Volume I Issue II

SPLASH AND SHOAL

DEPARTMENT OF INDUSTRIAL FISH AND FISHERIES

Brahmananda Keshab Chandra College
111/2, B.T. Road, Bonhooghly, Kolkata - 700108

SPLASH AND SHOAL

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FROM PRINCIPAL'S DESK

Department of Industrial Fish and Fisheries, Brahmananda Keshab Chandra College has already published their first issue of newsletter "Splash and shoal" on 1st July, 2020. Now they are going to publish the second issue of the newsletter. It is indeed a great effort from their end to engage the students in nurturing the different spheres of fisheries and aquaculture. This newsletter is also going to be a platform for showcasing their departmental activities and students' achievements. I would like to convey my best wishes to the concerned faculties and students engaged in this project.

FROM EDITOR'S DESK

Department of Industrial Fish and Fisheries, Brahmananda Keshab Chandra College has started to publish newsletter since July, 2020 and this is the second issue. The main aim of publishing this newsletter is to motivate our students to gather in-depth knowledge on topics of their choice and to represent those in their words in the newsletter. This will improve their knowledge and help them to develop their writing skill. Apart from this, we are also trying to publish articles written by eminent researchers/scientists to inform the general people and students on various interesting facts related to fisheries. This newsletter also is a platform to showcase our departmental activities and achievements of our students.

COLUMN FROM ALUMNA

Daily Life of A Fisherman

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Few months back, me and my friends took the train to Digha, a coast which lies on the border of Odisha and West Bengal in the northern part of the Bay of Bengal in the East Midnapore district. We stayed in a small beach town called Shankarpur. Earlier it was a small fishing village, but now it has turned into a full time harbor with all infrastructures. It being off season, there were barely any tourists around but there were lots of fishermen, and hence I got to know the circumstances which occur in everyday life of a fisherman through a close observation.

The fishermen are all very welcoming and don't mind if you stand by their net for a while and watch them. Some even invite tourists to join them and help pulling the ropes down- for a little tip ofcourse. So I tried my luck and realized how tough the ropes are. It is unbelievable that the fishermen do this hundreds of times every day for so little amount of fish. Understandably they are thankful for any tourist's tips, which seem to have become a second little income for them.

The fishermen leave his home at the break of dawn with his fishing nets. They put the nets on the simple wooden boats that are lined up on the beach and start their voyage in the water a few hundred meter off the shore. Then they float the net and head back to the beach; each boat hauling a long rope from each of the net. The huge nets are so big and heavy that it takes about 30 fishermen to get them on the shore in joint effort. The fishermen form two groups, one for each of the net. It takes about thirty minutes until the nets are back on the shore. Curious, we move closer to see the catch and were surprised again to see that there is almost nothing in the net; just few catfishes. We surprised to see so much work for such a little return!!

The fisherman's job keeps his family anxious all the time. The fisherman at times, moves into the deep seas for a better catch and there are chances that he is caught in bad weather which always worries his family. The fisherman reaches ashore around evening when his family waits for him at the shore to help him to collect the fishes and prawns netted and to put the collection in different containers. After the containers are filled, the fisherman saves a couple of fish for supper and goes to the middleman who buys the same from him to sell it in markets in the city. On a good day, the fisherman returns with happy face with good amount of catch; but there are also such days when the fisherman returns with less or no catch. His family starves the same night and the fisherman feels sorrow and pain.

Thus, to be specific, a fisherman's job is very uncertain in sense of income and risky; he risks his life each day for the sake of his livelihood and to run his family.

GUEST COLUMN

Biofloc: A Time Demanding Aquaculture Technology

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Biofloc is a new and modern method of affordable and sustainable fish farming. In order to convert toxic substances into protein in a sequence of ammonia, nitrite and nitrate which are used as fish food, the cost of fish culture is reduced by 20%. It is a method of high density fish farming in shallow water, zero water drainage and indoor and outdoor fish farming. In true sense, it is a wastewater treatment system where essential beneficial bacteria are released into the fish tanks or ponds and water quality is improved by producing high cell microbial proteins by adding the necessary carbon sources (chitagur/molasses).

Biofloc method of fish farming is a sustainable and environment friendly method of fish farming. The world's population is growing day by day. Modernization of food producing sectors is needed to ensure food supply to this growing population. Expansion of this sector must be sustainable to ensure productivity, quality, use of appropriate technology, biosecurity and conservation of natural resources. The primary goal of sustainable fisheries is to produce more fish by significantly reducing the use of natural resources such as water and soil, improving fisheries practices, eliminating adverse effects on the environment, reducing the cost of fish farming and increasing profit margins. Biofloc technology is one of the various ways to meet the goals of sustainable fisheries. It is possible to produce more fish in less space using biofloc technology.

Ammonia is harmful to fish and shrimp. Nitrifying bacteria in water break down ammonia into nitrite and then to nitrate. This eliminates the toxicity of ammonia. Nitrifying bacteria use ammonia's nitrogen and water-derived carbon to increase in number. So to speed up this process, the tank must have enough ammonia and carbon. Ammonia is produced by the decomposition of excess food and faeces produced by the culture species in ponds or cisterns. So the supply of ammonia is maintained. Carbon source is essential for nitrifying bacteria; if there is insufficiency of carbon in the pond or cistern water, nitrifying bacteria can't increase their number. In this case, the ammonia in the water will not be completely depleted by them. So to sustain the source of carbon, chitagur, brown sugar etc. are supplied to the cistern or pond water from outside. In this condition, nitrifying bacteria proliferate and increase in number. They accumulate in the colon or **flock**. Various protozoa, phytoplankton etc. are deposited in these flocks. Animal and plant particles accumulated in these cells are very rich in nutrients. Fish and shrimp in ponds or cisterns eat supplied food and at the same time, consume these flocks. As a result, the amount of food required for cultivation is reduced to around 20% in biofloc technology in respect to conventional culture method.

The bacteria secrete loose matrix of mucus which helps to hold the flocks together. Floc size may vary 50 to 200 micron. Biofloc has high nutritional value; the protein content may vary from 25-50 percent in dry weight and fat content may range from 0.5-15 percent. Due to high protein content in biofloc, low protein (18-20 percent) floating feed can be supplied to the culture fish. Biofloc is also a good source of vitamins and minerals.

So, in a nutshell bioflocs are protein-rich organic matter and macro-aggregates of microorganisms, such as diatoms, bacteria, protozoa, algae, fossils of organisms and other invertebrates. The floc may be floating or submerged in water. Flocs contain a lot of protein and lipids, which is an important food source for fish or shrimp.

Principles of biofloc technology

The essence of biofloc technology is, 'take care of microorganisms, microorganisms will take care of fish and farming methods'. Microorganisms remove water waste by converting the waste present in water into protein food. Intensive farming practices use a lot of food, part of which remains unused in water. In addition, the metabolic waste of fish is also deposited in the water. As a result, a large amount of nitrogenous inorganic matter is produced in the water, which helps in the growth of microorganisms.

In order to maintain a favorable environment for heterotrophic bacteria, it is necessary to maintain a carbon-nitrogen ratio of 10-15:1. Molasses, starch, flour, sugar, etc. are used to keep the carbon supply in the environment adequate. Adequate aeration is given in the water. In this condition, heterotrophic bacteria absorb the inorganic nitrogen present in the water and convert it into microbial proteins.

Heterotrophic bacteria can use ammonia as the nitrogen source to produce bacterial protein.

$$NH_4^+ + C_6H_{12}O_6 + HCO_3^- + O_2 \Rightarrow C_5H_7O_2N + H_2O + CO_2$$

Microorganisms of biofloc technology

The most important ingredient for biofloc is probiotic or beneficial bacteria. These bacteria reproduce rapidly by consuming carbon and nitrogen as food and convert ammonia into microbial proteins. These bacteria have 10 times more ammonia removal power than nitrifying bacteria.

Bacillus subtilis, B. licheniformis, B. megaterium, B. pumilus, B. polymyxa are the beneficial bacteria.

These bacteria can convert ammonia into protein cells without any means which is the first condition for the use of probiotics in biofloc. They are alive and well available in powdered form; so there is no problem of preservation and these bacteria can work in both aerobic and anaerobic condition.

Species suitable for biofloc culture

In our country commonly cultivated fish such as *Oreochromis niloticus* (tilapia), *Labeo rohita* (rohu), *Heteropneustes fossilis (shingi)*, *Barbonymus gonionotus* (rajputi), *Clarius batrachus* (magur), *Ompok pabda* (pabda), *Mystus cavasius* (gulsha tengra), *Anabas testudineus* (koi) and lobster can be farmed. However, those who want to start fish farming using this new technology must first start farming with tilapia, koi or rajputi.

Advantages of biofloc fish farming

- *Less consumption of water:* The first and foremost importance of biofloc technology is, here no need to change water during the whole culture period.
- *Less requirement of space:* In the modern era of civilization, there is a lack of space to culture fish in the pond/lakes; in this technology one can easily culture fish in their homestead or roof-top.
- *High bio-safety:* This technology uses beneficial bacteria which enhances the quality of water and provides high bio-security to the whole system by controlling the harmful pathogens that cause diseases.
- *Ammonia elimination and securing the growth of fish*: The beneficial bacteria present in the system control the amount of ammonia in the system by converting ammonia, the main regulator of fish farming, into food substance which is essential for the physical growth of fish and thus ensures the growth of fish by controlling the quality of water in the tank and controlling harmful pathogens.
- *Source of good protein:* Beneficial bacteria make meat using the harmful ammonia present in this system and the carbon supplied from outside. In addition, diatoms, protozoa, algae, fish droppings, food residues, body debris, etc. accumulate in the floc which acts as a good source of fish protein.
- *Reducing FCR (Food Conversion Rate):* The lower the food conversion rate, the higher will be the profit in fish farming. In this case, the beneficial bacteria of biofloc technology are used to make food for cultured fishes using unused food of fish, ammonia excreted from excrement, resulting in less supply of protein rich fish food from outside; thus the FCR in this method is less than other methods of fish farming.
- *Low cost and high profit:* It is known that about 80% of the cost of fish farming is spent on food. In biofloc technology, as the requirement of feed from outside is less, thus low cost is required for culture and more profit can be made.
- *Easy farming method:* This is a simple farming method. Any farmer at home can easily culture fish in 30-40 tanks by acquiring technical skills through proper training.

Recommendations

- Customized biofloc preparations (with inoculums of defined probiotics and algae), modulating the bio-floc yield by C: N ratio manipulation and their evaluation for host performance is a matter of further research.
- Molecular and biochemical characterization of microorganisms (quorum sensing), constituent of biofloc including heterotrophic-autotrophic organism through community approach is needed.
- Improvement of floc nutritional value (i.e. using different carbon sources or a mixture of phytoplankton and bacteria) needs further investigations.

Thus the detail and in depth research works on all these aspects are an absolute requisite for near future.

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STUDENT COLUMN

Freshwater Pearl Culture in India

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According to the Indian system of gemology of nine "Maha-Ratnas," the pearl is only next to diamond. Pearls are viewed as a symbol of purity, love, source of wisdom and power. India recognized the pearls about thousands of years ago and has a long and glorious history of appreciating pearls. Hyderabad is known as the “Pearl City” from the time of Royal Kings of Nizam.

In nature, a pearl is formed when a foreign particle, such as a piece of sand or parasite, makes its entry into particular species of mollusc and cannot be expelled. As a defense mechanism, the animal secretes a substance, known as nacre, to coat the foreign body. Layer upon layer of this coating is deposited on the irritant and in course of time a pearl is produced. While the demand for pearls in India and other countries is increasing, their supply from nature has reduced due to over-exploitation and pollution. India is importing a large number of cultured pearls every year from the international market to meet the domestic demand. This high demand of pearl can only be mitigated by artificial pearl culture using freshwater mussel. Generally, a natural pearl is small in size and irregular in shape. A cultured pearl is also natural pearl; the only difference being the human intervention in surgical implantation of a live mantle graft and nucleus for hastening pearl formation to the desired shape, color and size.

Species used for culture

Two genera of freshwater pearl mussels i.e. *Lamellidens* sp. and *Parreysia* sp. are used for pearl culture. The common species are *L. marginalis*, *L. corrianus* and *P. corrugata* which are being employed for pearl culture operations. Among these three, *L. marginalis* is most popular due to two reasons: i) the comparative large size (length from anterior to posterior end 7-10 cm) and ii) wide distribution range.

Lamellidens marginalis
(Reproduced from Natarajan and Sushithira, 2016)

Culture technology

1. ***Collection of mussels:*** The healthy mussels are collected from the fresh water bodies like pond, river etc. and kept in buckets or containers having water. The ideal mussel size for pearl culture is 8-10cm in anterior-posterior length. After collection, mussels are acclimated in culture condition.
2. ***Pre-operative conditioning:*** The collected mussels are kept in crowded condition in captivity (1 mussel/lit of water) with aged tap water for pre-operative conditioning for 2-3 days. The pre-operative conditioning helps in weakening of adductor mussels for easy handling during surgery.
3. ***Operational methodology:*** The components required for operation are surgical kits, nuclear beads for incorporation and the mussel species to be implanted. The nuclear beads are primarily made from hard molluscan shells. Beads can be manufactured in various shapes to produce different shaped pearls.

Depending on the place of surgery, the implantation are of three types- i) mantle cavity implantation, ii) mantle tissue implantation, and iii) gonadal implantation.

In mantle cavity implantation, appropriated size of nuclei of up to 1.0 cm diameter is placed in mantle cavity of the mussel.

In mantle tissue implantation method, donor mantle graft (2 to 5 mm square) is placed in the space between the outer and inner epithelial layers of the left and right mantle lobes of the recipient mussels. A small nucleus (<3 mm diameter) is placed along with the graft tissue in cases.

In gonadal implantation method, the donor mantle graft (2 mm square) and nucleus (3 to 6 mm diameter), is implanted in the gonad of recipient mussels. The gonad implanted mussels are maintained in post operative care units with antibiotic support for 7 to 10 days to minimize the rejection of the implanted grafts and nuclei before being transferred to pond cultured units.

The implantations in pearl culture operations are carried out throughout the year, except during hot summer months (May and June) for minimizing post -operative mussel mortality and rejection rate of implanted graft and nuclei.

4. ***Post-operative care:*** This is an important step in freshwater pearl culture operation, which is required for the implanted mussels to recover from the operative shock. Immediately after surgery, restricted movement of the mussel is essential for the retention of the implanted graft and nucleus. Thus after implantation, the mussels are kept in post-operation

care units. These units consist of rectangular Ferrocement FRP tanks (200 liter) filled with aged tap water and 50 nylon bags of size 30 cm x 12 cm (mesh size 1 cm) suspended at 0.2 m depth in two rows. The implanted mussels are placed at the rate of two mussels per nylon bag with ventral side up position for a period of 10 days. Sufficient care is taken to allow free opening and closing of the shell valves for respiration. The units are daily examined; the dead mussels and the ones that rejected the nucleus are removed. Treatment of the water in post-operative care units with broad spectra antibiotic, Chloramphenicol, at the rate of 1-2 ppm for the survival and wound healing of the implanted mussels is done.

5. ***Pond culture:*** After post-operative care, the implanted mussels are stocked in the cultured ponds. The implanted mussels are placed in nylon bags (12 x 14 cm and 1 cm mesh) at the rate of two mussels/bag and the bags are suspended at a depth of 1.0 m in the ponds. The mussels are cultured at stocking density of 20,000-30,000/ha. Monthly cleaning of nylon bag is required.

The ponds should be periodically fertilized with organic manure and inorganic fertilizer to sustain the plankton productivity. Periodically checking of mussels with removal of dead ones and cleaning of bags should be carried out throughout the culture period of 12-18 months.

6. ***Harvesting of pearls:*** Mussels are harvested after a culture period of 12-18 months. In mantle cavity implantation method, the implanted mussels are reared in ponds for 12 months and at the end of the culture period mussels are sacrificed. The mussels are opened one by one and the half round or design, shell attached pearls are cut out of the shell valves. The products are generally shell-attached, half round or designer pearls depending upon the shape of the nucleus implanted.

The culture period in mantle tissue implanted mussel is generally from 12-18 months. In this method, the mussels after the culture period are carefully taken out and the pearls are removed one by one from the pearl sacs. The same mussel can again be used for the next operation. In this method non- nucleated, solid, unattached, and irregular to oval pearls or round, unattached cultured pearls are obtained.

The culture period of gonadal implanted mussel is generally 12 months. The mussel after the culture period is opened carefully and the position of the pearl is felt by touching the area close to the incision scar. By a pair of scissors, fine forceps and needle the pearl formed is carefully removed without cutting or damaging the intestine or other internal tissues. In this process regular, round unattached pearls are obtained.

Future scope

Pearl culture can be integrated with carp polyculture system as the implanted mussels are kept in nylon bags suspended in an earthen pond from a bamboo frame. There is a vast scope of pearl culture in North West states of India and the farmers/small entrepreneurs can harness its commercial potentials.

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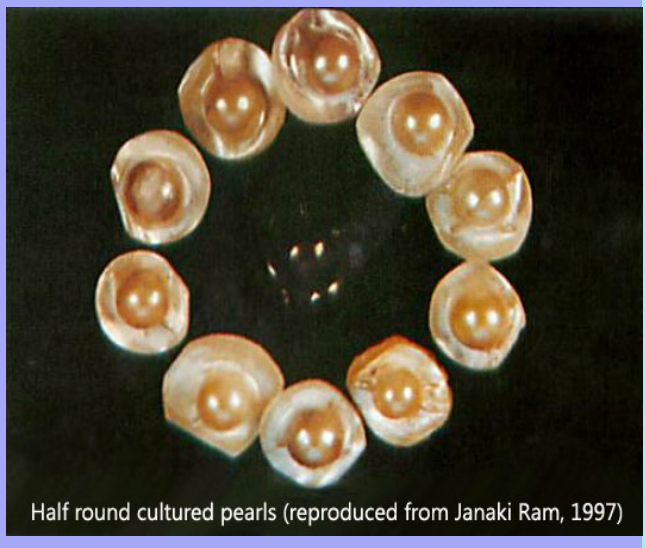
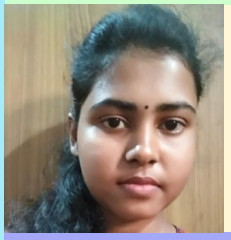


Half round cultured pearls (reproduced from Janaki Ram, 1997)

STUDENT COLUMN



Sex Changing Fish

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It's our general conception that sex of any animal is fixed at birth; it does not change; but you will be amazed to know that there are few animals which can change their sex as per requirement. The phenomenon of changing sex is not uncommon to fish and there are about 500 fish species where change of sex in adulthood in response to environmental cues has been reported.

There are many fishes which are known as "sequential hermaphrodites", they can switch to opposite sex on permanent basis at a specific period of their lives. The majority of them are known as "protogynous", which spent first part of their lives as female and then switch to male. This includes the kobudai, other wrasses, many species of parrotfish, and a wide variety of reef fish like damsel fish. Bluehead wrasses live in groups, on coral reefs of the Caribbean. A dominant male, with a blue head, protects a harem of yellow females. If the male is removed, the biggest female becomes male, in just 10 days; its changes its behavior and color, her ovary becomes a testis and starts to produce sperm. In most of the protogynous fish, some members start their lives as males, some switch from females to male in some time and some remain as females for the entire period of their lives. Though in some species like in Potter angelfish, *Centropyge potteri*, the sex skew is of extreme level; here all fishes start their lives as females and all males in the population were females at one point of time.

The second group of sequential hermaphrodites is known as "protandrous" which spent first part of their lives as males and then can switch to females at a certain point in their lives. Though less common than protogyny, protandry has also been reported from wide variety of fish, including the Australian barramundi (*Lates calcarifer*), gilthead seabream (*Sparus aurata*), Clark's anemonefish (*Amphiprion clarkii*) and the black porgy (*Acanthopagrus schlegeli*). In the clownfish Clark's anemonefish (*Amphiprion clarkii*) for example, females are larger than males. They live in small groups within protective sea anemones, with one breeding male and female pair and a number of subordinate non-breeding fish. When the dominant female dies, the largest male transforms into the female.

There is another type of hermaphroditism in fish which is known as "bidirectional hermaphrodites" or "serial hermaphrodites" in which fishes can change their sex back and forth in either direction depending on environmental circumstances. Like coral coral gobies (*Gobiodon* and *Paragobiodon*) which live within crevices inside coral reefs; they move very little during their lifetimes and thus have limited opportunity to find new mating partners. In these fishes, if any two fish that happen to find each other can form a male-female mating pair – no matter what sexes they are when they meet – this would be advantageous.

Advantages of sex changing

In both protandrous and protogynous species, the "size advantage hypothesis" has been reported to explain the advantage of sex changing in fishes. For some fishes, change of sex once reached to a certain size is advantageous. In protogynous fish like the kobudai, where one dominant male holds the control over a harem of smaller females; change of sex to male in later part of the life when larger become advantageous. For protandrous fish like the clownfish, large females are more fertile than smaller ones, so producing sperm when small and gestating eggs when larger is advantageous.

How fish can change sex?

In fishes, it has been reported that sex is not determined by chromosomes like birds or mammals, variety of methods are there to determine the sex of the fish offspring. An important enzyme which has been reported to control sex of fish is aromatase which can change the androgenic hormones into estrogenic hormones which can change the male gonads into ovaries. Aromatase down-regulation by epigenetic factors and cortisol has been considered as the potential trigger of female-to-male gonadal sex change, causing estrogen production to collapse.

Fish gonads contain the precursor cells of both ovarian and testicular tissue; a rapid flood of either estrogen or testosterone-like hormones can flip a switch and can influence new tissue to develop.

It has been reported that temperature has strong influence on sex change in fish. Role of salinity has also been reported by some researchers.

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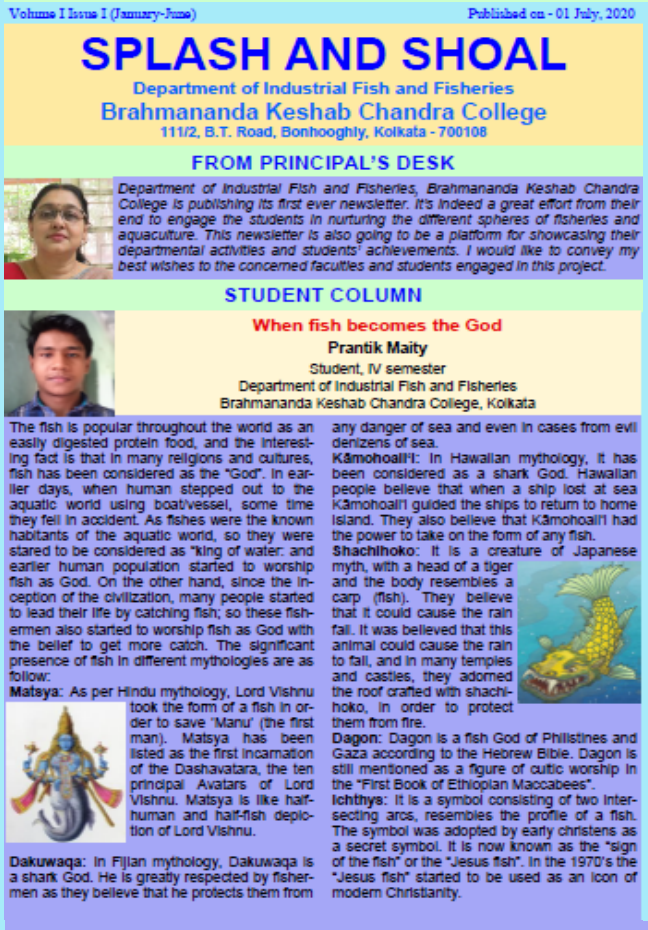
STUDENTS' RESULTS

Final Year: 17 out of 21 students have passed with first class marks. Kinshuk Choudhury has secured the sixth rank in the university as per percentage of marks. Other students who have secured first class marks are Souvik Nyaya, Samarjit Das, Piyali Das, Amrita Ghosh, Suvasmita Sarkar, Subham Baur, Suchandra Mukherjee, Shrestha Dutta, Debleena Das, Sangita Malakar, Rahul Ghosh, Parna Mukherjee, Samridhi Chowdhury, Soumyadip Pradhan, Pijush Das and Ankit Kanjilal.

DEPARTMENTAL EVENTS



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FROM PRINCIPAL'S DESK

Department of Industrial Fish and Fisheries, Brahmananda Keshab Chandra College is publishing its first ever newsletter. It's indeed a great effort from their end to engage the students in nurturing the different spheres of fisheries and aquaculture. This newsletter is also going to be a platform for showcasing their departmental activities and students' achievements. I would like to convey my best wishes to the concerned faculties and students engaged in this project.

STUDENT COLUMN

When fish becomes the God

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The fish is popular throughout the world as an easily digested protein food, and the interesting fact is that in many religions and cultures, fish has been considered as the "God". In earlier days, when human stepped out to the aquatic world using boat/vessel, some time they fell in accident. As fishes were the known habitants of the aquatic world, so they were stared to be considered as "king of water: and earlier human population started to worship fish as God. On the other hand, since the inception of the civilization, many people started to lead their life by catching fish; so these fishermen also started to worship fish as God with the belief to get more catch. The significant presence of fish in different mythologies are as follow:

Matsya: As per Hindu mythology, Lord Vishnu took the form of a fish in order to save 'Manu' (the first man). Matsya has been listed as the first incarnation of the Dashavatara, the ten principal Avatars of Lord Vishnu. Matsya is like half-human and half-fish depiction of Lord Vishnu.

Dakuwaqa: In Fijian mythology, Dakuwaqa is a shark God. He is greatly respected by fishermen as they believe that he protects them from any danger of sea and even in cases from evil denizens of sea.

Kāmohoali'i: In Hawaiian mythology, it has been considered as a shark God. Hawaiian people believe that when a ship lost at sea Kāmohoali'i guided the ships to return to home island. They also believe that Kāmohoali'i had the power to take on the form of any fish.

Shachihoko: It is a creature of Japanese myth, with a head of a tiger and the body resembles a carp (fish). They believe that it could cause the rain fall. It was believed that this animal could cause the rain to fall, and in many temples and castles, they adorned the roof crafted with shachihoko, in order to protect them from fire.

Dagon: Dagon is a fish God of Philistines and Gaza according to the Hebrew Bible. Dagon is still mentioned as a figure of cultic worship in the "First Book of Ethioplan Maccabees".

Ichthys: It is a symbol consisting of two intersecting arcs, resembles the profile of a fish. The symbol was adopted by early christens as a secret symbol. It is now known as the "sign of the fish" or the "Jesus fish". In the 1970's the "Jesus fish" started to be used as an icon of modern Christianity.

SPAWN TO FRY
STUDENT INDUCTION PROGRAM, 2020
DEPARTMENT OF INDUSTRIAL FISH AND FISHERIES
BRAHMANANDA KESHAB CHANDRA COLLEGE

Why we are studying fisheries?

DATE OCT 16 TIME PLATFORM

https://tinyurl.com/y2p9c5d6

SPEAKER

DR. SWAGAT GHOSH
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PUBLICATION OF NEWSLETTER: On 1st July, 2020, the first issue of our departmental newsletter "Splash and Shoal" was published. This issue contained an article entitled "When fish becomes the God" written by Prantik Maity, a IVth semester student of our department was published along with another article entitled "Carotenoids additive: Boon for aquaculture" written by Dr. Arunava Mukherjee, Assistant Professor, Department of Zoology, Ramakrishna Mission Vivekananda Centenary College, Rahara, Kolkata. Departmental activities and students' achievements were also showcased there.

STUDENT INDUCTION PROGRAM, 2020: On 16th October, 2020 "Spawn to Fry", the Student Induction Program, 2020 was organized on virtual platform. The aim of this induction program was to share the knowledge on job and research prospects of Industrial Fish and Fisheries as well as to brief the syllabus with the first semester students. Dr. Swagat Ghosh, Subject Matter Specialist (Fisheries) from Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute, Sonarpur, South-24-Parganas, Kolkata graced the session as the resource person.

CELEBRATION OF WORLD FISHERIES DAY: Every year 21st November is celebrated as "World Fisheries Day" throughout the world to demonstrate solidarity with all fisherfolk, fish farmers and concerned stakeholders. This year due to the pandemic situation, it was not possible for us to celebrate this special day physically, but students of our department celebrated this day virtually by sharing their sketches and self composed poems which were shared on our official departmental Facebook page.

STUDENTS' ACHIEVEMENTS

- Soumyadip Pradhan, IIIrd year student received the participation certificate for presenting a poster on the theme "*Current Environmental Hazard, Disaster and Challenge* "organized by R&D Cell and IQAC, Bijoy Krishna Girls' College, Howrah on 2nd July, 2020.
- Santanu Sahoo, Amamaheswari Muhury and Akshay Mandal from III semester attended the webinar entitled "*Mental health in times of pandemic: An interactive session with students*" organized by IQAC, Brahmananda Keshab Chandra College, Kolkata on 3rd July, 2020.
- Santanu Sahoo from III semester and Papiya Chakraborty and Suchismita Roy Chowdhury from V semester attended the webinar entitled "*COVID-19 through the eyes of young researchers*" organized by Surendranath College, Kolkata on 3d and 4th July, 2020.
- Sayan Maity from V semester attended the webinar entitled "*100 years of Jallianwala Bagh massacre*" organized by Department of History, Brahmananda Keshab Chandra College, Kolkata on 7th July, 2020.
- Papiya Chakraborty from V semester attended the webinar entitled "*Importance of healthy relationship: the need of the hour*" organized by Internal Complaints Committee, Brahmananda Keshab Chandra College, Kolkata on 15th July, 2020.
- Papiya Chakraborty from V semester received the participation and successful completion certificate in the online quiz competition on "*General studies and current affairs*" organized by Department of Zoology, Barasat Government College, Barasat, Kolkata on 18th July, 2020.
- Tanmay Mahato, Sayon Pal and Jyoti Singh from V semester received the participation and successful completion certificate in the online quiz competition on "*Pandemic outbreak 2020*" organized by Ramsaday College, University of Calcutta on 23rd July, 2020.
- Papiya Chakraborty from V semester attended the webinar entitled "*A primer contour integration*" organized by Department of Physics, Brahmananda Keshab Chandra College, Kolkata on 24th July, 2020.
- Papiya Chakraborty from V semester received the certificate for participating in the online movement on "*Spit free India movement prevent to spread of COVID 19*" organized by North Bengal University.
- Papiya Chakraborty and Suchismita Roy Chowdhury from V semester attended the webinar entitled "আচার্য প্রফুল্লচন্দ্র রায়ের বিজ্ঞান ও সমাজ চিন্তা" organized by Department of Chemistry, Brahmananda Keshab Chandra College, Kolkata on 2nd August, 2020.
- Debanjan Sinha from V semester successfully completed the online course on "*Remote sensing applications in agricultural water management*" organized by Indian Institute of Remote Sensing, Dehradun from 3rd to 7th August, 2020.
- Papiya Chakraborty, Sayon Pal, Soumily Shaw , Soham Roy and Tanmay Mahato from V semester received the participation and successful completion certificate in the online quiz competition on "*COVID-19 awareness*" organized by Department of Education, Brahmananda Keshab Chandra College, Kolkata on 11th August, 2020.
- Papiya Chakraborty and Suchismita Roy Chowdhury from V semester attended the webinar entitled "*Development of technology in fisheries and aquaculture with special reference to the fish production and processing*" organized by Department of Industrial Fish and Fisheries, Ashutosh College, Kolkata on 17th and 18th August, 2020.
- Satyaki Ghosh, Malay Duary, Akshay Mandal and Amamaheswari Muhury from III semester and Debanjan Sinha and Tanmay Mahato from V semester attended the webinar entitled "*Entrepreneurship opportunities in the fishery sector*" organized by Department of Industrial Fish and Fisheries, Acharya Prafulla Chandra College, Kolkata on 22nd and 23rd August, 2020.
- Papiya Chakraborty from V semester successfully completed the online workshop on "*Recent trends in technological advancements in aquaculture and fisheries*" organized by Guru Nanak Centre for Research, Guru Nanak College, Velachery, Chennai from 3rd to 10th September, 2020
- Tanmay Mahato from V semester attended the webinar entitled "*Wildlife as a career option: view of a wildlife biologist"* organized by Bangabasi College, Kolkata on 10th September, 2020.
- Satyaki Ghosh and Santanu Sahoo from III semester and Debanjan Sinha and Papiya Chakraborty from V semester attended the webinar entitled "*Career guidance for a bright future*" organized by Career Counseling & Placement Cell, Brahmananda Keshab Chandra College, Kolkata on 14th September, 2020.
- Santanu Sahoo from III semester attended the webinar entitled "*The aqua show, 2020: Virtual knowledge conclave*" organized by Altis Communication and Aquavet consulting on 19th September, 2020
- Amamaheswari Muhury from III semester and Arpan Das, Debanjan Sinha, Papiya Chakraborty, Soumily Shaw and Tanmay Mahato from V semester received the participation and successful completion certificate in the online quiz and poster making competition on "*COVID 19 pandemic and society*" organized by NSS Unit, Brahmananda Keshab Chandra College, Kolkata on 24th September, 2020.
- Soumily Shaw from V semester attended the webinar entitled "*Mental health effects of the COVID 19 pandemic"* organized by Harvard Medical School on 29th October, 2020.