1. Title: Innovative approach for addressing the problem for fish seed in-availability in proper time for stocking in NE India.

2. Category: Most significant success story in the field of aquaculture.

3. Challenge:

The state of Assam has high potential for developing the fishery sector as a lucrative industry on the basis of vast water resources, rich freshwater fish biodiversity, very high domestic demand for fish, export potentiality to the neighbouring states as well as availability of suitable fish culture technology and competent human resource to man the sector. However the task is riddled with several inherent constraints. Ecological factors like chronic flood due to very high rainfall, low pH of soil and water and inadequate environmental temperature during the four winter months in particular (November to February) are the major factors that are hampering the growth of this sector. In addition, the culture fishery sector, in particular has been facing some managerial constraints, out of which unavailability of quality stocking material at the right time of stocking is one. The right time for stocking fingerlings in the ponds is March-April, when the environmental temperature in the state rises and the fish farmers can avail the maximum period of optimum temperature (April-October) for fish culture. On the contrary, the breeding season for the cultivable carp fish species normally commences from the last part of April with the advent of monsoon with rising ambient temperature and rain. As such fingerlings of right size for stocking become available only during July-August (taking 90 days rearing period to attain fingerling stage). On the other hand, with the advent of winter, the ambient temperature falls below the optimum and fish fingerlings when stocked in July – August can get the desired level of temperature only for 2-3 months up to October. To address this mismatching of environmental temperature and availability of fingerlings, it has become essential to advance the fish seed production for at least two months in Assam by scientific interventions. However there was dearth of scientific technology to advance the breeding and seed production.

The cultivable carp species have specific annual breeding rhythm that coincides with the optimum environmental condition of the year. Environmental temperature is the key factor for gonadal development and breeding in these fish. A manipulation of environmental temperature and photoperiod length during winter season, when the fish are normally in early maturity stage may trigger rapid gonadal development resulting in early maturation and breeding. With this hypothesis a project had been formulated to study the feasibility of advance breeding through enhancement of environmental temperature by using UV stabilised LDPE film cover over pond and accelerate the gonadal development process for advance breeding, so as to ensure market availability of stocking size quality fish seeds during March-April for the fish farmers of Assam

It was expected that the development of the advance breeding and fish seed production technology would benefit two groups of entrepreneur, one the fish farmer or the fish growers and the other the fish seed producers and traders. The fish farmers can stock their ponds in right time and harness maximum productivity from available resources, whereas the fish seed producers can produce fish seeds well in advance to cater the need of fish seed traders and fish growers thus capture the market. The state of Assam currently has more than 60,000 ha pond area, as such the current need of fish fingerlings is around 500 million (under semi intensive level of

management). With the continuous horizontal expansion and vertical development of the sector, the need for fish fingerlings will be much higher in coming days. Assam is the feeder state for fish seeds for the entire NE region. As such to cater the need of the growing fish culture sector of the Region, the fish seed production sector of the state of Assam should be well equipped with technology for seed production in right time and with right kind of quality.

4. Initiative:

Initiatives were taken to fill the gap of scientific information through a research project with the following objectives:

1. Advanced breeding of carps through enhancement of environmental temperature and manipulation of photoperiod
2. To ensure availability of quality fish seed at the right time of stocking (March-April) for the fish farmers of Assam.
3. To study the economic and technical viability of the system.

Activities done to address the challenge:

1. A polyhouse was constructed (420 m^2) by using UV stabilized LDPE film to enhance and retain ambient temperature during winter so as to create an optimum condition for gonadal development, growth and breeding of cultivable fish species.

2. A concrete pond (320 m^2) was constructed under the polyhouse where brood stock of different cultivable fish species was raised during winter.

3. The polyhouse system was connected with a heater and filter system. The pond water is passed through the filter then through the heater and the filtered and warmed water is recycled back to the pond. This system was meant for enhancing the water temperature to the desired level as well as to maintain the water quality.

4. The brood fish stock was supplied with balanced feed during the period of culture.

5. Time to time health check up and gonadal development study, water quality monitoring was done during the period.

6. A portable hatchery was installed inside the polyhouse for breeding of fish during winter.

7. Induced breeding of different species was tried during December to February.

8. Successful induced breeding of *Labeo gonius* and L. *calbasu* could be achieved in the month of February.

9. Seed raising trials were conducted successfully under polyhouse condition.

10. Fish seed (spawn and fry stage) has been distributed to different farmers of Assam during February-March, which could address the problem of non availability of fish seed at the right time of stocking.

11. The knowledge generated has been imparted with farmers, scientific community, entrepreneurs and policy makers through demonstration, publication as well as media coverage.

12. The system has paved the way for advance breeding of fish in this part of the country for availing the optimum temperature regime (i.e. April-September) for fish culture which will lead to higher productivity from the available resources.

5. Key result/insight/interesting facts:

Temperature enhancement could be achieved to the tune of 5.0 – 16.0°C in different seasons through the impact of the poly house as well as water recycling and warm water influx. The water temperature of the poly house pond was 24.0 – 28.0°C during the period of experiment, when the temperature of the control pond under normal condition had 8.0 – 22.3°C.The photoperiod in the poly house pond was extended to 2 hours by artificial illumination.

Rapid gonadal development has been observed resulting in early maturation of the brood fish in experimental pond. The maturation process as depicted by monthly Gonado Somatic Index (GSI) value for both sexes (Fig. 1& 2) for both experimental and control ponds indicate faster maturation process in the experimental in comparison to the control. This indicated that the optimum water temperature prevailed in the experimental pond along with longer photoperiod, played a key role in accelerating the maturation process.

Based on the gonadal development study, the breeding period for the fishes was determined and induced breeding trials were conducted in the month of February, by using synthetic hormone Gonopro at standard dose and in two separate series of experiments using nylon hapa and using portable hatchery. The induced breeding trials was quite encouraging with 80-100 % spawning rate, 85-90 % fertilization rate and 90-95% hatching rate in hatchery and 80- 90% spawning,75-93% fertilization and 73-83% hatching in nylon hapa system. This indicates that the effect of enhanced water temperature and prolonged photoperiod have significant positive impact on the fish stock by advancing gonadal maturity and breeding season by a minimum of two months.

The seed raising experiment conducted by using cages made of nylon nets (Fig-) also revealed higher growth rate by 48-60% and higher survival rate by 20-28% under enhanced temperature in comparison to the normal ambient temperature. Significant difference was observed in length of fish fry after raising for 15 days under different temperature (Fig-). This again supports the positive impact of artificially enhanced temperature on the growth and survivability of the fish seed.

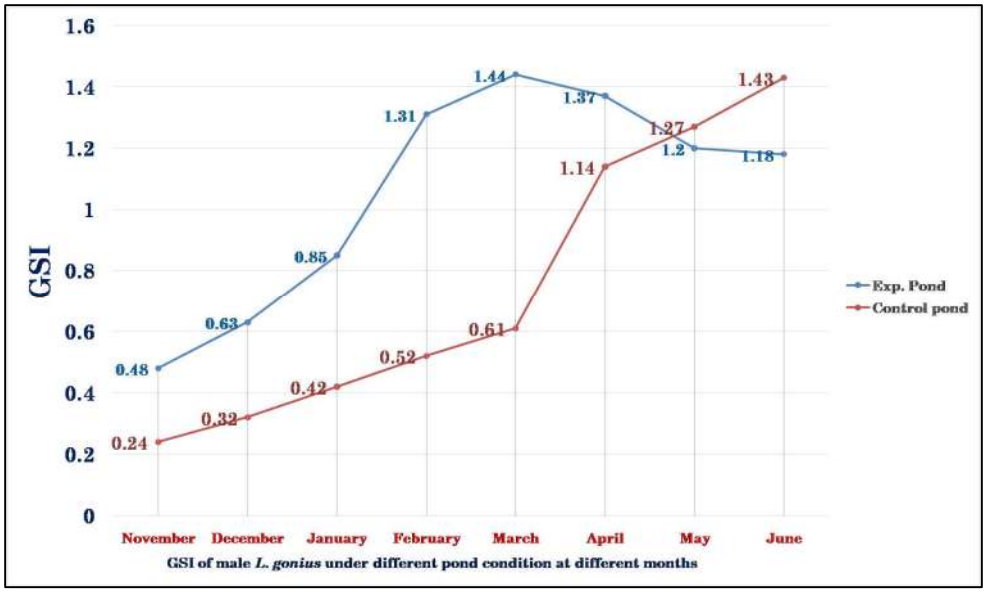

Fig-1

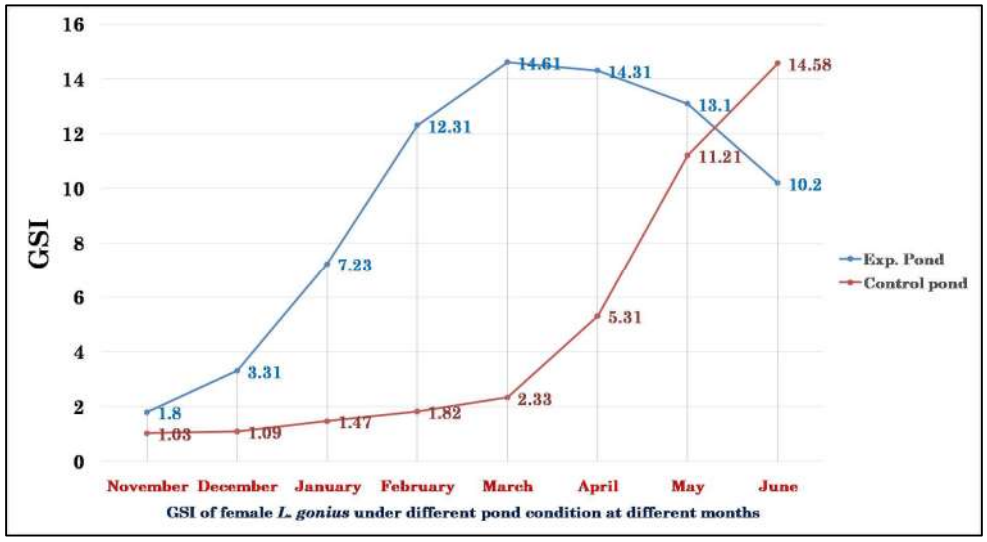

Fig-2

6. Impact: Impact of the findings of the present study is found to be far reaching in addressing a critical issue that has been faced by the fish farmers of Assam, i.e. unavailability of fish seed at the right time for stocking. This study paves the way for bringing about the needed change in fish seed production sector to cater the market demand as well as in the aquaculture sector for higher production from available resources.

A good number of entrepreneurs are expressing their interest to adopt the technology of advancing breeding and fish seed production of cultivable fish species by setting up polyhouse pond and hatchery system. This would definitely help in mushrooming business enterprises at primary and secondary level.

The study also helps to find out the impact of enhanced temperature on growth, development and breeding in fish under the prevalent agro climatic condition of the state *vis a vis* to select the climate resilient fish varieties that can be cultured under changing climatic condition of rising environmental temperature.

7. Lessons learned:

i. The difficult task during the process was to maintain the water temperature during winter season when the ambient temperature was average 10°C. To address this challenge standardization of volume and temperature of recycled water (through regulation of the heater) according to the volume and temperature of water in the pond was done with trial & error method. Electricity failure was major problem which was overcome by installing generator.

ii. The original rubber water pipes of the system were found to be not suitable for hot water enhanced were replaced with cast iron pipe after one year of experiment.

iii. If the project is to be done again the area of the system should be increased to minimum 700sqm so that bigger sized brood fishes can be reared. To raise the fish seed produce in advance (during Jan-Feb) nurseries with polyhouse and warm water facilities is needed.

8. Supporting quotes and Images:

Photo-I: The polyhouse (420sqm) with filtration and heating systems constructed for artificial enhancement of environmental temperature for the study

Photo-II: Concrete pond (320sqm) inside the polyhouse lined with black polyethene to prevent leakage, to enhance and retain water temperature.

Photo-III: Advance breeding trial by using portable hatchery system installed within the polyhouse. Observed and appreciated by Hon'ble Vice Chancellor, Dr. K.M. Bujarbaruah

Photo-IV: Seed raising trials conducted in enclosures fitted in polyhouse pond being observed and appreciated by Dr. G.N. Hazarika, Director of Research (Agri), AAU, Jorhat

Photo-V: Fish seed produced under polyhouse condition are ready for disposal to farmers during March, minimum two months advance then the normally produced seed.

9. Additional information:

i. The project was financially supported by Rastriya Krishi Vikash Yojana (RKVY), Govt. of India through the Nodal Unit under Directorate of Research, Assam Agricultural University, Jorhat during 2011-12.

ii. The reports on the achievements were published in different Newspapers, Annual reports of AAU, etc. Documentary evidence as follows:

The Telegraph

THE TELEGRAPH FRIDAY 11 APRIL 2014 NATION

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AAU-bred fish grows just in time for Bihu

SMITA BHATTACHARYYA

Jorhat, April 10: If the Fisheries Research Centre at Assam Agricultural University here had much to cheer with its huge catch ahead of Magh Bihu every year, this year the fingerlings bred in the centre have brought glee to fish-rearers ahead of Bohag Bihu.

AAU vice-chancellor R.M. Bujarbaruah said the green-house conditions had enabled fish to spawn much ahead of the usual time than in the actual climatic conditions in the Northeast.

"This would allow the fish to grow and mature on a par with fish bred in other states with warmer climate. We have been able to supply to fish breeders with these seeds before Bohag Bihu and the fully grown fish is expected to fetch a high price," he said.

Bujarbaruah said the experiment came in the wake of an interaction with fish farmers in the jurisdiction of Assam chief minister Tarun Gogoi about a year ago when one breeder said fingerlings could be supplied in February-March instead of the natural breeding season in May-June, when the weather becomes warmer.

"We worked towards advancing the fish breeding season by raising the temperature and in accordance we set up a greenhouse where the water and air temperatures were increased to summertime temperatures and the fishes monitored on a daily basis. They spawned much ahead of the usual time," he said.

ON YOUR PLATES

Bibha Chetia Borah, scientist and centre in charge, who had implemented the project, said in this sphere of research, they were ahead of other full-fledged fish research institutes in the country where experiment had been conducted to advance the reproductive stage of fishes like rohu and bahu.

"One of the reasons for low fish production was the adverse environmental condition during the peak period of fish breeding and growth, which leads to import of fingerlings from outside the state. Fish being cold-blooded are more dependant on environmental temperature," she said.

Since the cold and dry climate during the prolonged winter in Assam is not ideal for fish breeding, it was seen that maturation cycle start in October and completes July, while the breed season commenced in A May and continued July-August, peaking dur May-June. However, in m other states, the breeding son was quite early in Fe ary.

"The imported fish see often of low quality as it g weakened during long- tance transport, handl rvees as well as malnutriti This caused heavy loss fo farmers," Borah said.

She said fish breed would now adopt their tech ogy and set up businesse supply seeds to fish farmer Assam.

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The Telegraph Northeast

Advance fish breeding season, slash export

SMITA BHATTACHARYYA

Jorhat, April 6: Fish farmers of the state may soon no longer need to buy fish fingerlings from outside the state if the Fisheries Research Centre under Assam Agricultural University succeeds in advancing the breeding time of cultivable fish species.

Around 35 crore fingerlings are required for the state.

Bibha Chetia Borah, senior scientist and in-charge of the centre, said in Assam, because of the climatic conditions, fish start breeding from April end and fish fingerlings become available only from June-July and do not grow adequately in winter.

"The breeding season for most of the cultivable fish species in the region generally commences from the last part of April for climatic reasons. As a result, fingerling stage stock becomes available locally from the months of June-July. The growth rate of fish is reported to slow down with the advent of winter, that is, from October onwards, which means that fish fingerlings stocked in June-July get a very short span of optimum thermo profile (July-September) for their growth and development," Chetia Borah said.

SMALL FRY

The scientist said because of the unavailability of fish fingerlings at the proper time, farmers of the state were forced to buy fingerlings from outside.

This resulted in the increase in cost and the fingerlings were not of very good quality either.

"The late onset of summer is one of the major ecological constraints for low production of fish in the state. To overcome this constraint, the Centre put forth an innovative idea for advancing the breeding season of the cultivable fish species through scientific intervention," she said.

The proposal was mooted by AAU vice-chancellor K.M. Bujarbaruah, for advance breeding by increasing water temperature by utilising solar radiation.

This came in the wake of the farmers' plea for early availability of good quality fish seed to the chief minister of Assam in his presence a few months ago.

A research project based on this was proposed by the fisheries research centre towards which a fund of Rs 1 crore has been received under Rashtriya Krishi Vikas Yojana.

At the experimental stage, a 500 square feet poly-house fit with solar plates to enhance water temperature will be constructed and fishes of different species will be let in.

The Telegraph
calcutta, india

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AAU-bred fish grows just in time for Bihu

SMITA BHATTACHARYYA

On your plates

Jorhat, April 10: If the Fisheries Research Centre at Assam Agricultural University here had much to cheer with its huge catch ahead of Magh Bihu every year, this year the fingerlings bred in the centre have brought glee to fish-rearers ahead of Bohag Bihu.

AAU vice-chancellor K.M. Bujarbaruah said the greenhouse conditions had enabled fish to spawn much ahead of the usual time than in the actual climatic conditions in the Northeast.

"This would allow the fish to grow and mature on a par with fishes bred in other states with warmer climate. We have been able to supply 15 fish breeders with these seeds before Bohag Bihu and the fully grown fish is expected to fetch a high price," he said.

Bujarbaruah said the experiment came in the wake of an interaction with fish farmers in the presence of Assam chief minister Tarun Gogoi about a year ago when one breeder said fingerlings could be supplied in February-March instead of the natural breeding season in May-June, when the weather becomes warmer.

"We worked towards advancing the fish breeding season by raising the temperature and in accordance we set up a greenhouse where the water and air temperatures were increased to summertime temperatures and the fishes monitored on a daily basis. They spawned much ahead of the usual time," he said.

Bibha Chetia Borah, scientist and centre in-charge, who had implemented the project, said in this sphere of research, they were ahead of other full-fledged fish research institutes in the country where experiment had been conducted to advance the reproductive stage of fishes like *rohu* and *bahu*.

"One of the reasons for low fish production was the adverse environmental condition during the peak period of fish breeding and growth, which leads to import of fingerlings from outside the state. Fish being cold-blooded are more dependent on environmental temperature," she said.

Since the cold and dry climate during the prolonged winter in Assam is not ideal for fish breeding, it was seen the maturation cycle started in October and completed in July, while the breeding season commenced in April-May and continued till July-August, peaking during May-June. However, in many other states, the breeding season was quite early in February.

"The imported fish seed is often of low quality, as it gets weakened during long-distance transport, handling stress as well as malnutrition. This caused heavy loss for the farmers," Borah said.

She said fish breeders could now adopt their technology and set up businesses to supply seeds to fish farmers in Assam.

An innovative approach to address inadequacy in environmental factors for development of aquaculture in Assam

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Focal Points at a Glance

Pointing out the inadequacy in environmental factors to facilitate fish breeding mainly of major carps, as it happens in Assam or in other States of the country, as in the authors appraise the readers on the innovative measures that can be taken to bring about breeding, particularly in major carps well within the season so as to ensure that fish are bred and seed raised for supply in time to the farmers.

The State of Assam: At a glance

Assam, the second largest and the most populous State of North eastern Region of India is situated in the eastern Himalayan Region between 24°82' and 28°18' N latitude and 89°58' and 97°40' E longitudes. The State covers a geographical area of 78,438 km² that forms 2.4 percent of the country's total geographical area. As per 2011 census, the population of the State is over 3 crores (31,169,272 nos), which is the highest among the States of NE region and 2.45% of the country's total population. The population density of the State (397/sq km) is 4% higher than the country's population density. The State, with a literacy rate of 73.18% as per 2011 census, predominantly depends on agricultural and allied activities for its economy. Around 86% of the population lives in rural areas while some live below poverty line. Majority of the farming community (67.5%) is marginal farmers (operational land holding below 1 ha) and around 18.3% are small farmers (operational land holding 1.0-2.0 ha). The climate of the State has specific characteristics owing to several dominant factors such as orography, the alternating pressure cells of NE India and Bay of Bengal, the predominant maritime tropical air mass (mT), the roving periodic western disturbances and the Local Mountain and valley winds (Borthakur, 2004). Hot and wet summer and mild to moderately cold dry winter are the specific characteristics of the climate of the State. The food habit of around 95 percent of the population is non vegetarian with high preference for fish and fisheries products; the State has high potential for the development of fishery sector.

Fisheries potentiality

The State is bestowed with vast and varied aquatic resources covering around 3.94 lakh ha of area that includes 2.1 lakh ha of rivers, 1.0 lakh ha of *beels*, 41,949 ha of ponds and tanks etc. The State has a rich freshwater fish biodiversity comprising 216 species belonging to 104 genera, 37 families and 10 orders. A congenial background for the development of fishery sector prevails in the State by way of high demand for fish, sub tropical climate, available human resources and export potential to neighbouring States.

Fish production trend

The fish production in the State has been exhibiting a steady upward trend during the last five years. There is a 28.2% enhancement in fish production during this period, from 190.32 thousand MT in 2007-08 to 243.87 thousand MT in 2011-12 (Fig. 1). The fish production of Assam is the highest among the North Eastern States, contributing around 73% to the Region's total fish production. Although there is substantial development in fish production in the State, the trend is not up to the level to

keep pace with some of the rapidly growing fish production States of the country like West Bengal, Andhra Pradesh, Uttar Pradesh etc. As per WHO's recommendation of per capita fish consumption at the rate of 11.6 kg under Indian conditions, the present annual fish requirement for the 95% population of Assam is around 326thousand MT. The gap between demand (326 thousand MT) and production (243.87 thousand MT) is met through importing from the above mentioned States.

Inherent problems

Although the State has vast potential for augmenting fish production through culture, the task is riddled with several ecological and managerial constraints. Due to geographical location, the State is influenced by ecological constraints like chronical floods, low pH of soil and water, high intensity rainfall in certain areas as well as inadequacy of certain climatic factors that govern fish production. The floods in Assam are characterised by extremely large magnitude, high frequency and extensive devastation. The State witnesses fury of flood every year with frequency of occurrence ranging from 2 to 5 times and the months of occurrence extending from May to October. The State has around 3.25 lakh ha of chronically flood prone areas that include myriads of potential fishery resources. The pH of soil ranges from 4-6.5 in most parts of the State which influences the productivity of soil and water to a large extent. 85-100% of soil in different districts of Assam is acidic in nature. At the same time, Lower Brahmaputra Valley has 91.8% of and Upper Brahmaputra Valley has 96% of acidic soil. Low pH of water in the State is one of the prime causes for poor fish production status which is because of the low growth rate of fish as well as the occurrence of diseases like EUS. The State receives an annual average rainfall of 2800-3000 mm except in certain rain shadow belt of Karbi Anglong and Nagaon districts (Dhanikar and Deka, 2013). The rainfall is the highest, generally during May-August, with a range of 10.12-134.5mm/day. High intensity rainfall creates problems like overflow of water bodies, top soil loss of embankments and erosion, in addition to adverse impacts on soil and water quality, on transport and communication, and other activities related to fishery management. The trend of monthly mean rainfall pattern during last five years in Assam is depicted in Fig. 2.

While in the managerial front, unavailability of quality fish seed in the right time of stocking, unavailability of other essential inputs including fish feed, improper transportation and market facility, particularly in the rural areas, frequent power failure, unavailability of efficient crafts and gears, lack of infrastructure for storage, processing and value addition etc. are the major constraints faced by the fish farmers of the State.

Constraints due to climatic factor

- **Inadequate ambient temperature:** Fishes being cold blooded animals are more dependent on the environmental temperature than by warm blooded animals. Generally, the warm water fish species respond to a higher temperature of the environment by a faster metabolic growth rate. Due to prevailing cold and dry climate during winter season, the State is characterised by having a short period with optimum ambient temperature range required for growth and other biological process of cultivable fish species during summer months only, i.e. during April to September. Major fish species cultured in the State are the carps i.e. Indian Major Carps, exotic carps like grass carp, silver carp, common carp and minor carps like Calbasu and Gonius. The optimal temperature range for growth and breeding of most warm water fish species lies between 26-30°C. In Assam, the range of temperature during the summer period varies from 13.6-29.5°C (minimum) and 20.5-38.2°C (maximum). Although the lowest level of minimum temperature during this season (Table 1) is not within the optimum range, the maximum temperature range (Table 2) is more or less conducive for the growth and breeding of the cultivable fish species.

  On the other hand, during winter months i.e., from November to March, the minimum ambient temperature goes down to as low as 5.6°C in the State along with decrease in photoperiodic length, as recorded during the last five years (Table 3). The number of days having 5-16°C minimum temperature range during winter season (November-March) was recorded to be 8-31 during different months. December, January and February are the coldest months of the year having the minimum temperature (5-16°C) in almost all the days of these months during the last five years (Table 4). Hence, during these months the metabolic growth rate, food intake and gonadal development of cultivable fish species are at the minimum level. This inadequacy in environmental factor has tremendous impact on the fish production as well as growth of the aquaculture sector of the State as the growth rate of the cultivated fish species is generally slowed down with the advent of winter and decrease in atmospheric temperature from October onwards. The fluctuation in monthly mean temperature during the year 2009-12 is depicted in Fig.3-7.

- **Mismatching of availability of fish seed and culture period:** Successful breeding of fish is the result of a variety of factors out of which favourable environmental conditions are the most important. Reproduction in fish is therefore taken up in a particular season which guarantees the most conducive environmental condition for the process and also for survival of their progeny. Under the climatic conditions of Assam, the gonadal maturation cycle of the cultivable fish species (except common carp) generally commences from October and completes in July and the breeding season generally commences from April-May and extends to July-August with peak during May-June. With the advent of monsoon associated with the rising temperature and long photoperiod, the breeding of these fish species commences from April-May. As a consequence fish seeds of stockable size (>9.0cm) produced in Assam become available from the month of June-July only. As such, the fingerlings stocked during the month of the July, get the benefit of optimal ambient temperature range basically for a period of 3 months (July-September) only. Acc

Event

Inauguration of poly-house for advanced breeding of carps

Fisheries Research Centre, Assam Agricultural University, Jorhat, Assam: 16 April 2013

Unavailability of right size of carp fish seed in the proper time of stocking is one of the major problems hindering the growth of aquaculture sector in the State of Assam. With the objective of advancing the gonadal maturation process and breeding season of carps through manipulation of environmental temperature a polyhouse made of UV stabilised LDPE film was installed at Fisheries Research Centre, Assam Agricultural University, Jorhat. This polyhouse has been set up over a plastic lined pond with all other accessories for enhancing and retaining the water temperature within optimum range during winter spell, as well as for maintaining the other important parameters is the first structure of its kind in the country.

The poly-house for advanced breeding of carps at Fisheries Research Centre, Assam Agricultural University (AAU), constructed under the project, 'Advanced breeding of carps through enhancement of environmental temperature by using UV stabilized LDPE film' (RKVY), was inaugurated by Dr. S. Ayyappan, Hon'ble Director General, ICAR and Secretary DARE, Govt. of India, in the presence of Dr. B. Meenakumari, Hon'ble Deputy Director General, (Fisheries) ICAR, and Dr. K.M.Bujarbarua, Hon'ble Vice Chancellor of Assam Agricultural University, Jorhat on 16th April, 2013. All the statutory officers of AAU including the Registrar, Dean, Director of Extension Education, Director of Research, all the Heads of the Departments and faculty members of AAU and ICAR personnel were present on this auspicious occasion. Senior Scientist and Incharge of the Centre, Dr. Bibha Chetia Borah welcomed Hon. Dr. S. Ayyappan and Dr. B. Meenakumari along with other dignitaries. He explained the objectives of the poly house. The Vice Chancellor, AAU informed all the dignitaries present about the genesis of the poly house concept for advanced breeding of carps. The Director General expected advanced production of fish seed during the early culture season from the next year. He further added that this endeavour would be very promising for the fish farmers of Assam and would facilitate production of needed quantities of the right size of fish seed at the right time. Dr. S. Ayyappan congratulated Dr. Bibha Chetia Borah for the progress made so far and assured further help and support from ICAR for the development of fisheries research in the University. The dignitaries also released brood fishes in the poly-house on that occasion.

Lighting the inaugural lamp, Dr. S. Ayyapan, Hon'ble DG, ICAR & Dr. K. M. Bujarbarua, Hon'ble VC, AAU

Inauguration of the polyhouse by Dr. S. Ayyapan, DG, ICAR

Dr. B. Meenakumari, DDG, ICAR during inaugural ceremony

Release of brood fish in polyhouse pond during inauguration

A side view of polyhouse

Authors of the report inside the polyhouse

- Fifty six outbreaks of Classical swine fever were recorded in 17 districts of Assam. Lakhimpur, Sivsagar and Dhemaji districts were having 7 outbreaks each which were quite high.
- *Pestes-des-petits* ruminants continue to be the emerging disease of goats in Assam and 7 outbreaks were recorded in 4 districts.
- Not a single outbreak of Anthrax was recorded during the year.
- ORF or *contagious ecthyma* is another emerging diseases of goats in Assam and occurred in epidemic form in some districts of Assam mainly Kamrup, Dhubri districts.
- Among bacterial diseases of poultry, outbreak of fowl cholera was found to be the highest in Assam.
- Ranikhet (New Castle Disease) is one of the major important viral diseases of poultry in Assam causing high mortality; a total of 15 outbreaks were recorded from 11 districts during the year 2013-14.
- All total 9 outbreaks of Duck Plague were recorded from four districts of Assam.
- Among helminthic disease, incidence of fascioliosis, paramphistomiasis and amphistomiasis was recorded in all species of animals in different districts of Assam.
- No clinical cases of blood protozoal infection in animals were recorded.
- All total 501 serum samples from different species of animals like cattle, pig, sheep, goats were collected and tested for presence of antibodies against brucellosis, IBR, PPR and classical swine fever.
- Detection of antibodies against IBR is a major concern although till now no clinical cases of IBR could be detected in field condition.

4.3.18 Pox Viral Infections in Animals

- A total of 30 orf (contagious ecthyma) samples (Pock lesion and serum sample) and 7 fowl pox samples had been collected from different districts of Assam and Nagaland. Out of 30 orf samples 28 samples (93.33%) and all seven (100%) fowl pox samples had been found positive

4.4 Fishery

Fishery research activities of the University are being carried out at Fisheries Research Centre, AAU, Jorhat (established in 1982) and College of Fisheries, Raha. The Director of Research (Agri) and the Director of Research (Vety) coordinate the fisheries research activities. During the year under review, 5 research projects sponsored by different agencies were in operation besides quality seed production and balanced fish feed production. Some of the salient research findings are as follows:

- The College of Fisheries, AAU, Raha has developed technology of '*Fish Pickle preparation*' where bamboo shoot extract was used instead of vinegar. Chemical and Organoleptic studies indicated that the product remains in acceptable condition for six months. This low cost technology was transferred to *M/S Meghali Food Products*, a Jorhat based entrepreneur on August 24, 2013 after signing an MoU between AAU and the entrepreneur. Finally, the product was launched on October 8, 2013 at AAU, Jorhat in presence of Dr. K.M. Bujarbaruah, Hon'ble Vice Chancellor, AAU and other dignitaries of AAU.
- Successful advanced breeding and seed production of indigenous minor carps, *Labeo gonius* and *Labeo calbasu* during February-March, 2014 through enhancement of water temperature during winter months by using polyhouse made of UV stabilized LDPE film and increasing photo period length through illumination (Fig. 4.33). The results will pave the way for seed production of cultivable species in advance which will enhance the availability of stocking material in proper time *i.e* during March-April for the farmers of Assam.

Fig: 4.33: Advanced breeding and fish seed production under polyhouse

Fig. 4.34: Advanced breeding & seed rising of minor carps under polyhouse system at FRC, AAU

assay has been developed and standardized in the lab. A new digenetic trematode parasite, *Isoparorchis hypselobagrii* has also been identified from *Wallago attu* with morphometric and molecular characterization.

- In a study on community based cage culture in 5 selected *beels* of Nagaon and Morigaon district of Assam, raising fish seed for 45 days duration led to production of the fish fry stock with average weight of 0.4 g - 0.6 g and length of 2.0 cm - 3.0 cm and a phenomenal growth rate up to 10.0 cm - 22.0 cm in length. The survival rates of the fishes cultured in all the cages were also found to be more than 70% which was most encouraging as compared to the survival rates in rearing ponds.

Fig. 4.35: Freshwater Prawn cultured at FRC, AAU

- Several fish samples were collected from the Thekera *beel in Morigaon district by test fishing* and population growth, breeding biology, recruitment pattern of *Gadusia chapra* were studied.

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iv. Further work on economic viability and popularization of the system need to carried out.