakulam district. It is followed by Alappuzha (9.40%); Kannur (5.44%) and Thrissur (4.68%) districts in area coverage.

Alien species reach natural waters by escaping from aquaculture systems. Indian major and common carp have also reached the natural waters also through regular open water ranching done by the state department of fisheries and agencies under it.

Budget 2019 proposals on fisheries to boost seafood export

India was the top producer of aquaculture shrimps in the world last year with over 6 lakh tonnes and its seafood export stood around a record Rs 45,000 crore in 2017-18.

Kochi: The seafood industry expects the proposals for separate department for fisheries and the 2% interest subvention for fishery farmers to raise shrimp production and help in boosting the export.

India was the top producer of aquaculture shrimps in the world last year with over 6 lakh tonnes and its seafood export stood around a record Rs 45,000 crore in 2017-18. Separate department may help focus more on fisheries as at present it is clubbed along with animal husbandry and dairy under Agriculture Ministry.

"It will help in quicker decisions at administrative level for fisheries and seafood being an export-oriented industry will definitely benefit," said S Chandrasekhar, former president of Society of Aquaculture Professionals. He said it has been a long-pending demand of the industry.

"We hope that there will be a secretary for fisheries under the department whom we will be able to approach directly. For instance, our demands like quarantine facility for aquaculture can be easily settled," said V Balasubramaniam, general secretary of Prawn Farmers Federation of India.

He said the 2% interest subvention for fishery farmers and 2% interest subvention for farmers affected by calamities will help the industry. Recently the Gaja cyclone had hit the shrimp farmers in parts of Tamil Nadu.

The lack of clarity in the proposal for interest subvention was pointed out by Kenny Thomas, MD of Jinny Marine Traders in Guajarat, an exporter. `` The announcement says farmers pursuing fisheries and animal husbandry will get interest subvention. But we need to clarify whether it applies to river fisherman or in general including shrimp farmers," he said.

Sheng Long targets to sell 50,000 MT Shrimp feed in 2019; 75,000 in 2020 in India

Royal Dragon, Lion Feed are their 2 Aquatic feed brands; Haid Group's Global annual feed sale turnover Rs 41,000 crores

Chennai: Sheng Long Bio-tech, specializing in aquatic feeds, having its regional head quarter in Vietnam and strong marketing shares in Vietnam, Malaysia, Indonesia, India, Taiwan, Bangladesh, Ecuador and Iran has launched shrimp feed production in its Indian feed plant constructed near Chennai. The feed sales of Sheng Long Bio-tech Business Unit is more than 300,000 MT this year, generating an annual revenue of Rs 1,875 crores and Its parent company Haid Group's yearly feed sales exceed one crore MT with the turnover of over INR 41,000 crore in 2018 globally.

Shi Ji Yang, General Manager, Sheng Long Bio-tech India Pvt Ltd

Chuang Jie Cheng

Sheng Long Bio-tech India Pvt Ltd was incorporated in 2014. In 2016, in order to cater to the needs of Indian farmers by providing best quality shrimp feed, L.vannamei post larvae, Aquatic healthcare products, best service and all-round customer satisfaction, the company decided to invest on the Feed mill and Hatchery in Tamil Nadu, India. The state-of-the-art feed mill spans across an area of 5.57 hectares located in SIPCOT Industrial Park, Thervoykandigai Village, Gummidipoondi.Taluk, Thiruvallur Dist. 60 km from Chennai. This feed mill is equipped with 3 latest feed production lines having the capacity to produce 50,000 MT per year L.Vannamei feed with a space for expansion of another 50,000 MT / year. The facility includes an Aqua Health Product manufacturing unit to supply quality products to our customers, said a note from the company.

A. Kumaresan

> *"Sheng Long sold 35,000 MT of feed in 2018 in India, plans to sell 50,000 MT in 2019 & 75,000 MT in 2020-21."*

The feed mill took 2 years to construct and have encountered various hurdles and obstacles during the construction, but with the strong determination of Sheng Long Team, the company was able to overcome these barriers.

The production date was scheduled to start right after the Festival of Light - Diwali, where Indians look forward to go back home for reunion and get together. However, the Indian team voluntarily sacrificed their festivities mood to ensure that the production goes as per schedule. On the other hand, Sheng Long Vietnam send its best production team and equipment supplier send their team too, to train and assist the Indian Team successfully.

Jiang Wen

On November 9, 2018, two days after the Diwali festival, the first India feed mill went into trial and mass production

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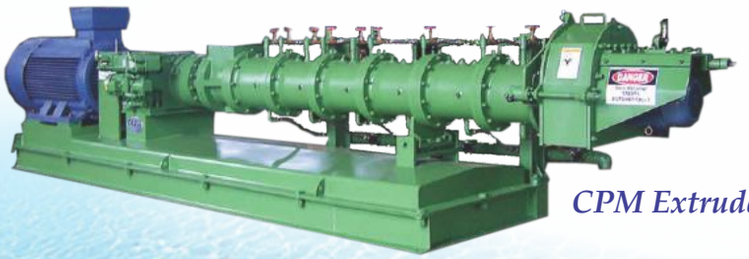

CPM Extruder

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Sheng Long India team during the launch of its shrimp feed plant recently. Shi Ji Yang, A. Kumaresan, Chuang Jie Cheng, Jiang Wen and others cheering for a photograph marking the launch of the feed plant.

successfully. Within 2 weeks, the first batch of Sheng Long famous aquatic feed brand – "Royal Dragon" and "Lion Feed" , "Made in India", feed were tested locally and received excellent feedback from the Pan India customers. Now, Sheng Long is able to satisfy the Customers' requirement of fresh and Quality feed in hours from the Chennai new feed plant.

Sheng Long India will start its next feed mill construction in 2019, to meet 1 lakh MT of aquatic feed target in the next few years and 2 crore MT for the entire Haid Group before year 2022.

This not only shows the determination of Sheng Long, but also proves that Sheng Long will go miles to be an aquaculture total solutions service provider for India customers, which includes the mass production of 1000 Million vannamei post-larvae from Hatchery as well as aquatic healthcare products made in India.

The owner and Chairman of Haid Group is Mr Hua Xue. The Global Head Quarter of Haid Group is Tianan Science and Innovative, No.55 North Fanyu Avenue, Guangzhou, 511400, China.

Sheng Long Bio- tech India Pvt Ltd has 57 Sales & Technical personnel in India besides 12 Technical Service Centres.

The company has 47 Dealers for Shrimp Feed in India.

The Volume of Feed sale in 2018 was 35,000 MT. Sheng Long has a target of 50,000 MT of feed sale in 2019-2020 and in 2020- 21 the target is 75,000 MT in the country.

Sheng Long India used Buhler brand feed mill machinery in India.

Besides feed, the company is supplying Aqua Health Products in the country.

Plans to produce Fish Feed

The company has plans to go for fish feed production in future.

Sheng Long India Team

- **Head of the Feed Mill Operations :**
  Mr Shi Ji Yang
  General Manager
- **Production Head Feed Mill operations :**
  Mr Jiang Wen
- ***Mr Hung Hsiang Shun***
  Vice President
  ShengLong Biotech International Co. Ltd
- ***Mr Chuang Jie Cheng***
  General Manager
  ShengLong Biotech International Co. Ltd
- **Marketing Head (Pan India) :**
  Mr A. Kumaresan
  Sr. Deputy General Manager
- **Regional Sales & Technical in charges in India**
  Mr Rajan Davamoni,
  Regional Manager, Central & South Tamilnadu.
  Mr B.Kiron,
  DGM, North AP.
  Mr Sairam,
  Regional Manager, Odisha & W.Bengal.
  Mr N.Bhaskaran,
  Marketing Manager, Hatchery operations.
  Mr Chiu Chun Ting
  Technical Manager.
  T. Iyappan,
  Regional Manager, Technical Service Department.
- **Marketing Coordinator:**
  Mrs Nasreen Shabbeer
  Assistant Manager.

Sheng Long India team in a jubilant mood with the launch of its feed plant near Chennai.

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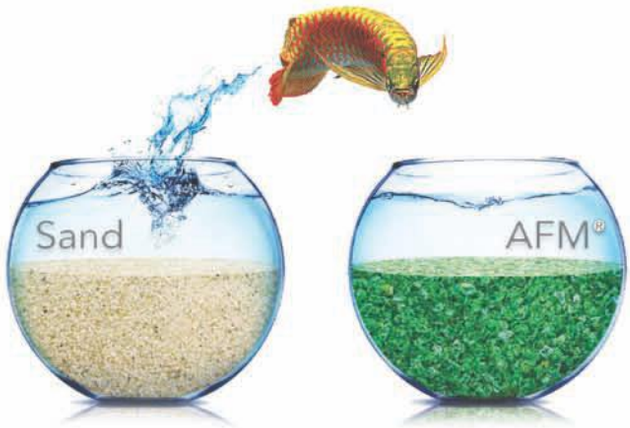

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Gujarat MLAs for Aquaculture Development in the State

Surat hosts Grand 33rd Aquaculture Expo

Olpad MLA, Mukesh L. Patel Inuagurating Aquaculture Expo 2019 at Surat on January 10. Seen from left: M.A. Nazeer, Ravi Kumar Yellanki, Shahenshah Khan, Maruti D. Yaligar.

Maruti D. Yaligar
Deputy Director, Aquaculture, MPEDA, Valsad, Gujarat Region

Ravi Kumar Yellanki
President, Society of Aquaculture Professionals

Surat: A 2-day exhibition and conference on aquaculture, 33rd edition of Aquaculture Expo 2019, was held at Surat International Exhibition & Convention Centre, Surat, Gujarat, on 10 & 11 January 2019. Inaugurating the Expo, Mr Mukesh Bhai Patel, told that they will put efforts to develop shrimp aquaculture in the region well in the next few years.

Mr Mukesh L. Patel, MLA, Olpad Constituency, Gujarat, in his address promised to do his best for the development of aquaculture activity in the region and in the state. He assured to raise this sector's problems in the State Assembly and invited the stakeholders of the industry.

The Expo was organized with the objective of bringing awareness among aquaculture farmers on shrimp and fish culture and various products, technology and services available to get better yield and results in aquaculture farming. Large number of farmers from Gujarat, Maharashtra, Rajasthan, Chhattisgarh, Haryana, Madhya Pradesh, Andhra Pradesh,

Mukesh L. Patel, *MLA*
Olpad, Gujarat

Saji Chacko, *Secretary, Gujarat Aquaculture Association*

Tamil Nadu and other states participated in the Expo. The farmers felt that the Expo was a very good opportunity to update their knowledge on various aspects in aquaculture. Exhibitors also expressed satisfaction at the turnout of farmers in the Expo.

Companies dealing with manufacture and supply of products and services related to aquaculture sector displayed their products in the expo. The expo was organized by Aqua International, English monthly magazine on aquaculture sector.

Mr M. A. Nazeer, Editor, Aqua International and Convener of the Expo said that it was a record break in the history of Indian Aquaculture Industry that big size of Exhibition with about 200 stalls held in Gujarat state. Though the industry is moderate in size in Gujarat, due to proper mapping, infrastructure facilities and the best productivity achieved in Gujarat state, it attracted lot of companies dealing with supply of seed, feed, nutrition and healthcare products, aerators, P-Line products, processors, exports etc to participate in the Expo in large number.

Effective representation needed

" I request all of you to give attention to a valid point and issue the President of GAA Mr Narendra Bhai Tandel has brought to my notice. The Aquaculture Farmers in Gujarat state are facing problems like allotment of Land, Electricity tariff, Procurement of harvested shrimp material at a profitable price from farmers etc.

During the Expo who ever comes as the Guest of Honour from the government are not doing any good later to help the farmers and the stakeholders in the state. There was also not proper follow up from the industry to the government at Gandhinagar. I would like to take initiative here after if a group of famers & other stakeholders from Gujarat state come to Gandhinagar. I will come with you and we can try to meet the Chief Minister, concerned Ministers and the Bureaucrats and do the needful", said M. A. Nazeer, Editor, Aqua International.

I will make sure that the voice of aquaculture farmers of Gujarat state made effective at Sachivalaya, Gandhinagar. I will gather all the print and electronic media and they give attention to aquaculture farmers issues at Gandhinagar. I also request our beloved MLAs Mr Mukesh Ji and Ms Zhankhana Patel Madam to accompany us and support the farmers on that day at Sachivalaya, Gandhinagar, the Editor further added.

He also stated that if land allotment is done more, Gujarat can become the biggest producer of shrimps in the country earning livelihood to lakh of educated and uneducated people, besides enhancing revenue to the entrepreneurs and to the government. Aquaculture is a big science and it requires good technology to produce quality shrimp and fish with better productivity. This sector needs government support to have sustainable growth.

M. A. Nazeer
Chief Executive, Aquaculture Expo 2019

VIPs in the Inaugural Session:

Mr Mukesh L. Patel, MLA Olpad, Gujarat.

Mr Maruti D. Yaligar, Deputy Director, **Aquaculture, MPEDA**, Gujarat Region.

Mr Ravi Kumar Yellanki, Managing Director, Vaisakhi Bio-Resources Pvt Ltd, Visakhapatnam, A.P

Mr Saji Chacko, Secretary, Gujarat Aquaculture Association.

A view of inaugural session

Speakers of AE 2019 Conference

Ravi Kumar Yellanki,
MD, Vaisakhi Bio-Resources Pvt Ltd

Mr Ravi Kumar Yellanki, Managing Director, Vaisakhi Bio-Resources Pvt Ltd, made a presentation on "**Management Changes needed to make Shrimp Farming Profitable again in Gujarat**".

Michael Leger,
Technical Manager, Skretting South Asia

Mr Michael Leger, Technical Manager, Skretting South Asia spoke on "**Feeding Solutions for Sustainable Aquaculture**"

Samir Ardeshana,
ADF, Fisheries Dept, Govt of Gujarat

Mr Sameer, Assistant Director of Fisheries, Govt of Gujarat spoke on "**Latest land allotment policy of the state government for aquaculture**"

B. Ravi Kumar,
Technology Head - India, Evergreen Feed Industries Co. Ltd

Mr B. Ravi Kumar, Technology Head - India, Evergreen Feed Industries Co. Ltd, made a presentation "**Sustainable Ways for Profitable Shrimp Farming**"

Aquaculture Conference: In connection with the Expo, aquaculture conference was held with presentations on various topics of aquaculture by leading experts in the indusrtry.

Panel Discussion

Below were the points discussed:

- Why there is significant decline in Shrimp production in India in 2018? What are the factors do you attribute for the fall in Shrimp Production?
- How did the industry perform in 2018 in different states like Gujarat, Maharashtra, Andhra Pradesh, Tamil Nadu, Odisha, West Bengal, Karnataka, Kerala, Goa, Haryana & other states ?
- How is Shrimp Market Trend globally. Why Indian Shrimp Farmers are not able to get Better & Profitable price ? Are the Exporters playing a role in low Shrimp prices ?
- What has to be done to Prevent Seed Mortality and to get Better Productivity and Farm Gate Price for Shrimps in 2019 ?

A view of Panel Discussion

Sponsors

Sponsor: Gujarat Agro Industries Corp. Ltd
First Day Lunch: West Coast Fine Foods (India) Pvt Ltd.
Dinner: Zeal Aqua Ltd
Second Day Lunch: Bashir & Washi Fish Co Pvt Ltd & ISF Trading.
Snacks for both the days: Evergreen Industry Co Ltd.

Aqua International thank the Sponsors for their kind gesture of sponsoring and hosting Lunch, Dinner and Snacks to the participants during the Expo.

Mementos Prersentation to Exhibitors at Aquaculture Expo 2019





















































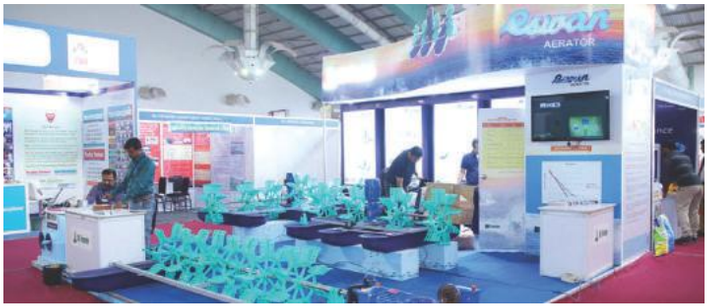








A view of Aquaculture Expo 2019, Surat, Gujarat



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8	Skretting Vietnam	17	Skretting Zambia
9	Skretting China	18	Skretting India

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Probiotics: Use in Aquaculture, Selection Criteria and Method of Application

Sanjeev Sharma[1]*, Upasana Mohanty[1], Munish Kumar[2], Rohit Kumar[1] Ankeeta Nayak[1] and Swapnarani Samantaray[1]

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Abstract

Intensive aqua farming accompanies several disease problems often due to opportunistic pathogens as evident from general aquaculture. Probiotics are micro-organisms or their products with health benefit to the host, have found use in aquaculture for the controlling of disease, and also used as supplementing in some cases replacing the use of antimicrobial compounds.Extensively microalgae, yeasts and Gram-positive and Gram-negative bacteria has been evaluated.However, there is lack of knowledge to farmers about probiotics, their types, criteria of selection, composition and methods of application. Probiotics may stimulate appetite and improve nutrition by the production of vitamins, detoxification of compounds in the diet, and by the breakdown of indigestible components. This study would be provide a supportive information about probiotics and their used in aquaculture.

Introduction

High stocking densities, high food inputs and other organic loads stimulate the selection and proliferation of opportunistic bacteria. Due to this negative balance of the microbial community in rearing water as well as in fish gut, the aqua culturists often face mass mortality of their stocks. However, with changing scenario farmers are emphasizing on diagnosis and prevention of infection to promote health and production efficiency. The fish farm health management has now become an integral part of ornamental fish Quality Assurance program. Though the use of antibiotics and chemotherapy remains the method of choice as disease control strategy, the abuse of chemotherapeutics, especially antibiotics has resulted in development of multiple antibiotic resistant bacteria. Increased concern about antibiotic resistant microorganisms has led to several alternatives including use of non-pathogenic microorganisms as probiotic.

Probiotics

The term Probiotics is derived from the Greek word "probios" Pro = "for" Bios = "life". The idea that Bacterial culture could benefit human health comes from Russian scientist, Elic Metchnikoff. (1908). the term Probiotics was1st introduced in 1953 by Kollath. Modern concept of Probiotics is given by Parker in 1974 (probiotics are organisms or substances which contribute to intestinal microbial balance. First reported trials of Probiotics in aquaculture were conducted in Japan in 1981. Ii is defined as a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance" (Fuller-1987). Verschureet al (2000) defined aquaculture probiotics as a live microbial adjuvant which has a beneficial effect on the host by modifying the host-associated or ambient microbial community, by insuring improved use of feed or by enhancing its nutrition, by enhancing the host response towards disease, or by improving quality of the ambient environment".

Antibiotics often treat the disease, but not the underlying problem. In addition, antibiotic and chemical therapy, especially broad spectrum chemical use, kills most of the beneficial bacteria in the water column of the pond and not just the bacteria causing problems to the aquatic species. In contrast, there are many different mechanisms involved in the probiotics process in the pond. Aquaculture probiotics have a very important role to play in the degradation of organic matter thereby significantly reducing the sludge and slime formation. As a result, water quality would improve by reducing the disease (including *Vibrio* sp., *Aeromonassp.* and viruses) incidences, enhancing zooplankton numbers, reducing odours and ultimately enhancing aqua cultural production. By speeding up the rate of organic matter breakdown, free amino acids and glucose are also released providing food sources for the beneficial microorganisms. Inorganic forms of nitrogen, such as ammonia, nitrate and nitrite are also reduced. By improving total water quality and FCR, the overall health and immunity of the shrimp will be improved.

Highlight Points

- **Probiotics are micro-organisms or their products with health benefit to the host.**
- **Probioticsused in aquaculture for the controlling of disease, and also used as supplementing in some cases replacing the use of antimicrobial compounds.**
- **Probiotics may stimulate appetite and improve nutrition by the production of vitamins, detoxification of compounds in the diet, and by the breakdown of indigestible components.**
- **This article provides the knowledge to farmers about probiotics, their types, and criteria of selection, composition and methods of application.**

Assessment of the Potential Candidates for Use as Probiotics

Development of probiotics for commercial use in aquaculture is a multidisciplinary process requiring both empirical and fundamental research, full-scale trial and an economic assessment of its uses. Many of the failures in probiotic research can be attributed to the selection of inappropriate

microorganisms. Selection steps have been defined, but they need to be adapted for different host species and environments. It is essential to understand the mechanisms of probiotic action and to define selection criteria for potential probiotics. General selection criteria are mainly determined by biosafety (non-pathogenic) considerations, methods of production and processing, method of administration of the probiotic and the location in the body where the microorganisms are expected to be active.

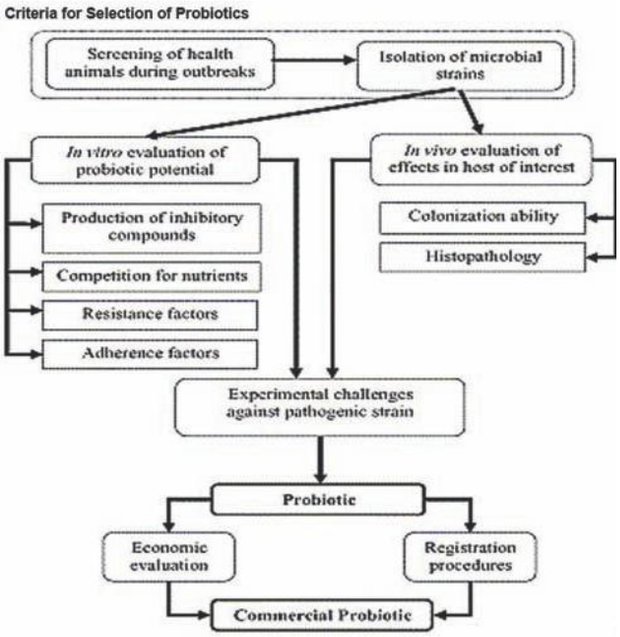
Types of Probiotics

Probiotics are mainly of two types a) gut probiotics which can be blended with feed and administrated orally to enhance the useful microbial flora of the gut. It can be added at the rate of 10-20 gm/kg of feed b) water probiotics which can proliferate in water medium and exclude the pathogenic bacteria by consuming all available nutrients. It can be added at the rate of 0.1-0.25 mg/l. Thus, the pathogenic bacteria are eliminated through starvation.

Probiotics Considered for Use in Aquaculture

The first probiotics discovered long time ago was Lactobacillus sp., the lactic acid producing bacteria. Thereafter, many probiotics such as Aeromonashydrophila, Altermonassp, Bacillus subtilis, Carnobacteriuminhibens, Debaryomyceshansenii, Enterococcus faecium, Lactobacillus helveticus, L. plantarum, L. rhamnosus, Micrococcus luteus, Pseudomonas fluorescens, Roseobactersp., Streptococcus thermopilus, Saccharomyces cerevisiae ,S. exiguous , Vibrio alginolyticus, V. fluvialis , Tetraselmissuecica and Weissellahelenicawere considered for use in aquaculture. Aeromonashydrophilafunctions as development of digestive tract of germ free for Artemiafranciscananauplii. Bacillus sp and Saccharomyces sp. functions as immunostimulants. Streptococcus sp. functions as growth enhancer. Lactobacillus sp. functions as antagonist against Aeromonas and Vibrio sp. Alteromonas sp. shows inhibitory action against A. hydrophila. Pseudomonas fluorescence is effective against pathogenic Vibrio sp. Carnobacterium sp. is effective in reducing damage caused by Aeromonassalmonicida.

Criteria for Probiotics



It should be non-toxic (GRAS), Fast multiplication, Biodegradable carrier, Not genetically modified, Resistance to gastric juice, Not close relative of pathogens, Able to attach and colonise in GIT, Contains proprietary growth stimulants, Having enzymes to start waste digestion, Cheap ,efficient & easily available, Able to influence metabolic activity (increase feed convertion), Remain stable and viable in any storage conditions.(temp).

Probiotic Composition

It may be single strain of live microorganism (usually bacteria or yeast) or microbial ecosystems (mixture of specially selected, live but dormant microorganism – synergistic mix).

Criteria for Selection of Probiotics

Methods of Application of Probiotics

Probiotics are marketed in two forms a) Dry forms: the dry probiotics that come in packets can be given with feed or applied to water and have to be brewed at farm site before application Each kit of dry probiotics contains a packet of dry powder and a packet of enzyme catalyst. Brewing has to be done in clean disinfected water after emptying the packets and blending thoroughly. Usually, it is brewed at 27–32°C for 16 to 18 hours with continuous aeration. The finished products must be used within 72 hrs. Maximum aeration is required in semi-intensive culture ponds. If aeration is less, the application of probiotics has to be spread for two consecutive days, applying 50% of the dose each time, b) Liquid forms: The hatcheries generally use liquid forms which are live and ready to act. These liquid forms are directly added to hatchery tanks or blended with farm feed. The liquid forms can be applied any time of the day in indoor hatchery tanks, while it should be applied either in the morning or in the evening in outdoor tanks. Liquid forms give positive results in lesser time when compared to the dry and spore form bacteria, though they are lower in density. There are no reports of any harmful effect for probiotics but it is found that the BOD level (biological oxygen demand) may temporarily be increased on its application; therefore it is advisable to provide sub surface aeration to expedite the establishment of probiotic organisms. A minimum dissolved oxygen level of 3% is recommended during probiotics treatment.

Probiotics Success Factor

It depends upon the type of strain, mode of supplementation, existing environmental conditions, usage of proper dosage & treatment frequency (duration of feeding), salinity: <40ppt, pond pH should be in the range of 6-10, effect is slower at low temperature.

Potential Benefits of Probiotics

It reduces inflammation, Prevention of colon cancer, Improves mineral absorption, Increase food digestion by their enzyme, Prevents harmful bacterial growth under stress, Improve water quality or reduce water pollution, Increase tolerance to stress during transportation, Improves FCR, increase size at harvest and production, Neutralization of bacterial toxins by their metabolites, Improves immune function and preventing infections

Probiotic Benefits vs. Antibiotics

Probiotics create no illegal residue, helps to digest pollutants, Cheaper to use probiotics than antibiotic. Antibiotics lead to slow growth rate of larvae. Probiotics promote high survival rate, so cost efficient to use. Bacteria cannot develop resistance to probiotics but can to antibiotics

Constraints

Leaching, Temperature: colonization in gut is possible is only if ambient temperature is available.Can regain the virulence. Quantification of the dosage of probiotics to be used

Consideration of Regulations on Probiotics

The authorization, marketing and use of feed additives are currently regulated under Council Directive 70/524/EEC. Before a feed additive may be marketed or used, it must be authorized in accordance with the provisions of the Directive. To obtain authorization, a manufacturer is required to submit a dossier containing data and studies demonstrating the efficacy and safety of the product for animals, consumers and the environment.

Recommendations for the Use of Probiotics

SEAFDEC (South East Asia Fisheries Development Centre) combined with ASAN (Association of South East Asian Nations) have collaborated to research and publish guidelines for sustainable production of shrimp. Their publication, entitled "Environment-friendly schemes in intensive shrimp farming", recommends the application of probiotics to both the grow out ponds and the reservoir for good water culture throughout the production cycle. In addition, both these organizations also recommend other pond management considerations including the stocking of fry that have been certified free from specific disease, such as white spot by PCR equipped diagnostic laboratories.

Limitation of Probiotics Use

Probiotics can be used in advance as prevention tools. They can prevent the disease rather than treatment of the disease. They can be established well in static or low water exchange systems (re-circulatory system). They are effective if applied as soon as the water medium is sterilized before contamination with other microbes. In the process of application of probiotics, no other chemical or drug should be used for treating other diseases like fungal and protozoan diseases caused by those other than bacteria. These probiotics can easily be destroyed by any other chemical or drug which generally interferes with the establishment of useful microbes.

Conclusion

It is essential to understand the mechanism of action in order to define selection criteria for potential probiotics. Therefore, more information on the host/ microbe interactions in vivo, and development of monitoring tools (e.g. molecular biology) are still needed for better understanding of the composition and functions of the indigenous micro biota, as well as of microbial culture of "probiotics". The decision of using probiotics in aquaculture has been in large part a result of historical and empirical use and not based on scientific criteria. The use of probiotics is an important management tool, but its efficiency depends on understanding the nature of competition between species or strains.

Reference

Abraham, T. J., Mondal, S., Babu, S. 2008. Effect of Commercial Aquaculture Probiotic and Fish Gut Antagonistic Bacterial Flora on the Growth and Disease Resistance of Ornamental Fishes *Carassiusauratus* and *Xiphophorushelleri*. J. fish. Aqua. Sci., 25(1): 27-30.

Cytogenetic Marker in Fishes

Riya Kumari[1] Sneha Surendran[1] and Nzanthung T. Yanthan[1]

[1]Department of Fish Genetics and Breeding, ICAR-Central Institute of Fisheries Education, Mumbai-400061

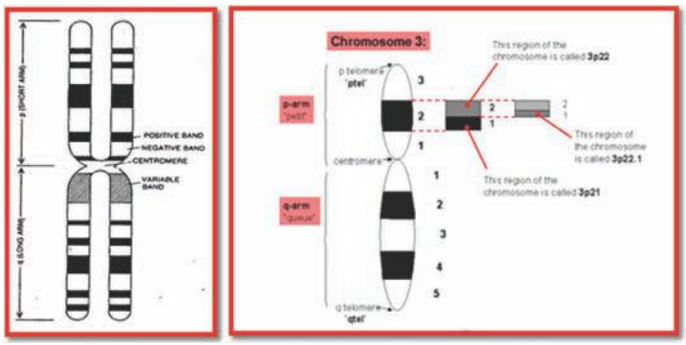
Introduction

At present, there are about 33000 fish species in the world and several hundred new species described in each year. Majority of the fishes have been discovered in the last 15 years. The chromosome banding is used in the field of taxonomy, cytogenetics, evolutionary study, fish breeding and environment to know whether hybridization has taken place or not.

The chromosome banding is a differential staining method produces a series of consistent landmarks along the length of metaphase chromosomes that allow for both recognition of individual chromosomes within a genome and identification of specific segments of individual chromosomes. A band is nothing but a part of a chromosome which appears as either lighter or darker compared to the adjacent segment. The banding method usually involves arresting the metaphase stage of mitosis by colchicine and staining it appropriate with dye. The band showing intense

Highlight Points

Fishes contain a large number of small chromosome, as a result, it is difficult to obtain a good chromosome spread. There are several cytogenetic marker used in fish species such as Q, G, C, NOR, restriction enzyme, replication, fluorescent banding, and CMA3 staining. Major success in chromosome banding has been obtained with C and NOR banding while G, R, and Q banding produces confusing results. Some other type of banding techniques like restriction enzyme, replication banding, and fluorescent banding has shown satisfactory results.



Cytogenetic banding nomenclature

staining is called positive band while less intense stained is called the negative band. The banding pattern is numbered on each arm of the chromosome from the centromere to the telomere. This numbering system allows any band on the chromosome to be identified and described precisely. Many works on chromosome banding have been done in mammals and also in birds, turtles, snakes, and amphibians. Fishes contain a large number of small chromosome, as a result, it is difficult to obtain a good chromosome spread.

Following are the few cytogenetic techniques that have been studied in the fishes till date.

Traditional Cytogenetic Marker

Quinicrine banding (Q-banding)

Q-banding was the first chromosome banding technique, when chromosome preparations were stained with quinicrine mustard. Q-banding is nowadays generally produced using quinicrine dihydrochloride, which is less toxic. A series of bright and dull fluorescing regions are revealed along the chromosomes when viewed with fluorescence microscopy (450– 500 nm). The Q-banding pattern strongly resembles the G-banding pattern, with the brightly fluorescing Q-bands corresponding to the dark-staining G-bands. Notable exceptions include the distal long arm of the Y chromosome, which shows extremely bright fluorescence. Q-banded chromosome preparations are not suitable for routine cytogenetic investigations, as the fluorescence fades rapidly during analysis. This banding method is, however, useful for specific examination of the heteromorphisms associated with the Y chromosome and the satellite regions of the acrocentric chromosomes. Q-banding patterns of short arm and satellite heteromorphisms can, for example, sometimes be used to determine the parental origin, and the stage of meiotic non-disjunction in trisomies involving the acrocentric chromosomes.

Giemsa banding (G-banding)

G-banding is most frequently used technique which uses metaphase stage of the chromosome pretreated with the proteolytic enzyme trypsin that probably alters chromosomal proteins, followed by a staining step with a Romanowsky-type dye mixture (a thiazine eosin-azure dye mixture, usually Giemsa stain, hence G-banding). It produces series of light and dark bands along the entire length of the chromosome and can be easily seen and photographed with a bright-field microscope. Dark bands incorporate heterochromatic regions, which is rich in adenine and thymine (AT-rich) DNA and relatively genetically inactive stain. In contrast, Euchromatin which is rich in guanine and cytosine (GC-rich) and more transcriptionally active incorporates less Giemsa stain, and these regions appear as light bands in G-banding. The G-banding technique originally developed for mammalian chromosomes and it has been successfully applied to cold-blooded vertebrates, including amphibians and reptiles. However, application of the G-banding techniques to fish chromosomes has been generally unsuccessful. Although distinct structural G-banding patterns have been described in some fishes such as trout, carp, eel and zebrafish. The difficulty in obtaining good quality structural banding patterns on fish chromosomes due to the weak compartmentalization of GC-rich and AT-rich regions in their genomes.

Nucleolar organizer region staining (NOR staining)

The ribosomal RNA genes that form and maintain the nucleolus in interphase nuclei are located on the short arms of the acrocentric, satellite chromosomes (13, 14, 15, 21 and 22). When chromosome preparations are treated overnight with silver nitrate solution, these nucleolar organizer regions (NORs) stain darkly. The satellites of the acrocentric chromosomes are often seen to group together within cells. This phenomenon, called satellite association, presumably reflects the common function of the different NORs in the organization of the cell's nucleolus. Studies have shown that this method only stains the active NORs that participated in the formation of the nucleolus in the preceding interphase of the cell cycle. The NOR staining pattern of acrocentric chromosomes is consistent within an individual and is heritable. NOR patterns and the Q-banding appearance of acrocentric satellites are therefore useful for determining parental origin and/ or the stage of meiotic non-disjunction involved in trisomies involving these chromosomes. NOR banding patterns are now known well over 200 fish species. It has been reported in various species such as 5 species of order Gymnotiformes viz., Gymnotus carapo, Apternotus, Sternopygus macrurus, Eigenmannia virescens and Eigenmannia sp, 10 neotropical species of family Cichlidae (Perciformes), Danio rerio, Ptychobarbus conirostris, Schizothoraichthys labiatus (Cyprinidae), Triplophysa microps and T. stoliczkae (Cobitidae) etc.

Advanced Cytogenetic Marker

Restriction enzyme banding (RE -banding)

The Restriction endonuclease is bacterial enzymes that cleave duplex DNA at specific sequences of nucleotides and generated a banding pattern by cleavage or loss of DNA. It produces banding pattern that do not easily banded by other methods. Many of the enzymes used to generate C band-like patterns followed by G banded patterns, and none are generating R bands. The effects of the digestion with type II restriction endonuclease on fixed chromosomes showed the existence of regions resistant to these enzymes, and produces differential banding patterns. The action of a restriction endonuclease depends on the number of target sites at a given chromosomal area. When the number of the targets is high, short DNA fragments (less than 1 kb in length) are extracted during the treatment. While low frequencies of recognition sites produce longer DNA fragments (more than 1 kb in length) which are retained by chromosomal proteins. Some restriction endonuclease produced a well-defined

pattern on chromosomes which was generally similar to the pattern generated by conventional C-banding. The bands generated with restriction endonucleases, however, were more evident in the telomeres than C-bands. Small bands can also be visible by restriction endonuclease treatment which is generally not detected by C-banding. Restriction enzyme banding provides additional information on fish chromosome such as chromosome identification viz the size of the chromosome, the position of the centromere, homologous pairs of chromosomes, DNA base composition, and repetitive components of the genome.

Fluorescent banding:

A fluorescent banding technique is a method for labeling a chromosome with some stains (Chromomycin A3 (CMA), 4'-6-diamidino-2-phenylindole (DAPI)), viz. coated with fluorescent material. Fluorochrome banding techniques, together with other chromosome banding methods (Giemsa, C-banding, and AgNOR-banding), are powerful tools in the cytogenetic and Kary systematic analysis. It allows one to characterize the heterochromatic bands concerning their satellite DNA composition. AT-enhancing fluorochromes such as quinacrine or DAPI have been used to resolve C-bands in most of fishes such as salmonids, a poecilid, and several European percids exhibiting dull bands. Whereas the GC-enhancing fluorochrome CMA has been used to resolve C-bands in a North American percid exhibiting bright band. The use of fluorochromes with opposite base-pair affinity and digestion using restriction endonuclease with specific-recognition targets has revealed differences in composition and organization in constitutive heterochromatic blocks detected by conventional C-banding in several species. Fluorochrome banding has been of great help in the identification of homologous chromosome pairs and the presentation of karyotypes and ideograms, structural chromosome variation, amount, distribution and type of heterochromatin. Banding patterns help us to know the difference between cytotypes, species, and groups and hence reflecting the dynamics of chromosomal differentiation and evolutionary divergence in fishes. Fluorochrome banding is largely restricted to birds and mammals, but limited in amphibia, fish, invertebrates, and plants and very poor in reptiles.

Replication Banding

This is a technique which includes substitution of thymidine by 5-Bromo-2'-deoxyuridine (BrdU) during S phase of the cell cycle in DNA. It was first introduced by Latt in 1973. After the incorporation of thymidine analog(BrdU), metaphase chromosome is the stained with fluorochrome mainly Hoechst 33258(bind to AT-rich region of DNA) or acridine orange which shows weak fluorescent and stains lightly with Giemsa. Thus the region where thymidine is incorporated appears to be a fluorescent band than the segment with BrdU. The replication banding involves two procedure they are: T-pulse and B-pulse.In case of T-pulse, the BrdU made available during early replicating S phase and then replaced by thymidine for 5-6hr before harvest. Thus after Giemsa staining the early or replicating chromosome stains lightly while late replicating chromosome stains darkly.B-pulse is the procedure where the thymidine is made available during the early replicating phase of chromosome while BrdU is made available during 5-6hr before harvest. Therefore the early replicating chromosome will stain darkly with Giemsa stain while the late replicating will stain lightly. After the cell has undergone two complete replication cell cycles in the presence of BrdU, the sister chromatids will stain differentially and enable to detect exchange between sister chromatids. In fishes, replication banding is one of the most important karyotyping methods which are used to find out the chromosome homologies between karyotyped chromosome, sex differentiation, evolution mechanism between species, replication time of all important chromosome bands and chromosome locus eg: ch-4q locus in zebrafish found to be late replicating by BrdU technique. Although much study can be possible through restriction banding, it is still restricted to a limited number of species of fishes.

CMA3 staining

In human, the chromatin of matured sperm is replaced by positively charged protamine to form tightly packed non supercoiled DNA. This help to maintain the integrity of the paternal genome during transmission from male and female reproductive tract. Many studies have shown that failure in the fertilization of sperm is mainly concerned with sperm chromatin anomalies. In order to evaluate the functional status of sperm chromatin, CMA3 staining is done. It is a fluorochrome which binds to the protamine deficient region of chromatin. The positive staining shows that chromatin is less condense while negative staining indicates highly organized chromatin structure. In case of fish, CMA3 staining is mainly used to detect the variation in NOR region. It indicates the evolutionary process taken place and also helps to distinguish between species or families.CMA3 banding is usually similar to silver staining as both differentiate the NOR region but the difference is that silver does stains NOR during late prophase I to metaphase II and also genetically inactive NOR. In the present scenario, along with CMA3 staining, the FISH technique is also used to identify NOR regions in the chromosome to correctly validate the result.

Conclusion

The present investigation of the study pointed out that fish chromosome has lagged far behind than the mammals, birds, turtles, snakes, and amphibians due to smaller in size and larger in number. It is clear that most types of metaphase chromosome banding can be carried out on fish chromosomes, some of which proved useful for identifying homologies both within and between fish species or some other produced confusing results.

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Molre References can be provided on request

Legendry Mahseer Conservation: Looking Beyond Knowledge

Salim Sultan

The Bigger picture: Mahseer, the much acclaimed legendary sport fish of Indian subcontinent, is represented by 47 species globally out of which fifteen species are reported in India. This cyprinid fish is characterised by their large scales and thick powerful lips with relatively longer barbells. It prefers temperature between 50C and 250C, upon maturity the adults inhabit lowland rivers and lakes and migrate upstream in torrential monsoon conditions to reach suitable spawning grounds. The fish generally breed during floods and spawn over rocky gravel substrate often in ephemeral waters. The fecundity is low 6 000 -10 000 eggs/kg. The individuals grow at an average rate of 10 cm annually. It is carni-omnivorous in feeding habits.

The decline: Mahseer occur in almost all Asian countries especially in Indian subcontinent. The species have suffered severe population declines in much of its distribution range, and are under stress. Out of the 15 species found in our country, 13 have been assessed by ICUN, 2014 for threat status. Of these, 5-near threatened, 1 critically endangered, 3 endangered and 4 are data deficient.

The battle is on: The population of Mahseer have declined fast in last half century and this is further continued unabated. The important factors which make this genus vulnerable are:

Biological factors: Delayed gonad maturity, Low fecundity (6000 to 10000/kg), slow long embryonic and somatic development, long hatching period (80 - 90 hrs), hatching to free swimming stage - 10 days, slow growth rate (10 cm/yr). The fish generally breed during floods and spawn over rocky, gravel substrates, often in ephemeral headwaters. Fish of all ages remain carni-omnivorous and the fish <46 cm size become piscivorous.

Overexploitation: Highly susceptible to capture during migration for breeding and subsequent indiscriminate fishing of fry, fingerlings in post monsoon season by hooking, netting, dynamiting and electrocuting etc.

Habitat fragmentation: Construction of dams, barrages/weirs across the flowing waters acts as physical barrier which impacts physical movement. This coupled with excessive deforestation in catchments catalyses degradation of environment changing hydrological and biological features irrevocably.

Unfavourable traits for aquaculture: Slow growth in captivity makes economically unprofitable hence farmers do not show any interest in culture of this fish. This restricts the revival of stocks through culture fisheries.

Absence of legal frame: Fisheries Acts in most States focus over commercial Fishery Regulations and are not effective in overall conservation or protection.

Contrary economic interest: There is money in fishing; hence fishers overstep limits harming the population beyond renewable limits.

Taking the plunge: Looking beyond fundamental research, institutions should work towards creating an ecosystem that can boost the number of sustainable mechanisms. There is need to understand *'Chain of Command'* to get sustainable Mahseer population in open waters. Realizing the severity of above mentioned causes, integrated conservation plan is needed involving Ministry of Environment & Forest and Local Communities fully. The idea must address real need in a larger perspective as in absence of protection measures; replenishment of stock by artificial propagation has very limited scope.

Highlight Points

- **Mahseer is the single most important game fish found in Indian sub-continent, represented by 15 species out of 47 species found globally.**
- **The fish has suffered significant decline in recent past.**
- **ICUN, 2014 has assessed 13 species to evaluate threat perception.**
- **Habitat destruction, over exploitation and biological traits are some of the contributing factors responsible for reduction in population.**
- **Several agencies and State governments are working to rehabilitate this fish.**
- **Efforts made by TATA Power Corporation are worth to emulate by other agencies to achieve the desired goals.**
- **This article has compiled the status of progress made by different governments and agencies for introspection and course correction.**

1. **Bottom line:** Atlas of Mahseer HOTSPOTs must be created for establishment of 'Conservation Reserves' or 'Community Reserves' based on scientific, social and management studies for locating spawning areas to adopt site-base restoration. These identified and demarcated *'Zero Tolerances Zones'* should get legal protection supplemented with conservation efforts.
2. **Site Based Conservation Projects:** Both *in-situ* and *ex-situ,* including ecotourism projects need to be engaged on identified locations rather than sporadic for meaning full outcome of initiatives. Enforcement of fishing rules is easier at these points all along the river stretches.
3. **Breeding Population:** Flourishing breeding population of any species is essential to maintain continuity of generations. Hot Spots, Sanctuaries and Conservation Sites must be notified as 'No–go Areas' to facilitate unhindered natural breeding of native stock. It has been experienced that places under protection for any **socio-religious** reason are the only places where wild population is thriving well. This opportunity must be explored to uphold the sanctity of these delineated 'No-go Areas'. Further, these protected brooders can supplement quantitatively much more number of fry/fingerling than hatcheries without any human involvement.

Attitude is everything: Community Awareness & Participation on Mahseer conservation is lacking in riparian population and mostly remained within scientific circles. There is no existing institutionalized mechanism. The local community, especially young minds, need to be incentivized and motivated to ensure their participation. The media needs to be sensitized and mobilized for addressing conservation issues. Financial interest of locals, earning their livelihoods from fishing, should also be made part of economic module to get their confidence. Training of Locals as Guides for tourists will help in river patrolling and poaching control simultaneously. The team and resources to convert the idea into a profitable engagement are a must.

Institutional Linkages: Presently no such linkage is in place, an institutional framework comprising diverse stakeholders to plan, design, implement and monitor is required for convergence of conservation initiatives. The capacity of various line departments dealing with Mahseer related issues should be further developed. A Steering Committee consisting following departments will be useful: Fisheries, Irrigation, Water resource, Tourism, Forest, Hydro power, Public and Private sector companies and Local communities.

Lessons Learned:

1. **TATA Power Corporation:** The Mahseer conservation project in association with State Fisheries Department, Maharashtra, was initiated more than four decade ago under the supervision of Mr S.N. Ogle. Tata power program operates on three thematic areas – captive breeding facility at Walvhan, Lonavla, awareness and sensitization and ecology. The project included setting up of a Mahseer hatchery of capacity to hatch five lakh eggs at a time. The four decade old project has enabled the return of Mahseer in Indrayani River successfully.
2. **WWF-India:** Conducted Golden Mahseer survey and is in process of preparing the species management plan along 30 km stretch of River kosi in Uttarakhand.www.wwfindia.org
3. **ICAR-DCFR:** Directorate of Cold water Fisheries Research, Bheemtaal, Uttarakahnd is continuously engaged in multidimensional research pertaining to cold water fishes. The ongoing project entitled 'Captive management of Golden Mahseer in perspective to aquaculture and conservation' includes photo-thermal in captivity, Molecular characterization and gene expression profiles of kiss genes and Devising a feeding regimen based on return of appetite in golden mahseer (Tor putitora) larvae/juvenile.
4. **International endeavours**
5. **Mahseer Trust:** The United Kingdom based organization is engaged in advancement in scientific knowledge through research and interaction for conservation in collaboration Indian partners. info@mahseertrust.org.
6. **Bhutan:** Ministry of Agriculture and Forest, Department of Live Stock (National Research & Development Centre for Aquaculture), Royal Government of Bhutan and Fisheries Conservation Foundation (FCF) are working on Mahseer conservation project through understanding migratory and spawning behaviour in wild habitat. info@fishconserve.org.
7. **Nepal:** Department of National Parks and Wildlife Department, Tribhuwan University, Royal Nepal Academy of Science & Technology, King Mahindra Trust for nature Conservation and International Centre for Mountain Development, Save Himalayan Aquatic Resources (NGO) are the leading organizations working on conservation of biodiversity including Mahseer.
8. **Bangladesh:** Experiments for compatibility of Mahseer with Indian Major Carps in poly culture were carried out. Results have shown the survival rate of Mahseer for about 95% without any loss of growth.

State Efforts: Various States in the country has initiated conservation plan to improve the status of Mahseer in natural waters that includes setting up of hatcheries and management measures. However, the emphasis is more over the artificial propagation while the results are not as encouraging as planned from the hatcheries.

Artificial Propagation: The Mahseer hatchery technology developed by Tat Power Corporation Limited (TPCL) has facilitated establishment of hatcheries in Jammu & Kashmir, Himachal Pradesh, Uttara Khand etc. Extensive studies has now standardised the techniques. However, except Tata farm the output of fingerlings is insignificant from any of these hatcheries reinforcing the need of protection of stock through conservation tools, in addition to scaling up of fingerling production.

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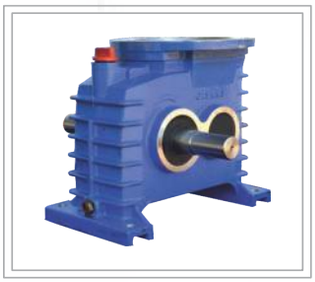

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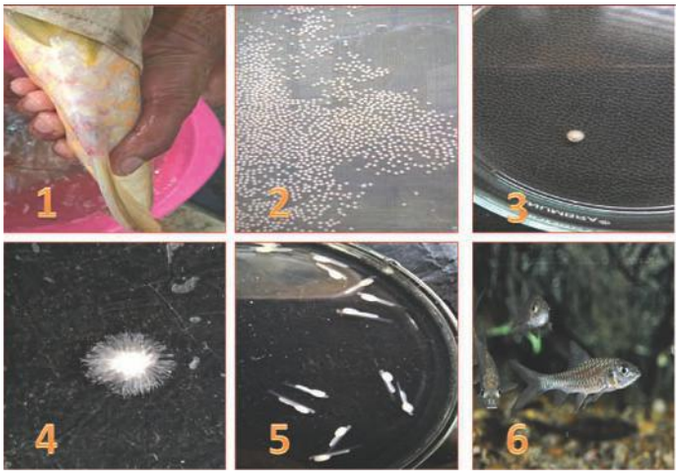

Life cycle of Tor Putitora 1-Gravid female, 2- Eggs, 3- Single egg, 4- Embryonic development, 5- Spawn, 6- Fingerlings at Machial Hatchery, Himachal Pradesh

1. **Jammu & Kashmir:** Department has established an exclusive hatchery at Anji, Reasi, J&K in 1999. Hatchery produces about 25000 fry annually to be released in natural waters.
2. **Himachal Pradesh:** State has established Mahseer Fish farm with an expenditure of about Rs 7 cr. Facilities created are Total area: 2.5 ha, Total water area: 4500 sq mt, Nursery Ponds: 1800 sq. mt. 16 no.,Rearing Ponds: 1800 sq. mt. 06 no.,Brooder Ponds: 900 sq mt 02 no. This hatchery produces about 20 000 fertilized eggs annually since last three years.
3. **Uttara Khand:** Forest Department allotted 24 km of Ramganga River in Corbett Tiger Reserve for private beat management.
4. **Kaveri Mission:** It will coordinate an interstate effort, including Karnataka, Kerala and Tamil Nadu, to implement a number of micro projects to address a broad range of issues that affect the health of the Cauvery River catchment and the rapidly declining population status of this fish with the involvement of Mahseer Trust, Tata Power, Bombay Natural History Society, WWF-India, IUCN Freshwater Fish Specialist Group, Wildlife Association of South India, Coorg Wildlife Society, as well as individuals within the Forest Departments of Karnataka, Kerala and Tamil Nadu.
5. **Madhya Pradesh:** Forest department through Biodiversity Board making efforts to breed Mahseer. Fisheries Federation, MP, also bring fingerlings from Tata Farm, Lonavla to stock in reservoirs. Efforts are on to establish exclusive hatchery for this fish in the state.
6. **Rajasthan:** The Forest Department has succeeded in rearing and breeding of Mahsser obtained from Tata Farm, Lonavla, at Udaipur.

Carp seed production in cylindro-conical hatchery units at Ganga Matshya hatchery

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Introduction

In West Bengal and other states in our country, the basic requirement of commercial fish culture is fish seed (spawn, fry, fingerlings) and induced breeding is the only dependable method for healthy and good quality fish seed production and supply. M/s. Ganga Matshya hatchery, located at Purba Collegepara, under Raiganj Municipality, P.O. Raiganj, Dist. Uttar Dinajpur, WB has gained immense expertise in induced breeding and seed (spawn; pure variety/ quality) production of major carps, economically-important medium carps, black carp *Mylopharyngodon piceus* and *Pangasianodon hypophthalmus* in a commercial scale. Established in 2001, this hatchery has obtained hatchery accreditation and seed certification from Department of Fisheries, Government of West Bengal on 15th May, 2015. Proprietors of this hatchery are Sri Kapil Prasad Chouhan, Sri Goutam Chouhan, Sri Dilip Kumar Chouhan, Sri Manik Kumar Chouhan and Sri Ranjit Chouhan.

Highlight Points

M/s. Ganga Matshya hatchery, located in Uttar Dinajpur district, West Bengal is presently a leading fish hatchery of repute in north Bengal. Since 2001, this hatchery has become a reliable supplier of best quality fish seed to fish farmers. Instead of the familiar circular, double-chambered egg incubation units (Chinese model), incubation of fertilized eggs, hatching and production of hatchlings is done here in cylindro-conical shaped concrete hatchery units. Authors visited Ganga Matshya hatchery on 26/10/2018 and gained much knowledge and information.

Cylindro-conical type egg incubation-cum-hatching units (also called vertical flow incubators, funnel incubators or vertical jar hatchery) are used for the

Semi-squarish fish breeding pool

incubation of non-adhesive fertilized eggs of warm water fishes. Eggs of a single species of major carp/medium carp is placed in each of such hatchery. Those are made of hard materials like fibre-glass (FRP) or metal. Water is introduced @ 400-2000ml/min from the inlet positioned at bottom of cylindro-conical incubator. In the improved hatchery technology for Asian seabass *Lates Calcarifer* introduced by ICAR-CIBA, Chennai, the hatching (incubation) tanks are around 200lit capacity of cylindro-conical shape. Sea bass fertilized eggs 0.8-1.0mm are released; hatched-out larvae after 17-18 hours are scooped out using plankton nets and transferred into larval rearing units.

Vertical flow incubators/jar incubators are also used in trout hatchery units in north India meant for seed production of *Salmo trutta fario.* Each jar is cylindro-conical in shape, narrow bottom end fixed to water inlet. Size of jar is 35cm diameter, 80cm in height and 70lit capacity, where 4,00,000 eggs can be incubated at a time. In 1985, the D-85 model of carp hatchery was introduced in India, which is a jar of size 200lit with conical bottom.

Hatchery set-up and activities

At Ganga Matshya hatchery, spawn of the fishes *Labeo rohita, Catla catla, Cirrhinus mrigala, Hypophthalmichthys molitrix, Cirrhinus reba, Labeo bata, Mylopharyngodon piceus, Labeo calbasu, Puntius javanicus* are produced and sold in polythene oxygen packets. Pangas catfish *P. hypophthalmus* are sold in fry/advanced fry stage. Commercial fertilizers are not used in brood stock ponds neither in nursery ponds. There are 24 brood stock ponds ranging from 0.5-1.5 acres in area (total area: 18 acres or 54 bigha). Proper brood ratio, quality feed and water quality maintained in brood stock ponds. Concrete slabs are provided at pond bank slope all around to prevent growth of aquatic weeds and save pond banks from erosion particularly during rainy season. Farm-made formulated feed, both in pelleted and dough ball form is used for broodfishes. Additionally liquefied paste of ground nut oil cake supplemented with Vitamin is used for *C. catla* and *H. molitrix* broodstock.

Hatchery premises

Broodstock is maintained from September-October onwards for the next/upcoming breeding season. In each season (mid-April to mid-August), 40,000 *bati* (spawn measuring cup) spawn are produced comprising eight species of carps. Instead of Ovaprim, pituitary gland extract is preferred as the inducing agent. There are 2 large circular breeding pools each of 16 feet diameter and 7 breeding pools (semi-square shaped) each of 11 feet diameter. Additionally there is one circular egg incubation-cum-hatching chamber (Chinese model), 64nos of cylindro-conical egg hatching units and 36nos of rectangular concrete spawn holding/rearing tanks.

Rectangular spawn holding tanks

Structure of cylindro-conical hatchery

At Ganga Matshya hatchery, dimension of each cylindro-conical, concrete egg incubation-cum-hatching unit is:- diameter 3 feet, wall thickness 3 inches, total height 4 feet, inlet pipe 0.75 inch dia (having regulatory valve to control water flow) and normal capacity 200lits. Each unit consists of a cylindrical shape upper portion and a funnel shape bottom. In each unit, 26-32lits (1lit = 20,000 eggs) of fertilized eggs are introduced and kept in one operation and 90% hatchlings (hatching percentage) are produced from it. In each such unit, eggs are kept in a separate egg container made up of georgette (fabric) cloth that remains suspended inside the jar/hatchery unit. Egg container is fixed in inner wall of hatchery unit in its upper portion and top portion of cloth container is attached to some support provided over the top

Cylindro-conical egg incubation units

of concrete structure.

After hatching, as soon as the egg shells dissolve and are eliminated, hatchlings with yolk sac are transferred from these units to rectangular spawn rearing chambers (7feet x 10feet x 2.5feet). Nursing of the advanced hatchlings with yolk sac is done for 72 hours, by this time, yolk sac is absorbed. Before sale, the deformed spawn are removed. At time of sale, each *bati* holds 50,000nos spawn of each of *L. rohita, C. catla* and *H. molitrix*; 80,000nos of *L. bata* and 1,80,000nos of *P. javanicus.* In each chamber, 50-55 *bati* of clean, healthy, ready-to-be-sold spawn are produced. Spawn is sold @ Rs 250/- - Rs 1100/- / *bati*, price falling during later part of breeding season.

In every season, more than 2000 customers buy carp spawn from Ganga Matshya hatchery, spawn are sold three days a week. It has been estimated that 9-12 *bati* major carp spawn are produced from each of cylindro-conical egg incubation-cum-hatching unit in one operation. Few hours before sale, boiled egg yolk is blended in mixing machine, sieved and fed to spawn in rectangular chambers @ 2 egg yolks / 50 *bati* spawn. Advanced fry of *P. hypophthalmus* are produced in eight nursery-cum-rearing ponds. The 100gm (6-7 inch) stage attain 250gm in one month; 1kg pelleted feed (Rs 42/-/kg) is provided to every 100kg pangas catfish daily. During summer, it has been found to attain 500-600gm in 3 months. Total area of ponds at Ganga Matshya hatchery is 80 bigha. Brooders of big head carp *Aristichthys nobilis* are incompatible with *C. catla* brooders, so seed production of *A. nobilis* is not much preferred (although demand exists from farmers of eastern Bihar).

End note

Sri Kapil Prasad Chouhan and Sri Manik Chouhan entertained authors at this hatchery premises; they opined that good quality water will give good spawn production. If fish farmers are helped and motivated, it will lead to progress and development in fish culture. Bulk quantity of spawn for individual species of carps can be produced effectively in such cylindro-conical shaped hatchery. Species-wise spawn, according to demand of fish farmers, are produced and sold. Fish farmers from Uttar Dinajpur district, Jalpaiguri district, Nishiganj and other areas of Coochbehar district, Hili, Balurghat, Kushmandi, Gangarampur and other areas of Dakshin Dinajpur district, fish seed traders and fish farmers from Sujapur in Kaliachak Block of Malda district, Purba Medinipur district, even those from eastern Bihar procure fish spawn from this hatchery. More man-power is required in operating such egg incubation-cum-hatching units in comparison to conventional Chinese circular hatchery, Chouhan brothers explained.

Among Indian major carps, 70% of spawn produced here is that of *L. rohita,* 20% of *C. mrigala* and 10% of *C. catla*. Sri K. P. Chouhan had obtained one-month training on freshwater fish culture and carp hatchery management at ICAR-CIFA, Bhubaneswar in 1992. In addition to afore-mentioned five persons, 2 Technical Officers, 2 official staff and 25 workers manage the entire activities efficiently at Ganga Matshya hatchery. Larger fingerlings and sub-adult stages of Indian major carps collected by fishermen from river Koshi in Bihar and river Ganga at Farakka in Murshidabad district and other places are stocked and reared upto broodstock stage. Fingerlings of grass carp and silver carp and procured

Authors with Sri K. P. Chouhan

from fish farmers for raising upto broodstock. Recently endeavour has been taken to produce fry stages (1 inch) of monosex Tilapia and *M. piceus* in nursery ponds, the latter introduced to eradicate aquatic molluscan population. About 250onos fry of *M. piceus* is being produced here and sold every season. Buyers/customers have 100% faith in obtaining pure quality seeds of Indian major carps and other commercially-important fishes according to requirement from Ganga Matshya hatchery. It has been fulfilling the fish seed requirement of different areas of West Bengal, Bihar and Nepal genuinely, leaving a good name for the hatchery to its customers.

Popularization of fresh fish cutting style for value addition in processing industry

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Introduction:

Fishes are known to be an excellent source of protein and healthy fatty acids. It is a staple diet of human beings long before the advent of agriculture. Fish come in all sorts of shapes and sizes; it is sometimes difficult to understand which part of a fish we should use in preparation of different recipes. There are a number of common cuts of fish are available but most of the people will have heard of fillets or steaks, others type of cuts are no longer used by many fish sellers in the market which can cause much confusion to the shopper. On the contrary in this internet era online shopping becoming more and more popular so when it comes to fish selling in online it is now even more important that the right name is given to the right type of cut of a species. The aim of this article to popularize the various type of fresh fish cutting style with the suitable species that will addvalue tothe products bas well as it increases the consumer attraction towards the variety of value-added products.

Different type of fresh fish cutswith accompanying pictures and descriptions:

1. **Whole:** The whole fish may not exactly be a cut. It is still quite a common way to cook a fish. It can be kept as such whole or just been scaled, gutted, fins removed and tail cut slightly. Any large flat fish such as Halibut, Brill, and Turbot can be used.

Fig 1: Whole striped bass

2. **Dressed:** In case of dressed fish viscera, head, and tail are used to removed (some fish may have the tail on) but with skin and bone retained. All fishes are suitable for this method except the largest fish species.

Fig 2: Fresh red tilapia dressed

Fig 3: Red tilapia pan-dressed

3. **Pan-Dressed:** Small to medium sized whole fish which is scaled, gutted and the fins, head, and tail removed used in pan-dressed. All small to medium sized round or flatfishes are suitable for this method.

4. **Fillets:** Fillets can be the boneless or 'pin bone-in' and consist of the complete sides of a fish from just below the gills to tail, being cut away from the backbone and removed in one piece. Available from any fish - round or flat exception includes ray, skate, and monkfish etc.

Fig 4: Nile perch fillets

5. **Butterfly Fillets:** Round fishes are used to de-headed then filleted by cutting through the belly, opening it flat then removing the backbone and smaller bones and joined like a 'butterfly' style. Fishes mainly used are herring, mackerel, mullet, sardines, tilapia, trout, whiting, etc.

Fig 5: Mackerel butterfly fillets

6. **Tail cut:** It is the part of fish nearest to the tail fin in a solid piece with the bone. The backend of a large fish closest to the tail is normally cut and sold separately.

Fig 6: Tail cut

7. **Steaks:** A thick and boneless piece of fish cut from big fish such as tuna or swordfish is called steaks. Here portion cut through the bone of a whole dressed round or flat fish like as a cutlet but it is slightly thicker and often cut from between the mid-body and tail.

Fig 7: Fish steaks

8. **Troncons:** Portion of fish is cut through the bone of a whole flat fish into single portion size. Troncons are another fish cut but relate to flatfish on the bone i.e. skate or sole.

Fig 8: Troncons cut

9. **Goujons or Goujonette:** In this method of cut narrow strips up to

Fig 9: Ray Goujons fish cuts

Highlight Points

- **Fish come in all sorts of shapes and sizes and there are a number of common cuts of fish are available.**
- **Different cutting style of fresh fish will help to popularize the various types of fish cuts with their suitable species.**
- **It will add value to the low-cost fish and helps in product diversification.**

10cm/4-inches long x 1cm/½-inch wide x 1cm/½-inch thick which is cut from a fillet. These are known as finger cuts and being coated with breadcrumbs before being deep fried.

10. **Loins:** A prime part of a fillet taken from larger round fish such as Cod or from either side of the backbone of large game fish like Tuna.

Fig 10: Fresh Bluefin tuna loins

11. **Cutlets:** It is a cross-section portion sliced straight through the backbone of a whole, dressed, round fish and slightly thinner than a steak, usually around 12mm/½-inch thick. It is also known as darnes cuts. Fishes are suitable for this type of cuts like Cod, Salmon, and Pollock.

Fig 11: Fresh salmon cutlets

12. **Cheeks:** As the name implies, these are cut from the head of larger mature fish and are the small pockets of flesh found just below each eye. The cheeks are a delicacy when it is taken from larger specimens such as monkfish, cod, hake, haddock,and Halibut.

Fig 12: Fresh halibut cheeks

13. **Paves:** The fillets are cut in half or into thick portions width wise and normally the skin is left on. Larger flatfish such as Halibut, Turbot, and Brill are suitable for this method.

Fig 13: Pacific halibut paves cut

14. **Paupiettes:** It is the fillet of fish spread with a farce and neatly rolled and tied in a knot. The fillet is rolled from the tapered tail to the wider head end and poached.

Fig 14: Paupiettes of solefish

15. **Wings:** The wings are usually removed and sometimes skinned from larger specimens. Any large round fish such as Salmon, Hake, Cod, Monkfish, and Sea Bassis suitable for this cut.

Fig 15: Skate Wing

16. **Medallion cut:** This cut is same as supreme but a little more on the slant and then trimmed carefully to a neat round or oval shape. A very small portion of fillet cut from 1 to 2 inches (2 1/2 to 5 cm) thick.

Fig 16: Salmon Medallion cut

17. **En tresse:** It is also known as plaited. Fillet of fish cut lengthwise into three and plaited.

Fig 17: En tresse cut

18. **Delice:** A fillet of fish which has been trimmed and neatly folded for presentation prior to cooking.

Fig 18: Delice fillet style

19. **Meuniere:** Pan-frying of fish, finished with butter noisette, chopped parsley, and lemon juice added.

Fig 19: Meuniere fillets

20. **Mignon:** Fillet of fish folded as cornet, triangular fold as for piping bag.

Fig 20: Mignon fillet style

Conclusions: Each and every part of the fish body is useful and proteinous. Fishery products play a very important role in the economy of our country. Therefore awareness regarding the different form of value-addition in fishery products must be needed. So popularization of the different cutting style of fresh fish willb add the value to low-cost fish and helps in product diversification which will, in turn, increase the consumer attraction towards the variety of value-added products.

Endangered Olive Ridley Turtles Found Dead Along Tamil Nadu Coast

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The olive ridley sea turtle (*Lepidochelys olivacea*), also known as the Pacific ridley sea turtle, are the smallest and most abundant of all sea turtles found in the world. This species of sea turtle is found in warm and tropical waters, primarily in the Pacific and Indian Oceans.

Common Name: Olive ridley – named for its olive green colored shell

Scientific Name: *Lepidochelys olivacea*

Description: Head is quite small. Carapace is bony without ridges and has large scutes (scales) present. Carapace has 6 or more lateral scutes and is nearly circular and smooth. Its body is deeper than the very similar Kemp's Ridley sea turtle. Both the front and rear flippers have 1 or 2 visible claws. There is sometimes an extra claw on the front flippers. Juveniles are charcoal grey in color, while adults are a dark grey green. Hatchlings are black when wet with greenish sides.

Size: Adults measure 2 to 2.5 feet (62-70 cm) in carapace length.

Weight: Adults weigh between 77 and 100 pounds (35-45 kg).

Diet: Have powerful jaws that allow for an omnivore diet of crustaceans (such as shrimp & crabs), mollusks, tunicates, fish, crabs, and shrimp.

Habitat: Generally found in coastal bays and estuaries, but can be very oceanic over some parts of its range. They typically forage off shore in surface waters or dive to depths of 500 feet (150 m) to feed on bottom dwelling crustaceans.

Nesting: Nest every year in mass synchronized nestings called arribadas (Spanish for "arrival"). Only the Kemp's ridley also nests this way. Nesting 2 times each season. An average clutch size is over 110 eggs which require a 52 to 58 day incubation period.

Range: The olive ridley inhabits tropical and subtropical waters of the Pacific, Indian and Atlantic Oceans.

Status: U.S. – Listed as Threatened (likely to become endangered, in danger of extinction, within the foreseeable future) in 1978 under the U.S. Federal Endangered Species Act. ***International*** – Listed as Vulnerable (facing a high risk of extinction in the wild in the near future) by the International Union for Conservation of Nature and Natural Resources.

Threats to Survival: Direct harvest of adults and eggs, incidental capture in commercial fisheries and loss of nesting habitat are the main threats to this species.

Population Estimate: 800,000 nesting females.

SCIENTIFIC CLASSIFICATION:

Kingdom:	Animalia
Phylum:	Chordata
Class:	Reptilia
Order:	Testudines
Suborder:	Cryptodira
Family:	Cheloniidae
Genus:	Lepidochelys
Species:	***L. olivacea***

DISTRIBUTION:

The olive ridley turtle has a circumtropical distribution, living in tropical and warm waters of the Pacific and Indian Oceans from India, Arabia, Japan, and Micronesia south to southern Africa, Australia, and New Zealand. In the Atlantic Ocean, it has been observed off the western coast of Africa and the coasts of northern Brazil, Suriname, Guyana, French Guiana, and Venezuela. Additionally, the olive ridley has been recorded in the Caribbean Sea as far north as Puerto Rico. A

female individual was found alive on an Irish Sea beach on the Isle of Anglesey, British Isles,

CONSERVATION STATUS:

The olive ridley is classified as **vulnerable** according to the International Union for Conservation of Nature and Natural Resources (IUCN). The Convention on Migratory Species and the Inter-American Convention for the Protection and Conservation of Sea Turtles have also provided olive ridleys with protection, leading to increased conservation and management for this marine turtle. National listings for this species range from endangered to threatened, yet enforcing these sanctions on a global scale has been unsuccessful for the most part. Conservation successes for the olive ridley have relied on well-coordinated national programs in combination with local communities and nongovernment organizations, which focused primarily on public outreach and education. Arribada management has also played a critical role in conserving olive ridleys. Lastly, enforcing the use of turtle excluder devices in the shrimp-trawling industry has also proved effective in some areas. Globally, the olive ridley continues to receive less conservation attention than its close relative, the Kemp's ridley (L. kempii). Also, many schools arrange trips for students to carry out the

conservation project, especially in India.

Several projects worldwide seek to preserve the olive ridley sea turtle population. For example, in Nuevo Vallarta, Mexico, when the turtles come to the beach to lay their eggs, some of them are relocated to a hatchery, where they have a much better chance to survive. If the eggs were left on the beach, they would face many threats such as getting washed away with the tide or getting poached. Once the eggs hatch, the baby turtles are carried to the beach and released.

Another major project, in India involved in preserving the olive ridley sea turtle population was carried out in Chennai, where the Chennai wildlife team collected close to 10,000 eggs along the Marina coast, of which 8,834 hatchlings were successfully released into the sea in a phased manner.

DEAD ON ARRIVAL:

Dead olive ridleys have been spotted every year of January and March months in Tamilnadu coastal areas like Chennai, Pondicherry (UT), Cuddalore and Nagapattinam districts. Arribada, in Spanish, means arrival. It also refers to the unique mass nesting phenomenon depicted by the Olive Ridley Sea Turtles. These mid-sized turtles, named for their olive green carapace, usually inhabit the warm, tropical waters of the pacific and Indian Ocean. Every year however, they travel thousands of kilometers to return to the shores where they born, to lay their clutches of eggs. Tamilnadu coastline is a popular nesting ground. But it also proves to be a death trap as recent news reports indicate there have recently been an alarming number of Olive Ridley deaths on the Tamilnadu coastal beaches.

The endangered Oliver Ridley turtles, well-known for their coordinated nesting in large numbers, mostly breed between **January and March** in southern India. After nesting, the female turtles swim ashore to lay eggs by digging pits in the sand. The hatchlings emerge 45 to 50 days after nesting. The female turtles, however, do not wait to see their eggs hatch and return to the sea.

There are many factors at play here, Climate change, fishing trawlers, predators like dogs and crows, scarcity of food, and also the garbage that clogs the sand and the waters. "We don't know what the survival rate of these hatchlings are," adding since it is the female turtle that comes to shore, "an entire generation is lost if she dies.

Over a hundred and more Olive Ridley turtles have been found dead along Chennai and Tamilnadu shores in the last two to three years since the nesting season began. Conservationists are worried there could be a three-fold jump in turtle casualty this season due to various reasons, including the use of banned gill nets and mechanized fishing boats. It's heart-breaking to find dead turtles tangled in nets with the soft tissue of their neck and fins sliced by nylon strings along the beaches.

REASON FOR DEATH:

The main reason for the deaths is the use of gill nets by fishermen. The turtle get caught in the net and are suffocated to death. The government has introduced the turtle excluding device (TED) to ensure turtles are not harmed during fishing. When this device is used along with the net, good portions of the fish that are caught escape through the gap along with the turtles complain fishermen. Excluder devices which allow them to escape through openings. These openings may allow around two per cent of the fish to escape which is why fishermen don't use these nets. However, alleges that fishermen have failed to use the device as instructed.

CONCLUSION:

The total number of olive ridley turtle deaths of its nesting season has reached alarming numbers. Conservationists who have been monitoring the nesting of the endangered olive ridleys for years now are shocked by the death doll for past years. In, 2017 & 2018; the entire nesting season saw 217&193 deaths in Chennai. But now, in, 2019 with over three months left for the season to end, the numbers are expected to increase further.

Over the past few years, some of the volunteers have been discovered the sea turtle nesting and suffering from cracked shells and cuts as well as soft tissue damage and internal injuries along the Chennai and coastline of Tamilnadu. There is a slim possibility that there could be a few more Olive Ridley turtle hatchlings in and around the location. A team has been stationed at the site to look out for more hatchlings, if present. Few nests have been sighted by volunteers so far and if the turtle population goes down, it could have terrible effects on the marine environment. These turtles eat jellyfish that in turn eat fish eggs. So a reduction in turtle population would mean a drop in the fish population as well.

A dead olive ridley sea turtle washed ashore and bloated with decomposition gases at Thirumullaivasal beach, Sirkazhi,Nagapattinam,India

Olive ridley Empty shells of eggs spotted at Thirumullaivasal beach, Sirkazhi,Nagapattinam,India

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