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Rajiv Gandhi Centre for Aquaculture

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Cobia juveniles at RGCA Cobia Hatchery, Muttom

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From the President's Desk

Ms. Leena Nair. IAS

It is my privilege to place on record the activities and achievements of RGCA during the year 2014-15 in the form of Annual Report. Impressive growth and commendable accomplishments were made by the organization during this period, which would serve to shape up the demand of our country in the sphere of technology developments for aquaculture.

This year, the Central Aquaculture Pathology Lab (CAPL) of RGCA succeeded in earning recognition as the first NABL accredited Aquaculture Pathology Lab of the Country. CAPL is well equipped with excellent diagnostic services and expertise and hence can provide reliable results in disease diagnosis of finfish and shellfish besides providing the requisite technical support to the hatchery and farming communities.

The year 2014-15 was also eventful to RGCA not only in terms of technology developments and dissemination but also in hosting interactive workshops. The India Tilapia Summit - ITS 2014, held at Vijayawada on 18th December 2014 was one such event that evoked maximum response from the farming community keenly looking to alternate species for aquaculture and is likely to be the trigger that popularizes tilapia farming in India.

Pioneering attempts were also made by the organization in the technology front of its flagship Project – the Domestication of Tiger shrimp project and significant progress was achieved in the development of founder families & selective breeding for the production of successive generations. The project stepped closer to production and supply of SPF Tiger Shrimp Broodstock to the Industry.

Similarly the Marine Finfish Hatchery Project put in efforts to develop and promote fish production through open sea cage farming. Cobia juveniles were stocked in grow out cages in Muttom, Kanyakumari District, Tamil Nadu and demonstration programmes on cage farming were carried out. Fishermen Societies were sensitized about the benefits of cage culture technology and its role in improving their livelihood.

The Genetics unit of RGCA resolved the taxonomic ambiguity of Indian mangrove mud crab species (genus *Scylla*) for the first time in India using multiple molecular markers and revealed the existence of only two mud crab species – *Scylla serrata* and *Scylla olivacea* in our Coastal waters.

The Aquatic Quarantine Facility for *L. vannamei* like in previous years continued its dedicated services to the shrimp industry and quarantined over 1.99 Lakhs broodstock with an excellent quarantine survival of 96%. Quality SPF vannamei brooders were also supplied by the Broodstock Multiplication Centre for *L. vannamei* of RGCA to the hatchery operators.

The Technology Transfer Training division of RGCA also succeeded in fulfilling the institute's mandate, by conducting a host of outreach and training programmes, including seminars, workshops, on farm-site demonstration trainings etc. RGCA thus continued to march ahead in all its technology development programmes, propelled by the encouragement and support from the Scientific Advisory Committee and the Executive Committee of the Organization.

While presenting the Annual Report for the year 2014-15 I have the privilege of acknowledging the commitments shown by the RGCA team for their performance in various project activities and I am sure the expertise built over 20 years of technological journey will deliver with dedication the set mission of RGCA. I also thank the Hon'ble Minister of Commerce & Industry, and other senior officials in the Ministry of Commerce & Industry for providing support to RGCA for all its endeavours.

Leena Nair. IAS
Chairman MPEDA & President RGCA

22nd September 2015

RGCA at a Glance

Rajiv Gandhi Centre for Aquaculture (RGCA) is the R & D arm of the Marine Products Export Development Authority (MPEDA), Ministry of Commerce and Industry, which implements the plan schemes of MPEDA under the head Research & Development. The organization is functioning as a society, registered under the Tamil Nadu Societies Registration Act, 1975 since January 5th 1996. and has established its Headquarters at Sirkali, Nagapattinam District, Tamil Nadu.

RGCA is actively involved in the development of various sustainable aquaculture technologies that are bio-secure, eco-friendly and traceable for seed production and grow out farming of various aquatic species, those having export potential in particular. RGCA has also developed a state-of-the-art Technology Transfer and Training centre for disseminating the technologies developed at the various projects established at different locations in the country to promote the aquaculture industry in India. The various projects of RGCA were implemented with a budget outlay of Rs. 133 crores during the 11th plan period. A budget outlay of Rs. 297 crores has been proposed for the ongoing projects and two new projects during the 12th Plan period.

RGCA is governed by an Executive Committee comprising of the members from offices of the MPEDA, MoC& I, ICAR, DBT, Commissioner of Fisheries from the states of Andhra Pradesh, Tamil Nadu & Gujarat; Director of Fisheries of Kerala, Tamil Nadu, Andaman & Nicobar Islands and the U.T of Pondicherry. The Chairman MPEDA is the President of RGCA. Presently Ms. Leena Nair, IAS, is the President RGCA and the Chairman of its Executive Committee. The other members of the Executive Committee are:

* Ms. Leena Nair, IAS, Chairman, MPEDA
* Shri. M. C. Luther, Director (EP&MP), MoC&I
* Dr. (Mrs) B. Meenakumari, DDG (Fy), ICAR, New Delhi
* Dr. A.S. Ninawe, Sr. Advisor, DBT, Ministry of Science & Technology, New Delhi

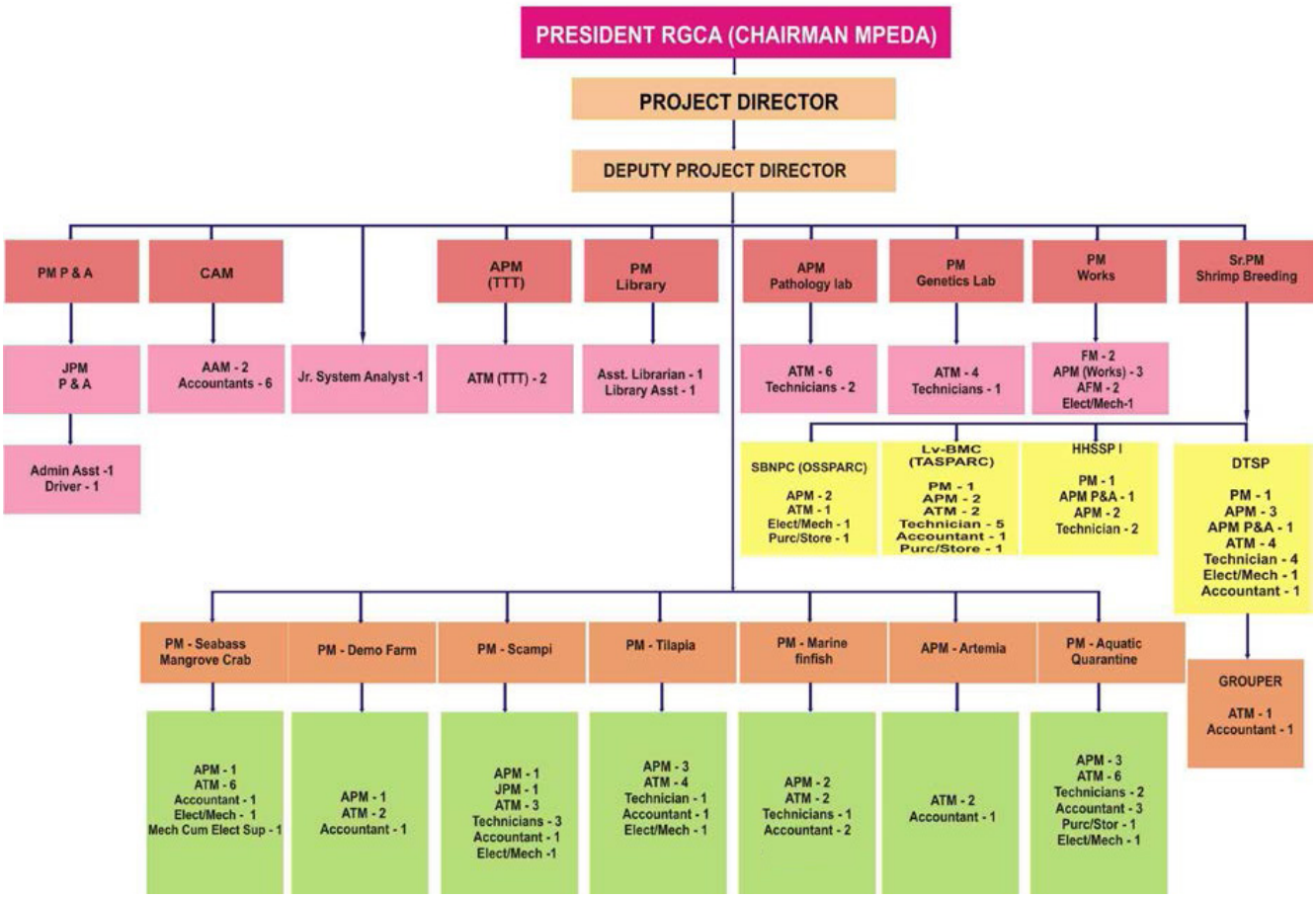
- Dr. K.K. Vijayan, Director CIBA, Chennai
- Shri. Rama Sankar Naik, IAS, Commissioner of Fisheries, Andhra Pradesh
- Smt. Beela Rajesh, IAS, Director/Commissioner of Fisheries, Tamil Nadu
- Shri. J. Chandrasekhar, Director of Fisheries, A&N Islands
- Smt. Noorjahan Beevi, Joint Director (Inland Fisheries), Dept.of Fisheries, Chennai
- Smt. Saira Banu. K.A., Executive Director, ADAK, Kerala
- Shri. P. L Darbar, Commissioner of Fisheries, Gujarat
- Smt. Mary Chinna Rani, Director, Dept. of Fisheries & Welfare, Pondicherry
- Shri. N. Ramesh, ITS, Director (Mktg), MPEDA
- Shri. B. Sreekumar, Secretary, MPEDA
- Shri. Y. C. Thampi Sam Raj, Project Director (I/c), RGCA
- Smt. E. V. Deepa, CEO, MPEDA, Kerala
- Shri. P. Mohanasundaram, Director, MPEDA

The Technical/Scientific programmes involved in implementing various projects of RGCA are conceptualized and finalized by a Scientific Advisory Committee comprising of senior level scientists of the country. Dr. E.G. Silas, former Vice Chancellor, Kerala Agricultural University and former Director, CMFRI is the present chairman of this committee.

The members of the Scientific Advisory Committee of RGCA are:

- Dr. E.G. Silas, Chairman, SAC
- Dr. George John, Former Sr.Advisor DBT, New Delhi
- Dr. (Mrs) B. Meenakumari, DDG (Fy), ICAR, New Delhi
- Dr. A.S. Ninawe, Sr. Advisor, DBT, Ministry of Science & Technology
- Dr. A.Gopalakrishnan, Director CMFRI, Kochi
- Prof. Dr. T. Balasubramaniyan, Former Dean, CAS, Marine Biology, AU, Parangipettai
- Dr. E. Vivekanandan,Former Principal Scientist, CMFRI, Kochi
- Dr. T.C. Santiago, Former Principal Scientist, CIBA, Chennai
- Ms Leena Nair, IAS, President RGCA
- Shri. P. Mohanasundaram, Director MPEDA
- Shri. Y.C. Thampi Sam Raj, Project Director, RGCA

Organizational Structure



CAM - Chief Accounts Manager, Sr.PM - Senior Project Manager, PM - Project Manager, APM - Assistant Project Manager, JPM - Junior Project Manager, FM - Facility Manager, AFM - Assistant Facility Manger, ATM - Assistant Technical Manager, AAM - Assistant Accounts Manager

Mission Statement

* To promote sustainable aquaculture with long term vision

* To function on no profit no loss basis for research & development activities relevant to its objectives

* To establish Technology Development Centres in Aquaculture in various locations of the Country for the development and dissemination of appropriate technologies for scientific aquaculture

* To develop and introduce world class sustainable technologies in aquaculture

* To transfer technical know-how, plans, designs and other relevant information for establishing aquaculture units in various states of India

* To give consultancy and technical services to the entrepreneurs and farmers for establishing aquaculture units

* To impart training in various aquaculture technologies developed at its centres

* To conduct pilot scale operations and to set up demonstration farms to popularize the technologies developed/acquired

* To scale up the technologies developed in other allied research institutes by collaborating with the concerned scientists and disseminate the same through extension, education and demonstration programmes

* To assist public and private National Institutes and agencies for the development of innovative technologies which have scientific applications

* To undertake execution of aquaculture projects entrusted by Government agencies/ departments such as Department of Bio-Technology (DBT), Department of Earth Sciences, Ministry of Agriculture, Ministry of Commerce and Ministry of Food Processing.

* To take up such activities as to re-seed and replenish the over exploited stock of the sea and other large in land water bodies through ranching with hatchery reared young ones for restoration and sustainable development of fisheries

* To introduce proven aquaculture technology of the selected species which are commercially successful elsewhere in the world and would be campatible in India. The centre will buy the technology from national or international source, blend the same under Indian condition with local technology if available and sell it to Indian entrepreneurs after assuring its sustainability and commercial viability

Ongoing Projects & their Locations

RGCA operates 12 important aquaculture projects spread over 21 different locations across the country. They are;

- **Seabass Hatchery Project**
  Thoduvai, Nagapattinam District, Tamil Nadu

- **Mangrove Mud Crab Hatchery Project**
  Thoduvai, Nagapattinam District, Tamil Nadu

- **Aquaculture Demonstration Farm**
  1. Karaikal, UT of Puducherry
  2. Mahendrapalli, Nagapattinam Dt. Tamil Nadu

- **Domestication of Tiger Shrimp Project(DTSP)**
  1. Amkunj, Middle Andaman
  2. Kodiaghat, South Andaman
  3. Kanyakumari, Tamil Nadu
  4. Pilot Scale Broodstock Multiplication Centre (OSSPARC), Gopalpur on sea, Odisha
  5. High Health Tiger Shrimp Seed Production Unit Chirala, Andhra Pradesh

- **Scampi Broodstock Development Project**
  1. Kankipadu, Krishna District, Andhra Pradesh
  2. Manikonda, Krishna District, Andhra Pradesh

- **Artemia Project**
  1. Tharuvaikulam, Tuticorin, Tamil Nadu
  2. Artemia Demo Farm, Uppoor, Ramanathapuram

- **Broodstock Multiplication Centre for *L.vannamei***
  (TASPARC : Andhra Pradesh Shrimp Seed Production, Supply and Research Centre), Vishakhapatnam in Andhra Pradesh

- **Tilapia Project**
  Manikonda, Krishna District, Andhra Pradesh

- **Pilot Scale Marine Finfish Project**
  1. Pozhiyur, Thiruvananthapuram, Kerala
  2. Muttom, Kanyakumari District, Tamil Nadu

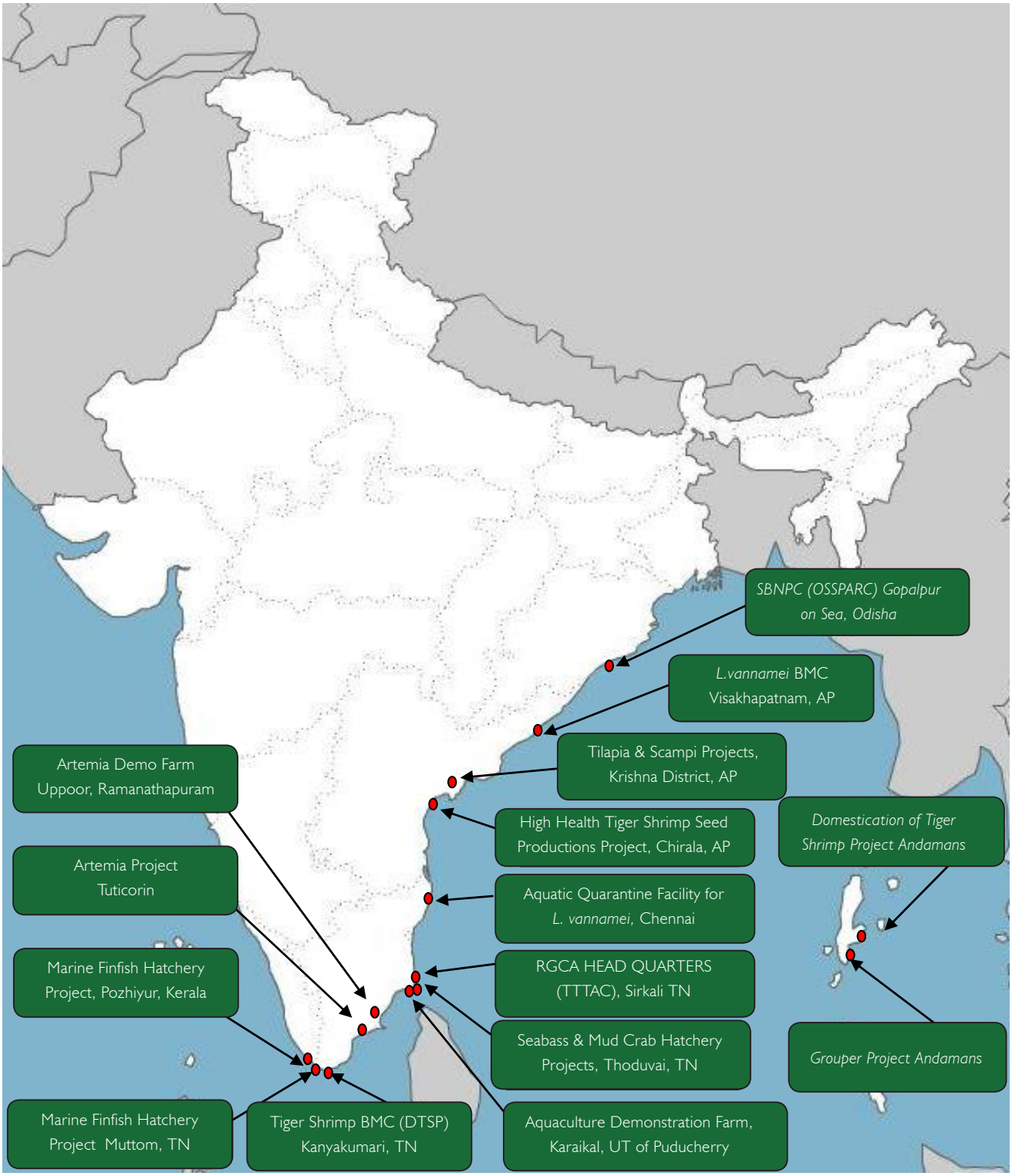
- **Grouper Project**
  1. Kodiaghat, South Andaman
  2. Sea area of Rutland Island South Andaman

- **Technology Transfer Training and Administrative Complex**
  Sirkali, Nagapattinam District, Tamil Nadu
  The Head Quarters of RGCA functions from this complex

- **Aquatic Quarantine Facility(AQF) for *L.vannamei***
  Neelankarai, Chennai,
  TamilNadu.

(Full addresses of the above locations, please see page 113)

RGCA Project Locations



Cobia harvest at RGCA farm, Muttom, TN

Executive Summary

The projects implemented by RGCA lead to outcomes that are significant to the aquaculture sector of the Country. The ensuing report highlights the major accomplishments for the period 2014-15, at each of the 12 projects of the Organization operated across 21 different locations:-

* The Seabass hatchery (*Lates calcarifer*) facility at Thoduvai, Nagapattinam District, continued captive spawning of wild caught seabass brooders and achieved a survival of 64.8 % in rearing fry from hatchling stage. About 5 successful spawns were obtained and around 2.01 million seabass seeds were supplied by the hatchery to various beneficiaries such as farmers, Research organizations and Universities etc.

* The Mangrove Mud Crab Hatchery facility of RGCA, at Thoduvai, Nagapattinam, recorded a production of approximately 7.1 lakhs of crab instars (crab seed) of size range 0.4-0.6 cm, during the period under report. The consistent production of seeds by the hatchery indicated success in standardization of technology for seed production through the adoption of green water system and use of probiotics in larval rearing. The hatchery supplied 4.85 lakhs of WSSV free instars to the farmers from Tamil Nadu, Andhra Pradesh, Orissa, Kerala, Maharashtra and ICAR Research Institutions.

* The Aquaculture Demonstration Farm (ADF) at Karaikal devised improved packing methodology which paved the way to minimize the mortality of crablets during transport. The innovative packing method helped to obtain a survival of 98.6 % during

the period under report. The ADF also produced and supplied around 94,000 crablets to 22 farmers in different coastal states and also for the UNDP, NIO and MPEDA for their field demonstrations apart from imparting technical guidance to the UNDP mangrove mud crab project in Sindhudurg, Maharashtra on pen and tide fed farming of mud crabs.

- The Domestication of Tiger Shrimp Project moved closer in achieving the targeted production of founder families for the programme and was successful in the production of G5 stocks at the Nucleus Breeding Centre of the facility at Andaman. The facility also stepped closer to production and supply of SPF Tiger Shrimp Broodstock to commercial shrimp hatcheries for trial production.

- The Scampi (*Macrobrachium rosenbergii*) broodstock development project with its hatchery facility at Kankipadu Mandal, and its experimental farm at Manikonda Village, Andhra Pradesh carried out extensive field trials with all-male scampi seed produced at the facility from the Neofemales of Kerala and West Bengal strains. Production of Neofemales continued at the facility through microsurgical interventions.

- The Artemia Project Facility at Tharuvaikulam, registered a production of 102.1kg wet cysts translating to 31.4 kg of dry cysts of Artemia during the period under report. The Project also secured additional land area of 10 ha area in Upoor Village, Ramanathapuram District to expand its activity for the establishment of an Artemia Demonstration farm that would serve as a hands on training facility to SHGs and women folk on Artemia Cyst and Biomass production in salt pan areas.

- The Broodstock multiplication Centre for *L. vannamei* at Visakhapatnam continued broodstock production and supplied over 19,400 High Quality SPF broodstock during the year to 22 Hatchery operators in 27 consignments.

- The Tilapia Project based at Manikonda Village, Krishna District successfully completed mating programme of G2 generation of Genetically Improved Farmed Tilapia (GIFT) for the development of 44 unique G3 families. The facility also produced >5 million all-male tilapia seeds during the period under report and supplied 1.2 million to registered/approved farms, Government Institutes of Tamil Nadu, Andhra Pradesh, Odisha, Chhattisgarh, Karnataka and Kerala for demo-farming programmes. The project also took initiative to popularize Tilapia culture in the country, by hosting an international conference - ITS 2015, the India Tilapia Summit at Vijayawada on December 18, 2014.

- The Pilot Scale Marine Finfish Hatchery facility at Pozhiyur achieved year round Cobia Breeding and Seed production and obtained seven successful spawning during the period under review. The project registered a comparatively high production and supply of fingerlings during the period under review than when compared to the previous years. About 34290 nos seeds were produced and 26870 nos of fingerlings were supplied to the farmers and Research Institutes.

- The Grouper project, continued demonstration farming of Tiger Grouper at its sea cage farm off Rutland Island in South Andaman. The project also is in the progress of development of a Multi Species Grouper Project at Rangachang in South Andaman.

- The Aquatic Quarantine Facility for *L. vannamei* (AQF) at Chennai is functioning at full capacity and quarantined close to 2 lakhs vannamei brooders imported by approved hatchery operators during the year.

The percentage of quarantine cubicles occupied during the period under report was 81.9%. AQF achieved to deliver its benchmark quarantine services with a consistent quarantine survival rate of 96.87%.

* The Central Aquaculture Pathology Lab (CAPL) earned the accreditation of NABL as per ISO/IEC 17025:2005 and thus has become the only accredited aquaculture pathology laboratory of the country. The lab has identified the etiological agent of the Idiopathic Hyaline Granulomatous Syndrome (IHGS), which has long been a hurdle in *Penaeus monodon* aquaculture and breeding. It has also discovered the causative agent of low level continuous mortality, commonly known among shrimp farmers as Running Mortality Syndrome of *Penaeus vannamei.*

* The Central Aquaculture Genetics Lab (CAGL) succeeded in resolving the taxonomic ambiguity of Indian mangrove mud crab species (genus *Scylla*) for the first time in India using multiple molecular markers and revealed the existence of only two mud crab species – *Scylla serrata* and *S. olivacea* in Indian coastal waters.

* The Technology Transfer Training Centre (TTTAC) of RGCA which is involved in dissemination of technologies developed at various aquaculture projects of RGCA conducted twenty training programmes on best husbandry practices and culture aspects of various important fish and shellfish species. The training was imparted to 215 beneficiaries.

* Feedback on training programmes was also collected by the Centre which was appreciative and encouraging. Some of the participants who attended the training expressed interest to start their own farming and many of the farmer participants procured seeds from RGCA. The TTTAC also conducted nine Familiarization programmes on latest trends in Aquaculture practices of Cobia, Seabass and Mud Crab Aquaculture to about 310 participants comprising of farmers, students, fisheries officials and entrepreneurs.

R & D Project Highlights

Unloading Cobia juveniles from RGCA hatchery

Seabass brooders at RGCA seabass hatchery, Thoduvai

Seabass fingerling

Seabass Hatchery Project

Name of the Project : Seabass Hatchery
Location : Thoduvai, Sirkali, Nagapattinam District. Tamil Nadu
Year of Commencement : 2000

The Sea bass Hatchery project was initiated by RGCA during the year 2000 at Thoduvai village in Sirkali taluk of, Nagapattinam Dt., Tamil Nadu. The project envisaged to establish a hatchery facility for the development & dissemination of technology on sea bass seed production in hatchery systems and to impart training on specific areas of hatchery operations to the entrepreneurs and hatchery operators. The project also envisaged to supply sea bass seeds to the aquaculture industry for augmenting aquaculture production mainly through cage farming in earthen pond, open water system and marine cages.

The Seabass Hatchery Project has been established on a 13. 2 acre own site at Thoduvai village, Sirkali Taluk, Nagapattinam District. The hatchery complex

RGCA's Seabass hatchery at Thoduvai, Tamil Nadu

comprises of a Quarantine section, Broodstock housing and Spawning sections, Larval rearing section, Fingerling rearing area and a full-fledged Live feed section that includes areas for Micro algae, Rotifer and Artemia. Accessory systems of seawater intake, treatment, fresh water intake, reservoirs, overhead tanks, filtration, aeration and power back up systems are also in place. The hatchery is having an installed capacity for production of maximum 3million seeds (2-3cm) per year.

State-of-the-art infrastructure facilities equipped with RAS (Recirculation Aquaculture Systems) with thermo and photo controls have also been established at the facility for broodstock housing and management for year round production of seed.

Activities & Accomplishments

The summary of activities of the project such as broodstock collection, Quarantine and husbandry as well as seed production and survival is detailed below:

Broodstock Collection & Quarantine

During the year, 12 nos. of seabass broodstock were recruited from wild and brought to the hatchery for quarantine treatment. Another 52 seabass brooders were maintained in broodstock housing tanks fitted with Recirculation Aquaculture System (RAS). The broodstock collected were subjected to an elaborate 40 days quarantine before being used for spawning.

Harvested seabass

Breeding and Seed production

The seabass spawned successfully in Recirculation Aquaculture System (RAS) installed in the hatchery. From five spawnings during this year, 3.15 million larvae were obtained and stocked in larval rearing tanks. A total of 2.01 million seabass seeds (fry & fingerlings) were supplied to the farmers, Universities, Research Institutes, Fisheries Departments, ICAR organizations, MPEDA and RGCA Demonstration programmes.

Infrastructure additions during the year

The hatchery facility was installed with additional infrastructure facilities such as oxygen concentrators, packed bed Bioreactor system and an automatic egg collection device to facilitate quality seed production.

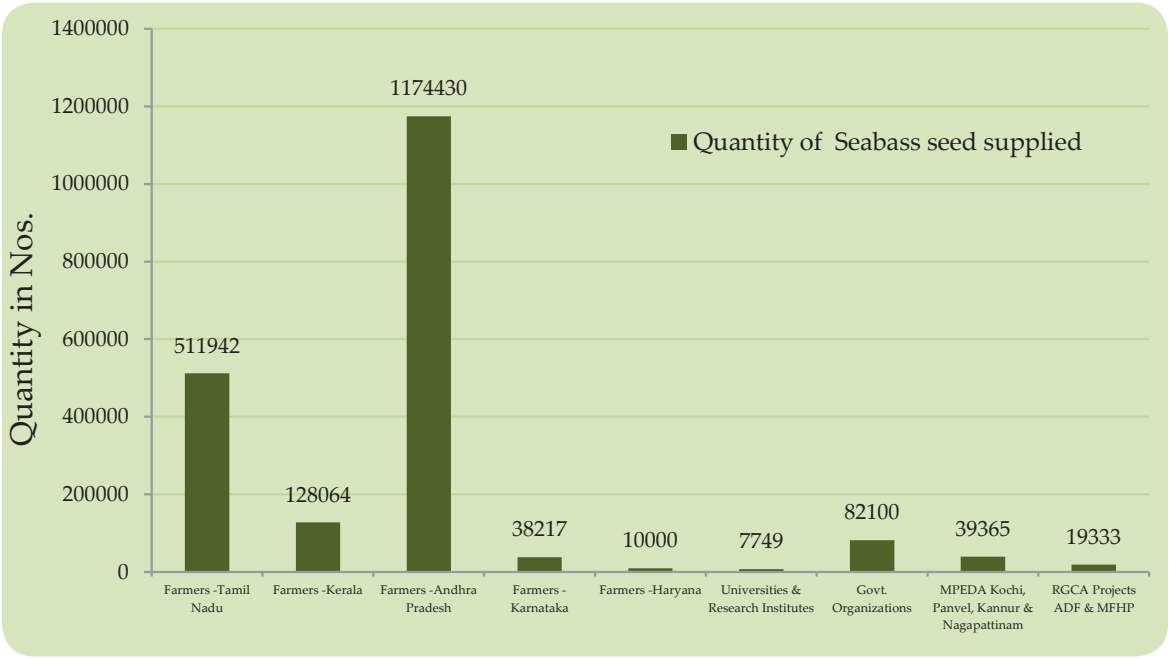
Seabass fingerling rearing tank

No. of Spawning conducted during 2014-15	5 nos
No. of Hatchlings stocked	3.15 million
No. of Seeds (Fry/Fingerlings) supplied	2.01 million
Survival rate	64%

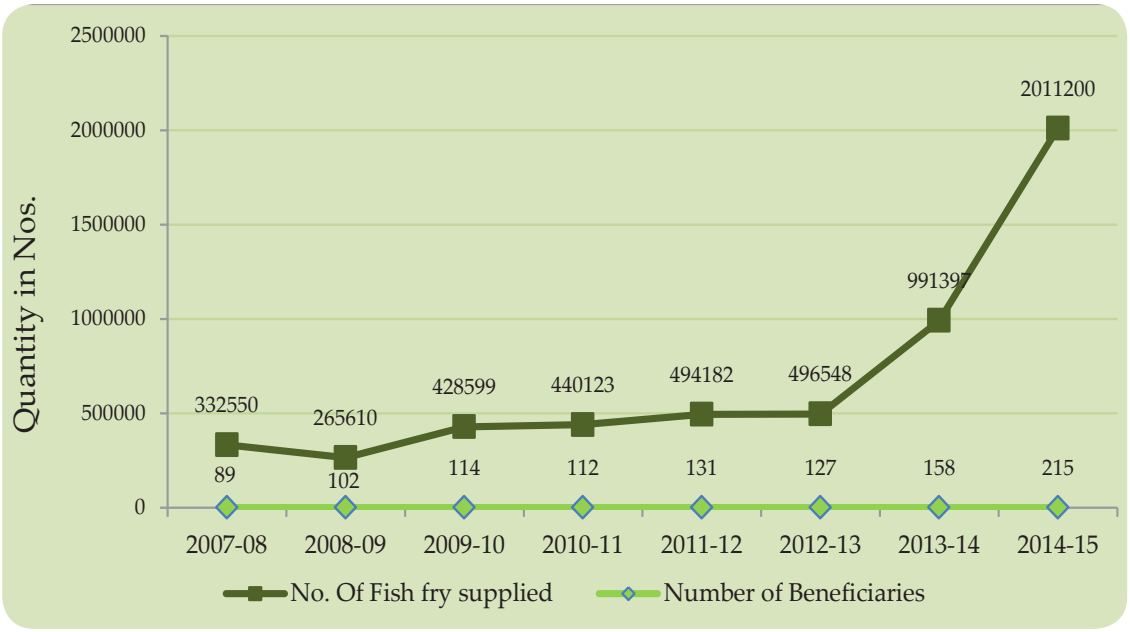
Spawning and seed production of seabass during 2014 - 15

Particulars	No of Farmers/ Beneficiaries	Quantity of Seed Supplied
Farmers – Tamil Nadu	151	511942
Farmers – Kerala	22	128064
Farmers – Andhra Pradesh	9	1174430
Farmers – Karnataka	6	38217
Farmers – Haryana	1	10000
Universities & Research Institutes	8	7749
Government Organizations	12	82100
MPEDA Kochi, Panvel, Kannur, & Nagapattinam	4	39365
RGCA Projects ADF & MFHP	2	19333
TOTAL	215	2011200

Seed supplied from the hatchery to various farmers / organization during 2014-15



Categories of seabass fry/fingerlings buyers from the RGCA hatchery during 2014-15



Year wise seabass seed production from the RGCA hatchery

Weaning the larvae in seabass hatchery at Thoduvai

Healthy seabass fingerlings produced at RGCA hatchery

Supply of seabass fingerlings to farmer

Intensive production of Seabass fry at RGCA hatchery

Automatic egg collection device in spawning tank

Broodstock of Mangrove crab collected from farm

Mangrove Mud Crab Hatchery Project

Name of the Project : Mangrove Mud Crab Hatchery Project
Location : Thoduvai, Thirumullaivasal, Sirkali, Nagapattinam District, Tamil Nadu
Date Of Commencement : 2004

India's First and Exclusive Mangrove Crab Hatchery

Mangrove Mud Crab under the species Scylla commands sustainable domestic and international market. Owing to the fact, this species is indiscriminately exploited without paying attention to the size, maturity status (berried or not) and physiological status (water or hard) resulting to heavy pressure on the natural population and the stagnation of fisheries production of this species from all along the coastal belt of India. Due to the said reasons, the Mangrove Crab Hatchery project of RGCA was initiated to promote Aquaculture of this species both to augment the Aquaculture production as well for the natural stock enhancement of the species in the wild by ranching activities. This is achieved by the development of a Pilot Scale Mangrove Crab Hatchery Project which was started by RGCA during October 2004 by constructing a small larval rearing section and other sections like Broodstock and live feed were shared with Seabass Hatchery facility. Presently State-of-the-art infrastructure facilities equipped exclusive Mangrove Crab full scale hatchery facility has been established with

A view of larvae rearing section in Mangrove mud crab hatchery

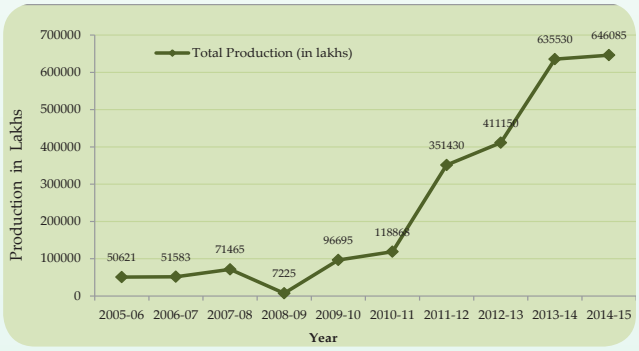
a production capacity of 1million crab seeds (Crab Instar) per annum. This facility comprises of dedicated sections for Broodstock quarantine, maintenance, hatching, larval rearing and live feed. Besides these, supporting systems such as Seawater intake systems, Ozone &UV treatment systems, Aeration systems and backup power systems.

Activities & Accomplishments

Details of Broodstock collection, quarantine, Spawning, instar production and supply for the period under review are furnished below:

Collection and Quarantine of matured crabs

Both farm reared as well as wild caught matured crabs were used for seed production. Around 101 crabs in the size range of 500 to 1000 gms were collected which included 4 crabs from Andaman & Nicobar Island and 14 crabs from Andhra Pradesh. These were quarantined at the facility prior to use for seed production. The crabs were screened for White Spot Syndrome Virus (WSSV) and only those free of WSSV were stocked in broodstock holding tanks. Healthy broodstock among these were then selected for spawning.



Year wise production of Crab instar from the RGCA Hatchery

Live feed stock room at crab hatchery of RGCA

Spawning and Hatching

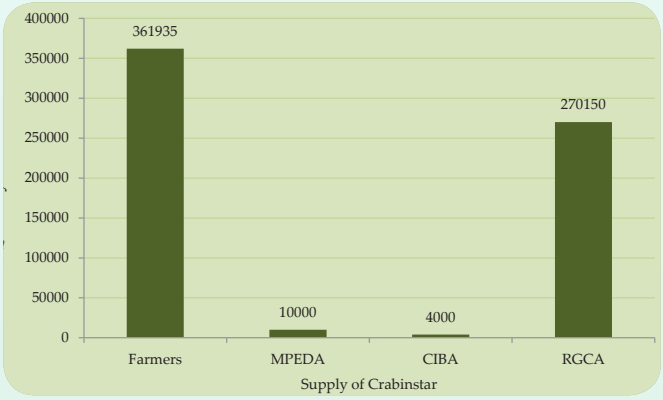
47 successful spawnings were obtained at the hatchery during the year. These spawnings yielded about 104 million zoea while 32 million healthy zoea from the above were stocked for larval rearing, the remaining 72 million were ranched into the nearby estuary and open sea.

Seed Production

The period under report recorded twenty one production cycles through which approximately 6.4 lakhs of crab instar (crab seed) of size range of 0.4-0.6 cm were produced. The consistent production of seeds in the hatchery indicated success in standardization of technology for seed production through the adoption of green water system and use of probiotics in larval rearing. The maximum survival rate achieved in larval rearing (from zoea to crab instar) during the year was 9%. The steady increase in survival rates over the years provides ample scope for viable commercialization of crab hatchery seed production. Details of crab instar production at the RGCA Mangrove crab hatchery facility over the years is shown in the table below.

Promotional supply of Crab instars

Out of 6.4 lakhs of crab instars produced at R&D output during the year 2014-15, around 3.62 lakhs



Category wise supply of Crab instar from the Hatchery during the year 2014-15

were supplied to the farmers from Tamil Nadu, Andhra Pradesh, Orissa, Kerala and Maharashtra and around 14000 crab instars to MPEDA & CIBA. The remaining 2.7 lakhs crab instars were stocked in nursery hapas at the RGCA Demonstration Farm, Karaikal for rearing to crab lets.

Additional Infrastructure facilities

The following infrastructure was added to the mud crab hatchery during the year.

- Oxygen Concentrator (2 units) & Oxygen Distribution Chamber for increasing Dissolved Oxygen level in Larval Rearing & Artemia Hatching tanks

Oxygen Concentrator & Oxygen Distribution Chamber

- HP 200 Air blowers 3nos. were procured for live feed lab & Oxygen distribution Chamber
- An additional CCTV Camera was set up in mangrove crab hatchery premises
- A Mini Centrifuge was procured for micro algae purification purpose
- EB line Bye pass set up from Seabass Hatchery to Mangrove Crab Hatchery and Mangrove Crab hatchery to Seabass Hatchery was installed

RGCA hatchery produced crablets

Transportation of Crabinstars from RCGA hatchery to Private farms

Nursery rearing of crab instar in hapas

Aquaculture Demonstration Farm Project

Name of the Project : Aquaculture Demonstration Farm
Location : Karaikal, UT of Puduchery
Year of Commencement : 2000

The Aquaculture Demonstration Farm project of RGCA was taken up with a view to develop and demonstrate viable technologies in nursery rearing and grow-out farming of commercially important species such as Asian seabass and mangrove mud crabs in different farming systems such as earthern ponds, hapas, pens, open ponds etc. The farm is located at two separate sites. The first site have an extent of 10 acres of leased land developed during the year 2000 at Keezhoduthurai, Karukkalacherry Road, Karaikal in the Union Territory of Puducherry and the second site of 18.72 acres of own land on the banks of the Kollidam River at Mahendrapalli, Nagapattinam District, Tamil Nadu. The latter site is under construction and development during the period under report.

Activities & Accomplishments

Nursery rearing of crabs & supply of crablets

Crab instars produced at the RGCA hatchery were stocked in nursery hapas and grown to crablets in the demonstration farm. During the period under report, 3.18 lakh crab instars from 22 batches received from RGCA – Mangrove Mud Crab Hatchery, Thoduvai were reared in nursery happas for the production of 1,20,650 nos. of crablets at survival rate in the range of 36.4 – 54.5 %. 93,958 nos. from the above were supplied to farmers, SHGs, SHGs of Mangrove Crab Project, Sindhudurg, MPEDA Demonstration programmes and Research institutions.

Grading of crablets

The packing methods to minimize the transport mortality of the crablets were also improvised during this period. A survival rate of 98.6% could be achieved with the improved method of packing and transportation in contrast to the survival of 84.5 % achieved during the previous year. Crablets reared from the RGCA farm were supplied to the farmers in the neighbouring states such as Andhra Pradesh, Kerala and Maharashtra without transit loss.

Harvested Crabs from pelleted feed trial experiment

Grow-out farming trial with pelleted diet

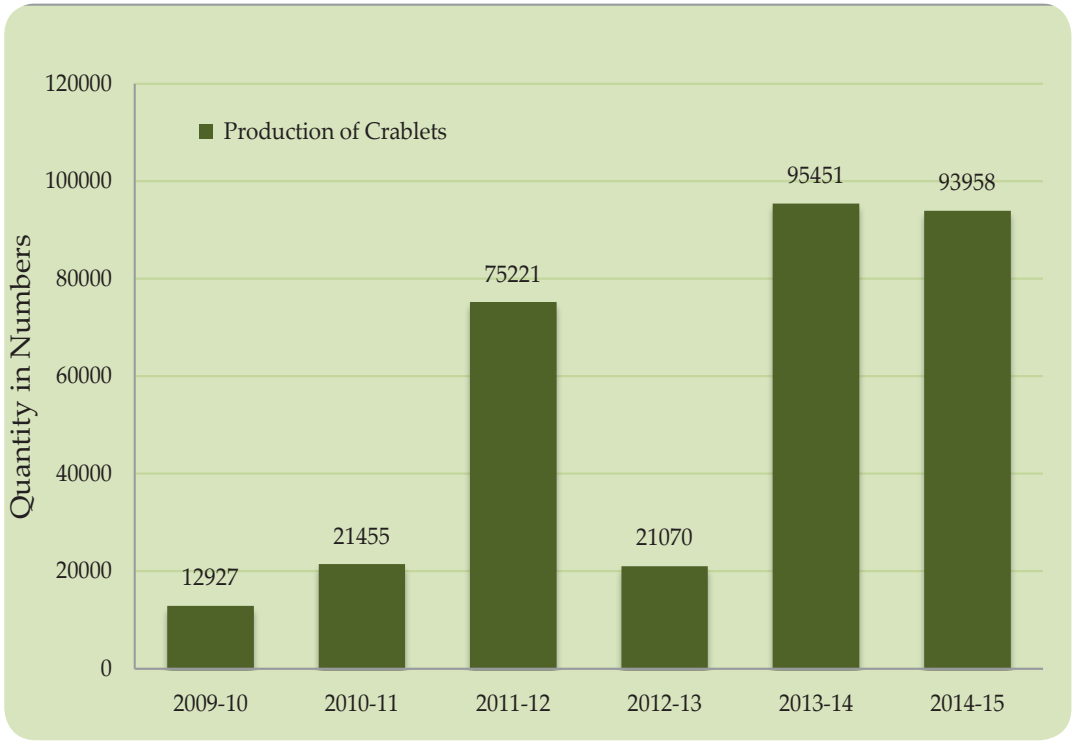
Feed trial of mudcrab farming with artificial pellet diet was initiated by stocking crablets at a density of 0.5 nos./m^2 in 0.75 ha pond. Around 3750 nos. were stocked in the pond. Regular assessment of growth, feed intake, water quality etc were done throughout the farming period. The crabs were harvested after a a culture period of 280 days. The yield of harvest was recorded as 817.34 kg of crabs (2052 Nos.)of size range 350-950gm. The trial farming with pellet feed is being repeated with further improvements. Similarly, nursery rearing of crab instars produced from four batches was also taken up using artificial pellet feeds.

Stock Enhancement Programme of Mangrove Mud Crab by pen farming in Sindhudurg mangrove areas in Maharashtra

Technical guidance by RGCA on farming of Mangrove mud crab in pen and tide fed farms was extended to UNDP Mangrove crab project in Sindhudurg, Maharashtra as part of the stock enhancement programme. A holistic technical support was rendered by the Scientists from RGCA, right from the site selection to harvest. About 7 sites suitable for crab farming were identified in 6 villages during first phase and an additional of 6 new sites were surveyed during second phase. The selected sites were stocked with approximately 27,300 nos. of crablets by providing additional infrastructure such as individual nurseries, hide-outs, check trays, catwalks etc. after reviewing the results and outcome of the first phase for better survival and growth. Subsequently, a survey was conducted and a concept layout was prepared. The estimated budget was worked out for establishing one million capacity crab hatchery. Technical team of RGCA monitors the progress of the activities of the programme on a monthly basis in addition to the technical guidance offered whenever required.

RGCA hatchery produced mangrove mud crab

Pen culture of juvenile crabs in demo farm, Karaikal



Crablets supply from Demonstration Farm, Karaikal

Mangrove mud crab harvest at the Aquaculture Demonstration Farm, Karaikal

Demonstration of Asian seabass culture

The culture of Asian Seabass in net cages in ponds was demonstrated by stocking 5000 nos of fingerlings. The fishes were reared for a period of 305 days and subsequently harvested. Around 2.65 M.T with an avg. size range of 0.90 – 1.3 Kg was produced. The survival was recorded to be 74.2 %.

6,833 nos. of seabass fingerlings of 5.0 – 7.0 cm. size were maintained in three batches for feed trial using indigenous feed and attained the avg. size of 550 gms after rearing period of 160 days and the culture is under progress.

Crab Pen at ADF, Karaikal

SPF tiger shrimp

Domestication of Tiger Shrimp Project

The Project on Domestication of Tiger Shrimps has been established to provide high quality Specific Pathogen Free (SPF) domesticated stocks of black tiger shrimp – *Penaeus monodon* to the shrimp aquaculture Industry. This facility was upgraded for full scale production with the following project units.

Project Units	Location	Year of Commencement
Primary Quarantine Unit	Amkunj, Middle Andaman	2009
Secondary Quarantine Unit	Kodiaghat, South Andaman	2011
Nucleus Breeding Centre	Kodiaghat, South Andaman	2014
Pilot Scale Broodstock Multiplication Centre	Gopalpur on Sea, Odisha	2011
High Health Tiger Shrimp Seed Production	Chirala, Andhra Pradesh	2013
Broodstock Multiplication Centre for Tiger shrimp	Kanyakumari, Tamil Nadu	Under Development

SPF tiger shrimp harvested during a pond trial

An aerial view of DTSP project facility at Andaman

Description of the facility

Primary Quarantine Unit (PQU)

Primary Quarantine unit is 800 m2 biosecure facility established at Amkunj, in Middle Andaman, A & N Islands, very near to a major shrimp broodstock landing centre.

This facility consists of quarantine area, holding area, maturation tanks, spawning & hatching area, larval rearing and post larval rearing section, live feed section, a microbiology lab, ETS, back up diesel generators, pumps, blowers, filtration, disinfection systems, dormitory, kitchen and stores.

Activities and accomplishments

Good quality tiger shrimp broodstock from the wild were selected and maintained in the pre primary quarantine unit where each broodstock was maintained in a separate 50 litre capacity plastic crate with aeration and flow through water exchange until initial pathology screening result was available. Broodstock which were free from all known pathogens and with desired characteristics for the breeding programme (size, fecundity, survival etc.) were selected and bred to produce Nauplii. Nauplii are reared to Post Larvae in a separate facility in the quarantine unit with periodic screening for the presence of pathogens. Once the

Post Larvae stock produced from disease free parent stock was provisionally declared as disease free, it was shifted to Secondary Quarantine Unit for further disease screening and growout operations.

No. of founder families produced	:	27
No. of founder families qualified and transferred to SQU	:	17
No. of founder families maintained at PPQU as back up	:	04

Secondary Quarantine Unit (SQU)

To receive provisionally qualified founder families from Primary Quarantine Unit and to grow them until the stocks are qualified for transfer to Nucleus Breeding Centre based on grow out performance and health status.

The SQU unit was established at Kodiaghat in South Andaman A & N Islands in the site owned by RGCA with a floor area of about 1100 m2. This facility is provided with sophisticated seawater intake systems, filtration/disinfection systems and twelve number of 15 MT tanks with individual recirculation systems for high end bio security.

The facility commenced operation since 2011 and founder families of tiger shrimps are being developed in this facility and qualified stocks are transferred to NBC for selective breeding programme.

Activities and Accomplishments

During 2014-15, SQU maintained 15 founder families in the first batch and 12 founder families in the second batch. Out of the above, 24 families were qualified for transfer to NBC and 3 founder families were discarded due to poor performance.

Nucleus Breeding Centre (NBC)

This is one of the largest shrimp selective breeding centres built in an area of 8500 square meters consisting of dedicated facilities required for maturation, spawning, hatching, larval rearing, live feed production, nursery rearing and grow out. The facility is well equipped with Recirculation Aquaculture Systems and other supporting systems.

Activities and Accomplishments

Nucleus Breeding Centre is the repository of tiger shrimp germplasm. This facility maintains SPF tiger shrimp germplasm ranging from 5th generation to first generation. Water quality parameters are maintained with the help of Recirculation Aquaculture Systems. Families of different generations are maintained separately in bio-secure environment with the help of polymer tags. Periodic surveillance of the stock and the SPF status of the stock is certified by RGCA's Central Aquaculture Pathology Lab and confirmed at Aquaculture Pathology Lab of University of Arizona. Dr.Roger W. Doyle, renowned quantitative geneticist and RGCA's Central Genetics lab are responsible for the implementation of the breeding plan of tiger shrimp selective breeding programme. Priorities of the selective breeding are on tolerance to diseases, reproductive performance and growth which are evolved from the current economic imperatives of the shrimp aquaculture sector in India.

The selective breeding strategy is to bring in new families into the NBC every year to allow the population to grow as well as to replace those that are removed during strong selection process for survival. The mating procedure is effectively managed in such a way that the breeders sent off for production every year are those from the ancestral stock that possess the longest cumulative history of domestication and selection.

In addition to the commercial SPF broodstock feeds, specialised bio secure feed developed by RGCA in collaboration with CMFRI is provided for feeding the broodstock.

This facility provides necessary germplasm to pilot scale BMC of RGCA at OSSPARC, Gopalpur on sea, for SPF tiger shrimp broodstock production.

Allocation of land for creation of additional facilities

The Andaman & Nicobar Administration allotted two acres (0.8 Ha) of land (bearing survey no. 255/205) contiguous to the RGCA NBC facility. This land would be the buffer zone around the NBC facility and would also be used for the development of a dormitory facility for the staff of the DTSP Nucleus Breeding Centre.

Pilot scale Broodstock Multiplication Centre at OSSPARC

Orissa Shrimp Seed Production and Research Centre (OSSPARC) hatchery facility at Gopalpur on Sea was modified and retrofitted into a pilot scale tiger shrimp broodstock multiplication centre. This facility was set up to produce SPF broodstock or SPF seeds in limited quantities by sourcing germplasm from NBC in Andamans until the main Broodstock Multiplication Centre of RGCA is established in Kanyakumari. This centre was also responsible for R & D work on disease tolerance and seed production through artificial insemination.

Activities and Accomplishments

During 2014-15, this facility was holding 18 no. of G4 families which had its origin from tiger shrimp NBC in Andaman. Shrimp PL's brought from NBC were reared in grow out tanks under strict biosecurity conditions for a period of 300 days to produce high quality tiger shrimp broodstock. Specialised superior quality certified feeds were provided for the grow-out operations and broodstock conditioning. Broodstock was certified as SPF for all OIE & US listed pathogens for 4 consecutive generations. Production in this facility was under strict biosecurity protocols and documented with3standard operating procedures which were audited and approved by international biosecurity experts. The hatchery produced 0.8 million SPF tiger shrimp seeds and supplied to tiger shrimp farms for trial production and performance evaluation. Trial farming was progressing and the results were encouraging. This facility proposes to release SPF tiger shrimp broodstock for commercial trial production during 2015.

All the above operational facilities function based on a documented Standard Operating Procedure approved by a technical committee consisting of technical experts. Though this project succeeded in producing SPF tiger shrimp in 2009 by completing tiger shrimp life cycle under captivity for many generations, further research was carried out on for tolerance to prevalent shrimp diseases in farms. In 2014, RGCA produced Specific Pathogen Free tiger shrimp seeds at RGCA's pilot scale tiger shrimp Broodstock Multiplication Centre at OSSPARC, Gopalpur on Sea, Odisha. These seeds were supplied to farms for trial farming. Successful crop taken by the farmer especially during challenging winter months in Odisha provided confidence to RGCA for the release of SPF tiger shrimp broodstock to hatchery operators in 2015.

Shri.N.Chandra Babu Naidu, Hon'ble Chief Minister of Andhra Pradesh, had released RGCA's SPF tiger shrimp brodstock by handing over the broodstock to Shri.Pulla Rao, Agriculture and Fisheries Minister, AP, during AquaAquaria held at Vijayawada on 28th February 2015. It is proposed to supply of SPF tiger shrimp broodstock to hatchery operators on trial basis by mid 2015.

Broodstock production process included disease surveillance program for OIE listed diseases and new emerging diseases by non lethal and lethal samplings of shrimp samples of various sizes. Pathogens on

RGCA's SPF list include during 2014-15 were WSSV, TSV, YHV, IHHNV, IMNV, MBV, BP, HPV, MoV, NHP, AHPND. Screening for Disease causing pathogens were conducted at RGCA's Central Aquaculture Pathology Lab and Dr.Lightners Aquaculture Pathology Lab, University of Arizona, USA. Genetics Lab of RGCA and Dr.Roger Doyle provide necessary guidance for quantitative genetics and selective breeding.

After physical inspection of the RGCA's broodstock development facilities and verifying Standard Operating Procedure & documentations, Aquaculture Pathology Laboratory of University of Arizona, USA, (OIE referral laboratory for shrimp diseases) had certified that broodstock development facilities of RGCA complies with the general bio-security requirements to prevent the entry & spread of OIE & US listed diseases of Peanaeid shrimp.

High Health Tiger Shrimp Seed Production

The high health tiger shrimp seed production unit – II was established at Chirala, Andhra Pradesh, at a leased out hatchery facility

This facility was established for the production of high health tiger shrimp seeds by screening broodstock from various tiger shrimp landing centres in India. In this connection, quarantine units were established at Vizag and Sirkali with a capacity of 51 and 59 cubicles respectively. Broodstock collected from the wild were screened at RGCA - Central Aquaculture Pathology Laboratory for the presence of OIE listed shrimp pathogens before using them for breeding purpose.

Thermocole boxes with battery operated aerators were supplied to boat operators for collecting quality broodstock directly without contaminating the broodstock at the boat and the landing centre.

About one hundred broodstock were screened from 161 wild collected brooders and were maintained in the Chirala project facility for breeding purpose. From this, around 3.214 million seeds were produced and supplied to 26 farms located in Andhra Pradesh and Maharashtra.

In the second cycle, 125 brooders were screened from 377 wild collected brooders and were maintained in Chirala project facility for breeding purpose. Successful spawning and rearing was accomplished and around 9.12 million seeds were produced which were supplied to 32 farms of the neighbouring states including Kerala.

Upon finding higher incidence of WSSV in wild broodstock collected from Visakapatanam, collection was initiated from Pazhayar region by utilizing the quarantine facility at Sirkali. About 89 brooders were screened from 238 wild collected broodstock and were maintained in the hatchery for breeding purpose.

About 37% of the broodstock collected from Pazhayar during July-August were rejected due to White spot disease. During December – January, 65% of the broodstock collected from Pazhayar and 69% of the broodstock collected from Vizag were discarded due to white spot disease.

Broodstock Multiplication Centre for Tiger Shrimp

A multiplication Centre for tiger shrimp broodstock production is under development at Neendakarai-B village, Agasteeswaram Taluk, Kanyakumari District, Tamil Nadu for large scale production and supply of selectively bred SPF tiger shrimp (*Penaeus monodon*) broodstock to Shrimp hatcheries in the country. This facility is being developed at 32 acres of land allotted by the Government of Tamil Nadu to RGCA for the purpose.

SPF broodstock in maturation tank

Harvest of the farm stocked with SPF tiger shrimp seeds

Harvested SPF Tiger shrimp

Indoor Microalgal unit for maintaining axenic cultures

Scampi experimental farm at RGCA, Sirkali

Inside view of the hatchery and individual rearing systems for holding suspected neofemales

Scampi Broodstock Development Project

Name of the Project : Scampi Broodstock Development Project
Location : Vijayawada, Andhra Pradesh
Year of Commencement : 2007

The RGCA Scampi Broodstock Development Project comprises of a hatchery facility at Kankipadu and a grow-out & experimental farm at Manikonda, Krishna District of Andhra Pradesh. The main focus of this project is to facilitate the revival of Scampi Aquaculture in India by developing protocols to improve the yields of *Macrobrachium rosenbergii* (Scampi) through strain selection, selective breeding and developing technologies for all-male seed production for monosex culture.

Activities & Accomplishments

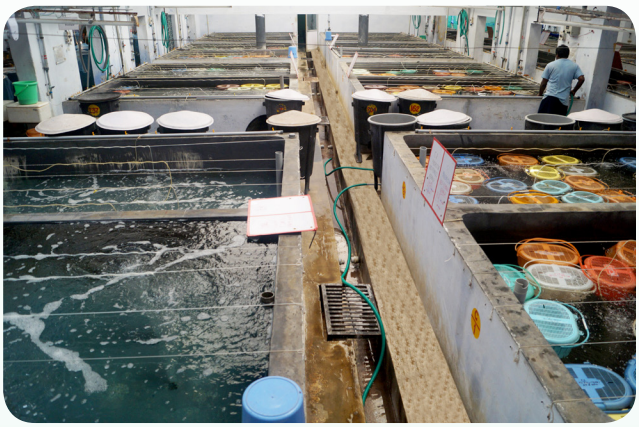
Neo female production

During the period under report, the facility developed a total of sixty one Neofemales (females that yield all male progeny) which included 57 from Kerala strain and 4 from West Bengal Strain. By the end of March 2015, the facility maintained a total of fifty three neofemales comprising of 49 nos. of Kerala strain and 4 West Bengal strain. About 22 batches of larval cycles from these Neofemales were being maintained in the hatchery for their reconfirmation as Neofemales.

Microsurgery of Scampi Post Larvae

The development of Neofemales is carried out by early identification of Scampi males (at ages of PL 15 to PL 25) and subjecting these to microsurgery for the ablation

All male scampi



Inside view of the hatchery and Individual rearing of suspected neofemales

of Androgenic gland. During the period under report, 1,37,948nos of Post larvae from the Kerala strains were segregated. About15,396 nos of males were identified at the above mentioned age and ablated. Similarly, from the West Bengal strain 26,188 nos of Post Larvae were segregated and 2098 nos of identified males were ablated. These Post larvae were then subjected to quality checks to identify sex reversal.

Maintenance of suspected Neofemales of Scampi

Sex reversed Scampi produced from the above treatment are termed as Suspected Neofemales and such Suspected Neofemales (SNF) that have already bred and the progeny is awaiting all-male confirmation are referred to as Prospective Neofemales (PNF). The hatchery presently holds 34 nos of PNFs from Kerala and 6nos of PNFs from West Bengal strains and 146 nos of SNFs from Kerala and 21 nos of SNFs from West Bengal strains. Apart from these, the experimental R & D farm also maintained 2317 nos of Kerala SNFs and 444 nos of West Bengal SNFs, at the end of the period under report.

Selective breeding

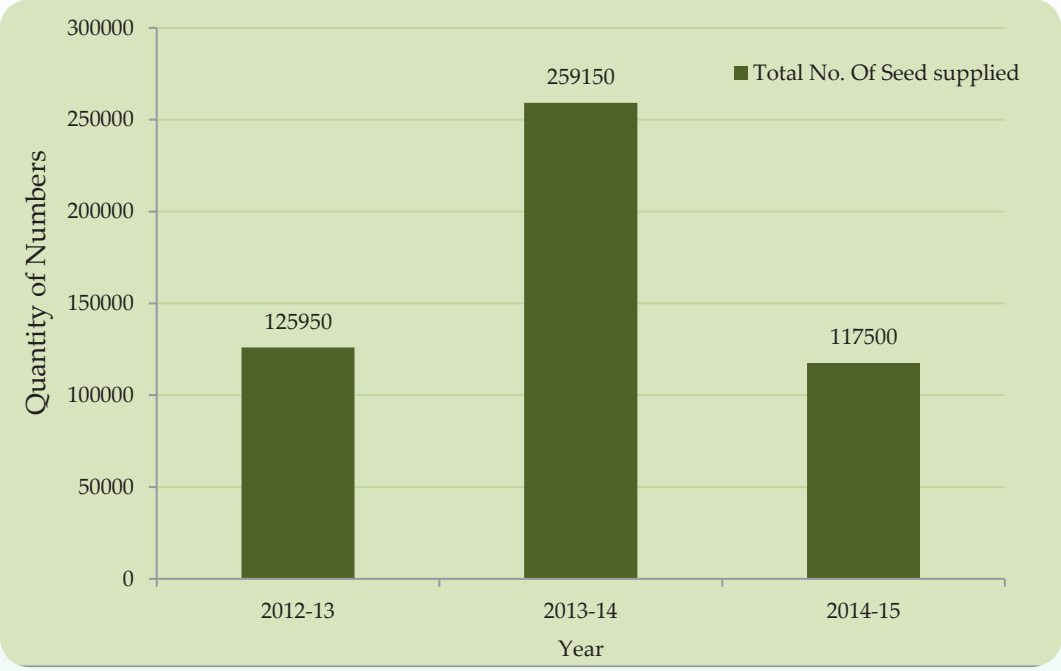
In the Selective Breeding operations, G1 stocks (Post Larvae) obtained through synchronous mating of several pairs of G0 Brooders belonging to the Kerala and West Bengal strains were grouped into three pools and subsequently reared in Quadruplicates in 250 m^2 ponds. These were then harvested after culture period of around 7 months. 20% of the best males and females from each pool of each region were selected in terms of growth and a total of 3936 animals were tagged for selective breeding.

30 best pairs from each pool of each strain were set up in 180 nos of 100 litre tanks for mating at the hatchery. The F2 generation obtained through this mating process were similarly grouped and stocked at a density of 4 nos/m^2 in the experimental ponds for further rearing. An average body weight of 10 gms was recorded at the end of 82 days of culture.

Promotional Seed Supply

During the period under report, a total of 1,17,500 nos of Scampi seeds (including 39,800 All-male seed) were supplied to 5 farmers in the state of Andhra Pradesh.

Stocking of seeds in open ponds



Yearwise scampi seed production

Nursery rearing of progeny from individual suspected Neofemales in separate hapas in ponds


Artemia

Artemia Project

Name of the Project : Artemia Project
Location : Tuticorin, Tamil Nadu, Ramanathapuram District, Tamil Nadu
Year of Commencement : 2007

RGCA had established an integrated Artemia production unit in 6.75 hectare area at Tharuvaikulam, Tuticorin in 2007. The objectives of the project were to develop and standardize the technology for good quality Artemia cysts and biomass production and to disseminate the Artemia culture technology to Coastal communities Self Help Groups and Entrepreneurs across the Country.

Activities & Accomplishments

Production of Artemia Cysts

The period under report registered production of 102 kg wet cysts from the farm site of the Project facility.The dry cysts produced were recorded as 31.363 kg. These were packed in nitrogen flushed containers and supplied to Ornamental Fish breeding units, Shrimp and other finfish hatcheries after quality evaluation.

Production of Artemia Biomass

About 67.500 kg of frozen artemia biomass which was available as the balance stock of the previous year harvest was made available for supply during the period under report. In addition to this, 816 kg of Artemia biomass was harvested from which 786 kg was supplied to the shrimp aquaculture and ornamental fish breeding industry and research organizations.

Production of decapsulated cysts

Decapsulated cyst can be used as direct feed without hatching. The nutritional value of decapsulated cyst is higher than the fresh live nauplii, as they spend some energy while hatching out. Thus, the use of decapsulated cysts contributes a saving of over one third in the amount of Artemia cysts used when compared to the use of live nauplii. The Project facility produced about 7.900 kg of decapsulated cysts during the period under report.

Experiments on Production of Value added Artemia Nauplii

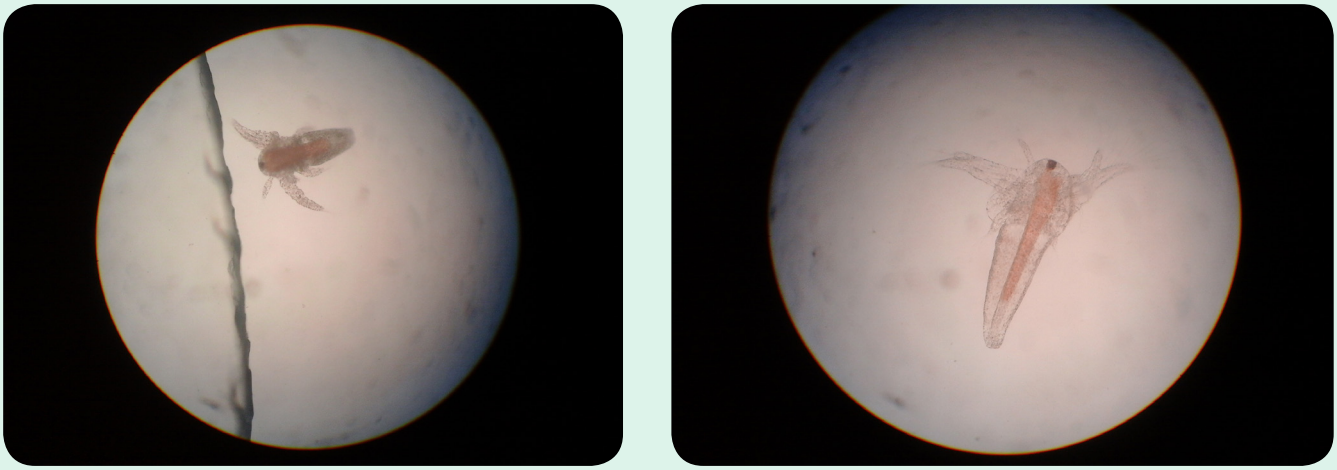
Artemia nauplii from the farm produced cysts were observed to be less attractant to the predators due to the lack of sufficient quantity of, carotenoids. Preliminary experiments were conducted from the ponds to enhance the pigmentation of artemia nauplii by feeding adult artemia with astaxanthin rich diets for a period of 90 days which resulted in pigmented artemia nauplii and cysts. These when fed to the shrimp larvae was found to enhance the feeding rate of the larvae.

Research is on to optimize the dose of astaxanthin concentration required in the diets of artemia.

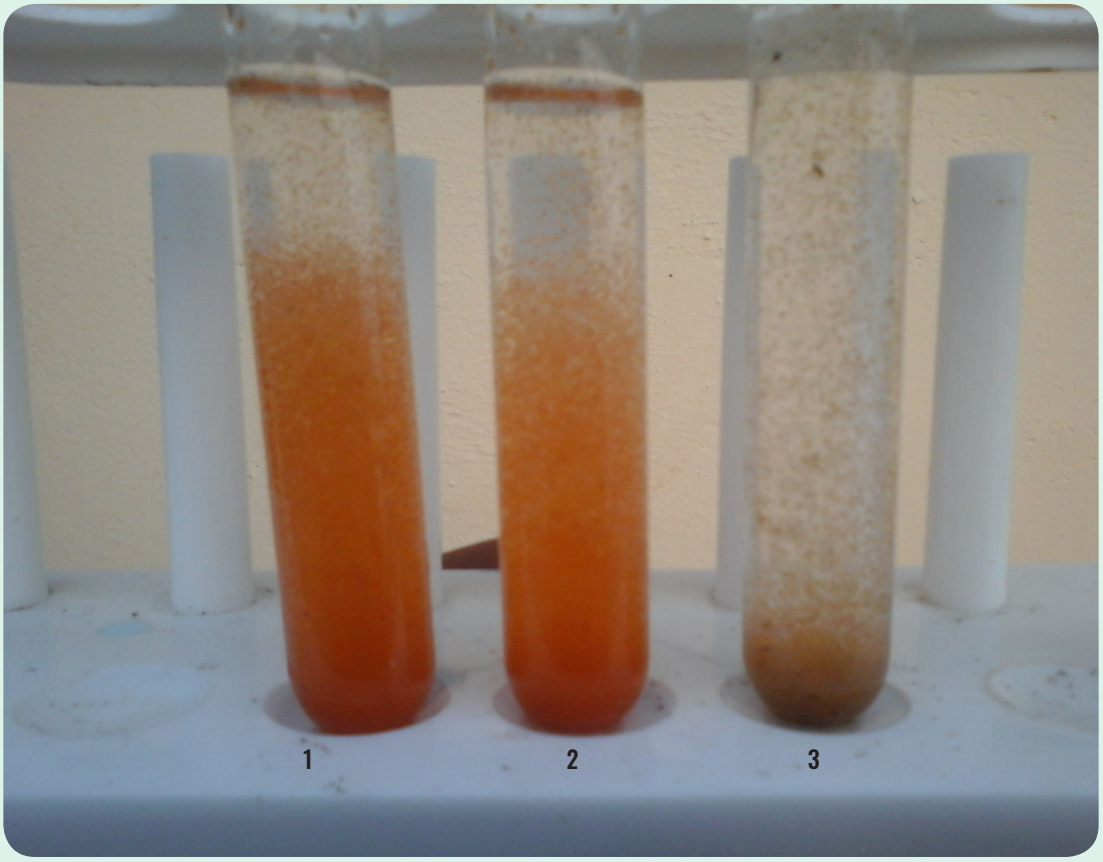
	2007 - 2008	2008 - 2009	2009 - 2010	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014- 2015
Cyst (kg)	9.200	25.950	38.775	32.250	103.850	189.500	156.155	102.200
Biomass (kg)	0.000	37.450	223.950	1591.400	1522.100	793.000	1312.000	816.000

Production trend in Artemia Cyst and Biomass in R&D trials during 2007-2015

A view of the Artemia farm at Tharuvaikulam, Tuticorin



Microscopic view (10X) of active nauplii and Metanauplii produced from experimental trials with astaxanthin



1 & 2 - Pigmented artemia nauplii from the artemia pond treated with Astaxanthin
3 - Artemia nauplii from the control pond (untreated with Astaxanthin')

Development of New Artemia Demo farm in Ramanathapuram District

During the period under report, RGCA had taken steps to expand its activities which are vital for the sustainability of the finfish and shellfish hatcheries by securing a 10 ha land in Uppoor village, Ramanathapuram District.

The Government of Tamil Nadu has allotted 10 Ha. of land at Uppoor, Tiruvadanai Taluk, Ramanathapuram District, Tamil Nadu to set up an Artemia demo-farm. Land lease agreement between the Tahsildar, Tiruvadanai Taluk and the Project Director, RGCA was signed on 10.03.2015 and the land was formally handed over to RGCA.

The site was cleared and secured with fencing. District level Coastal Zone Management Authority (DCZMA) recommended the project on 03.02.2015 for environment clearance under CRZ notification through State Level Coastal Zone Management Authority. Construction of ponds is under progress.

View of the site for the new artemia demonstration farm at Uppoor Village, Ramanathapuram Dist. Tamil Nadu

Pacific White Shrimp ***L. vannamei***

Broodstock Multiplication Centre for *L. vannamei*

Name of the Project : Broodstock Multiplication Centre for *L. Vannamei*
Location : Vishakhapatnam, Andhra Pradesh
Year of Commencement : 2010

The Broodstock Multiplication Centre (BMC) for *L. vannamei* at Vishakhapatnam has been established by the Rajiv Gandhi Centre for Aquaculture to provide consistent supply of high quality SPF Pacific White Shrimp *(L. vannamei)* broodstock, that are selectively bred for good maturation performance, fast growth, resistance to diseases and high survival. These broodstock with desirable traits are supplied to the hatcheries in the country for production & supply of high quality seeds to the farmers. The programme on broodstock multiplication is implemented in collaboration with M/s. Oceanic Institute, Hawaii, the pioneers in the field of domestication of *L. vannamei* for aquaculture.

The activity of this project facility involves the rearing of imported Germplasm from the Oceanic Institute to broodstock under total biosecure conditions. The broodstock are then subjected to screening to select the best ones for supply to the hatchery operators of the Country. The facility is capacitated to supply around 45,000 nos. of broodstock to the Industry each year.

Description of the facility

The TASPARC (The Andhra Pradesh Shrimp Seed Production, Supply and Research Centre) facility of MPEDA at Vishakhapatnam in Andhra Pradesh has been modified suitably for the development of BMC. The entire operation is being carried out in two phases.

- Phase – I Rearing System: 20 tanks for the rearing of Post larvae at day 15 to shrimps of 15 gm size (10 tanks of 15 sq. m each & 10 tanks of 27 sq. m each).

- Phase – II Rearing System: 20 tanks for the rearing of 15 gm sized shrimps to brooders (4 tanks of 27 sq. m & 16 tanks of 40 sq. m each).

In addition to these two phases, the facility has a complete seawater intake and treatment system comprising of Pumps, Reservoirs, Ozone generating units, UV filters, Cartridge filters and Sand filters. The Algal production area, Re-circulation Units, Seawater Chiller Units, Power Back-up systems, Aeration systems and Bio-security systems are also in place.

A view of the Broodstock Multiplication Centre (BMC) for L. vannamei

Activities & Accomplishments

❋ In each cycle, the unit receives around 30,000 nos of SPF PLs of *L. vannamei*.

❋ Throughout the rearing period, the shrimps are fed only with commercially available formulated bio-secure feeds and semi-moist feeds. The water quality is maintained with the help of Recirculation Unit provided at each section separately.

❋ At the end of a successful cycle, ie. 6 – 8 months, the Unit provides an average of 15 thousand numbers of quality vannamei broodstock to the hatcheries.

Surveillance Protocol followed at Lv-MC to ensure the SPF Status of the produced brooders

❋ The brooders are screened for the major pathogens viz; WSSV, TSV, YHV, IHHNV, IMNV, MBV, BP, HPV, MoV AHPND/EMS, EHP & NHP, through PCR, RT-PCR & H&E Histology.

❋ Each lot/cohort are analyzed for the listed pathogens thrice during each culture period (at 1 - 2 g stage, 15 – 20 g stage & 35 – 40 g stage).

❋ A minimum of 60 shrimps per lot per stages are analysed for the presence of specifically listed pathogens (95% confidence).

❋ Non-lethal sampling methods such as analysis of Hemolymph, Pleopods or Faecal Strands is practiced for sample collection.

❋ The screening is conducted either by experts of CPL-RGCA, Sirkali or University of Arizona, USA. Histopathological tests are also conducted at least once or twice in a year

Production Details:

During the period under report, a total of five consignments of SPF *L. vannamei* Post Larvae / Juveniles comprising of a total of 72,275 PLs / Juveniles have been

An aerial view of RGCA Broodstock Multiplication Centre for L. vannamei at Visakhapatnam

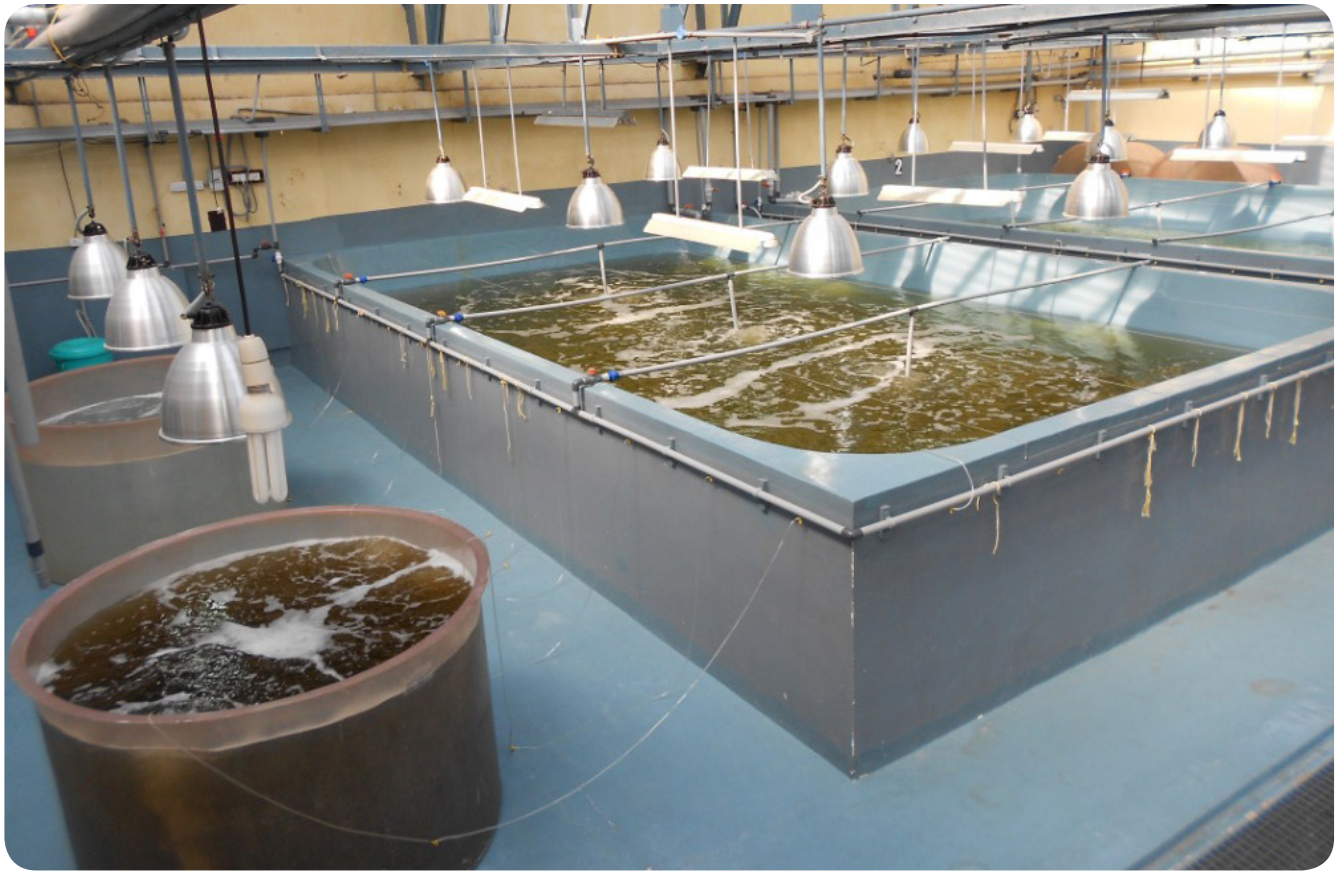
imported for the production of quality SPF *L. vannamei* Broodstock at this facility.

The production of SPF *L. vannamei* broodstock was carried out at the facility by following high level of bio-security protocol. A total of 32,800 nos of quality broodstock were produced from three batches during the period under report. Out of which, one batch (Batch no: 5) comprising of 8,000 nos of broodstock could not be provided to the hatcheries as there were delay in obtaining required permission order from the Ministry of Agriculture for the supply of broodstock After the quality selection process a total of 13,940 nos of brooders were distributed to CAA approved hatcheries.

One more batch (Batch no: 7(a)) comprising of approximately 16,800 nos were stocked in the facility during the period under report. This stock will be ready for distribution in the month of August 2015 and altogether, the facility is targeted to produce & distribute 60,000 nos of quality SPF *L. vannamei* broodstock in the forthcoming financial year.

Hudhud cyclone hits BMC

The Broodstock Multiplication Cenre for Lv at Visakhapatnam suffered minor damages in the coastal Cyclone on 12.10.2014. The entire telecommunication and power supply was cut off for a week. The boundary wall located on the sea side was partially washed away. Seawater intake pumps and Ozonisers were damaged. Speedy action has been taken to restore the routine activities of the facility without any biosecurity breach.



Indoor Algal Mass Culture

A view of broodstock holding facility at Broodstock Multiplication Centre for L. vannamei of RGCA at Visakhapatnam

Packing of broodstock for supply to private hatcheries

Trainees being familiarized with harvesting of Tilapia in pond culture systems

GIFT Tilapia

Tilapia Project

Name of the Project : Tilapia Project
Location : Vijayawada, Andhra Pradesh
Year of Commencement : 2008

The Tilapia project of RGCA is based at Manikonda Village, Krishna District, Andhra Pradesh. This project has been established to develop and disseminate technologies for breeding and seed production of all male tilapia and also established a Nucleus Breeding Centre of the Genetically Improved Farmed Tilapia (GIFT) strain in India. The facility extents over an area of 12.7 acres and comprises of 20 ponds (10 each of 300 sqm and 2600 sqm area respectively). It has a breeding unit with incubation facilities for hatching of fertilized eggs and an All-male seed production unit, well-equipped with ancillary infrastructure facilities that includes reservoirs, effluent treatment ponds and necessary bio- security measures.

A fully pedigreed selective breeding program with GIFT strain is being implemented in technical collaboration with M/s. World Fish Centre, Malaysia. The project imported fingerlings from 60 families of GIFT stocks during August 2011 and commenced selective breeding after growing them to broodstock size. The project has been successful in developing 46 families of G3 populations in India over the last three years. The project has also developed the capability for supply of all male GIFT Tilapia fry / fingerlings for farming in India as well as to provide technology support for establishment of Satellite Breeding Centres for GIFT strain. Broodstock required for satellite breeding centres will also be produced and supplied by RGCA. The project presently also holds stocks of Redline GMT (YY Technology) obtained from M/s. FishGen, UK.

Fisheries official from Tamilnadu holding Tilapia brooder at Tilapia Project, Vijayawada

Activities & Accomplishments

Selective breeding programme of GIFT strain

During the period under report, the mating programme of G2 generation which was initiated during the previous year was completed successfully.

99 successful spawnings were obtained which yielded 44 unique G3 families.

During the current year, tagging of 70 fish sourced at random from each of the above referred 44 G3 families was performed and the tagged fish were released into 4 nos of 300 m^2 grow-out ponds at a stocking density of 4.7 nos./m^2. These were reared for a period of 3 months until they attained size of around 250 gms and then harvested. Morphometric data of each fish was recorded during harvest. This data was used for the preparation of the mating list by selecting the top three male and female fish from each family which were ranked based on their growth performance in communal rearing, inbreeding coefficient and estimated breeding value.

132 mating hapas were installed in the mating pond and the three top ranked fish from each of the 44 G3 families were set up for mating based on the mating plan. This mating strategy yielded 83 successful spawnings which included 39 unique G4 families by the end of March 2015.

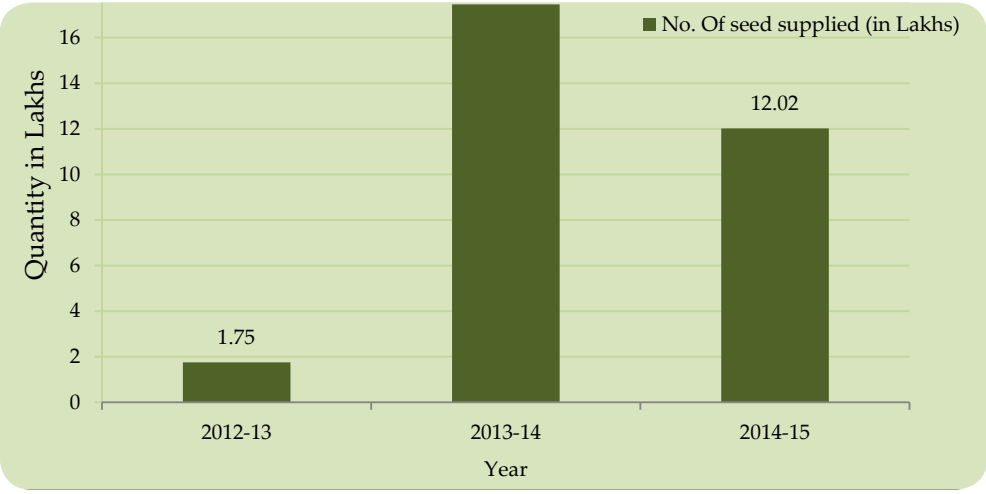
Genetic Gain Experiment – Second phase

The second phase of genetic gain experiment was initiated along with the G3 mating activity of the Selective breeding programme. A set of 11 mating pairs from G1 generation and 49 mating pairs from G2 generation were also set up for mating along with the G3 stocks and the resultant 8 and 25 families respectively obtained from the above were also reared along with the G4 stocks in the communal rearing ponds.

Comparative growth performance would be evaluated based on the data obtained during the current experimental period as well as that of the first phase of the study to analyse the Genetic Gain.

All Male seed production and supply

During the year under report, three ponds of 2600 m^2 area were set up for mating GIFT. 25 mating hapas of 10m x 3m x 1m were installed in each pond and each hapa was stocked with GIFT Brooders for mating. Egg collection from these mating hapas was performed in 54 batches which yielded approximately 18.1 million eggs. The average hatching rate was recorded as 32%. A total of over five million all-male tilapia seeds were produced at the facility, out of which about 1.2 million seeds were supplied to registered/approved farms or Government Institutes of Tamil Nadu, Andhra Pradesh, Odisha, Chhattisgarh, Karnataka and Kerala for their demonstrations.



Year wise supply proceedings - GIFT Tilapia

Members of the sub-committee of Ministry of Agriculture comprising of Dr. Siddiqui, MOA; Dr. Piyush Punia, NBFGR; Dr. Routray, CIBA and Ms. Madhumita Mukherjee, NFDB observing all male Tilapia fry at Tilapia project, Vijayawada

An inside view of the nursery rearing tanks

Feeding of cobia fingerlings at MFHP, RGCA

Pilot Scale Marine Finfish Hatchery Project

Name of the Project : Pilot Scale Marine Finfish Hatchery
Location : Pozhiyur, Thiruvananthapuram, Kerala
Year of Commencement : 2008

The Marine Finfish Hatchery Project of RGCA has been established at Pozhiyoor near Thiruvananthapuram to develop technologies for hatchery seed production of high valued export oriented species of marine finfish with cobia as the candidate species to begin with. The project also established a sea cage farm at Muttom, Kanyakumari District, Tamil Nadu for broodstock maintenance as well as to standardize and demonstrate technologies for farming of cobia using hatchery produced seeds.

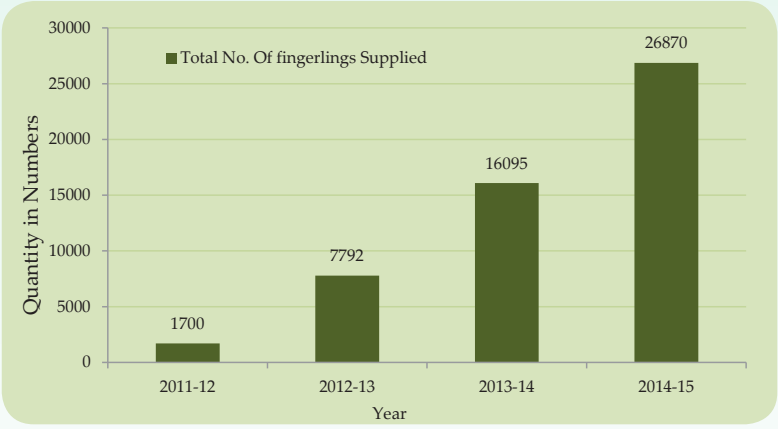
Activities & Accomplishments

Cobia *(Rachycentron canadum)* Broodstock Collection & Quarantine

During the period under report, five numbers of cobia broodstock were collected from the wild. In addition to the above, 34 healthy sub adult fish from the 3rd and 4th batch were also conditioned for broodstock development. A total of 5 batches consisting of 39 nos. of fishes were quarantined. Of which, 11 fishes were maintained in broodstock holding facility with recirculation system after screening for pathogens such as VNN, IRIDO and *Photobacterium damselae*. In addition 17 fishes were maintained in the brood stock facility in which composed of 12 matured (6 males and six females) and five immature fishes

Spawning & Larval Rearing

Seven successful spawnings were recorded during the period under report. 2.66 million fertilized eggs were obtained which yielded around 34,200 nos of 30 dph (day post hatch) cobia fingerlings. A total of 26,870 fingerlings were supplied to farmers, Fisheries Research Organizations and Departments. The survival rate from egg to 30 DPH larvae varied in the range of 0.9 – 11.9%.



Year wise cobia fingerlings production

Batch No.	Total Nos. of fishes	Total Length (cms)	Body Weight (kgs)	Cage Number	Remarks
4	11	-	5 - 7	17	Sub adults For Brood-stock Development
6	2852	57 – 71 39 - 74	2.04 – 2.58 1.94 – 2.26	1,7,8,9 10,11	Juveniles Juveniles
7	2679	20 - 22	35 – 45 gms	5	Fingerlings

Cobia fishes maintained in Sea Cage farm at Muttom

Supply of cobia seed

The project registered a comparatively high production and supply of fingerlings during the period under report than when compared to the previous years. A total of 26870 nos of fingerlings was supplied to nine farmers and six Research Institutes during this period.

Cobia juveniles shifted to sea cage farm of RGCA at Muttom.

Harvesting Cobia from Open Sea Cage at RGCA Farm, Muttom, TN

8730 no`s of Cobia juveniles were stocked in sea cage farm of RGCA at Muttom for grow out farming.

Production of Sea farmed Cobia

22.1 metric tons of cobia was harvested at the RGCA sea cage farm, during the year. 1390.6 kg of Cobia in chilled form was exported to European Union by a seafood processor and exporter who procured the stock from RGCA.

Inaugural release of cobia juveniles in open sea cages

Release of Cobia juveniles in open sea cages of RGCA at Muttom was inaugurated by Ms. Leena Nair, IAS, Chairman of MPEDA and President of RGCA on 11.04.2014 in the presence of Shri. S. Nagarajan, IAS, District collector, Kanyakumari District, Tamil Nadu. Shri. Y.C. Thampi Sam Raj, Project Director of RGCA. Officials of RGCA and MPEDA, Tamil Nadu State fisheries Department and local fishermen representatives witnessed the event. 400 nos of cobia juveniles from Sea cage farm in the fishing harbour were stocked in open sea cages for trial grow out culture.

Initiatives on Outreach Programme on Sea cage farming of Cobia

During the period under report, a series of outreach programmes on open sea cage farming of Cobia were conducted at Adimalathura, Thiruvananthapuram, Kerala to sensitize and encourage fisherfolk about the importance of cage farming technology and to adopt it to improve their livelihood. As requested by the President, RGCA and the District Collector, Thiruvanathapuram, the Kerala State Coastal Area Development Corporation Ltd. (KSCADC) conveyed a meeting with RGCA and MPEDA officials on 30th October 2014 at Adimalathura, Thiruvananthapuram District and decision was taken for deployment of cages at Adimalathura coast for providing training on cage culture to the local fishermen.

The outreach programme was attended by 110 fishermen of Adimalathura Village in addition to officials of RGCA, Dept. of Fisheries, representatives of the church and Self Help Groups. Fr. Mathias Oliver, Parish Priest, Adimalathura welcomed the gathering. Ms. Leena Nair, IAS, Chairman, MPEDA and President, RGCA, Mr. Biju Prabhakar, IAS, District collector, Thiruvananthapuram, Dr. K. Ambady IIS, MD, Kerala, State Coastal Area Development Corporation, Mr. U. S Sajeev, Additional Director, Department of Fisheries, Govt. of Kerala, Veli. Varghese, Member, KSCADC, Mgsr. Eugene Pereira, Vicar General, Arch Diocese of Thiruvananthapuram interacted with the fisherfolk. A power point presentation on the technology of Sea Cage farming of Cobia, its benefits etc was delivered by the Project Director of RGCA. Shri. Biju Prabhakar, IAS, District collector of Thiruvananthapuram urged the fisher communities to improve their livelihood standard by adopting new scientific technologies developed by RGCA.

Ms. Leena Nair, IAS, Chairman MPEDA and President, RGCA explained about the proposed investment on infrastructure facilities for installation of 4 nos of HDPE circular cages and other inputs such as cobia seed for stocking in cages and feed for producing 100 tons of cobia fishes. The profit amount generated from the farming activity would be used by two selected fishermen societies to float their own cages with the aid from NFDB and other agencies. Accordingly two fishermen societies comprising of 20 active fishermen each registered under Charitable Societies Act were identified as beneficiaries of the programme.

One more such awareness programme was also conducted during the review period at Azhikkal village, Kanyakumari District to sensitize fishermen about the fish culture in sea cages through registered fishermen societies. This programme was attended by 13 fishermen representatives the Parish Priest of St. Mary`s Church Azhikkal, Shri. Mohan, Deputy Director of Fisheries, Tamil Nadu and Shri. Rubert Jothi, Asst. Director of Fisheries, KK District.

Ms. Leena Nair releasing cobia juveniles into the sea cage at Muttom

Sea ranching of Cobia

During the period under report, about one thousand cobia fingerlings of size range 13.1cm TL and 12.75 g BW reared in the Project facility were sea ranched in the nearby open sea at MuttomThe ranching programme was marked by the release of fish by Ms. Leena Nair, IAS, Chairman, MPEDA and President, RGCA in presence of Shri. S. Nagarajan, IAS, District collector, Kanyakumari District, Tamil Nadu and officials of state fisheries and MPEDA on 11.04.2014.

Trial farming of Asian Seabass

Grow-out sea cage farming trials with Asian Sea bass was carried out at the RGCA sea cage farm at Muttom. Seabass fingerlings produced by the RGCA hatchery at Thoduvai, Sirkazhi Tamil Nadu were reared in this cage facility. About 4500 nos. of fingerlings were stocked and reared to an average size of about 0.5-1.2 kg. A partial harvest was carried out during the period under report where around 1.01 metric tons was supplied to seafood exporters.

Brood stock Development of Pompano and Red Snapper

A total of 92 nos of Pompano sub-adult fishes and 36 nos of Red Snappers are being maintained in two separate HDPE cages for broodstock development at the RGCA sea cage farm.

Infrastructure added during the period under report

❋ A hatchery land comprising of 4.82 acres was purchased for the expansion of the project facility

❋ Constructed PCC platform and shed for cobia nursery rearing section

❋ Installed ozone disinfection system for disinfection of incoming sea water to the hatchery, effluent treatment of waste water before discharging into the sea. Newly fabricated floating platform (6 sq.metre) was installed at sea cage farm at Muttom. A fibre boat of 32 ft length, 7 ft width and 3 ft height was purchased for the sea cage farm operation.

❋ Solar light buoys were installed for open sea cage farm at Muttom

❋ CCTV cameras were installed in all sections of the hatchery. Biometric attendance system was introduced.

Nursery rearing of cobia in FRP circular tank at MFHP, RGCA .

Collection of cobia eggs in spawning tank of MFHP, RGCA, Pozhiyoor

Open sea cage grouper farm of RGCA at Rutland Island in South Andaman

Epinephelus fuscoguttatus (Tiger Grouper)

Grouper Project

Name of the Project : Grouper Project
Location : 1. Kodiaghat, South Andaman 2. Rutland Island, South Andaman
Year of Commencement : 2006

The Grouper Project of RGCA was initiated during the year 2006, with its hatchery facility located at Kodiyaghat village in South Andaman and the sea cage farm of the project, located off Rutland Islands of South Andaman. Technology development activities for breeding and seed production of tiger grouper *Epinephelus fuscoguttatus* and the demonstration of grow out farming of hatchery produced fingerlings in open sea cages were carried out.

Ms. Leena nair, IAS, President RGCA on her visit to the open sea cage farm at Andaman

Details of wild grouper broodstock held in the floating net cages

Sl.No.	Species Name	Common name	Male	Female	Total Number
01	*Epinephelus fuscoguttatus*	Tiger grouper	25	56	81
02	*Epinephelus coioides*	Orange spotted grouper	05	05	10
03	*Plectropomus areolatus*	Squaretail coral grouper	04	12	16
04	*Cromileptes altivelis*	Mouse grouper	01	02	03

Broodstock maintenance in open sea cage facility

There are 21 HDPE cage rafts moored near Rutland Island, South Andaman to condition wild caught grouper broodstocks and for grow – out farming of grouper fish in floating net cages.

All the wild caught broodstock were tagged with RFID (Radio Frequency Information tags) for identification.

Development of a new multi-species grouper hatchery facility

The Andaman administration had allocated a land area of two acres to RGCA for the development of a multi – species grouper hatchery. While efforts were being made to obtain another site contiguous to the allotted land, RGCA initiated efforts towards carrying out an EIA study for the same.

Production of tiger grouper fingerlings

During the year, the activities at the existing pilot scale hatchery were scaled down for maintenance and larval rearing was carried out only in a limited area.

Grouper fingerlings maintained in open sea cage at Andaman

Three larval rearing runs were attempted during the period. The first cycle was successful and yielded around 479 fingerlings. These were subsequently transferred to the sea cage farm and stocked in cages. Farming is in progress.

Supply of market size grouper fish produced from net cages.

A total of 816.8 kg of market size tiger grouper fish was harvested and supplied to the exporters.

Maintenance of the seawater intake pipeline of the grouper project being carried out

A view of the Broodstock Quarantine cubicle for vannamei at AQF, Chennai

Aquatic Quarantine Facility for *L. vannamei* (AQF)

Pacific White Shrimp L. vannamei

Name of the Project : Aquatic Quarantine Facility for *L. vannamei*
Location : Neelankarai, Chennai, Tamil Nadu
Year of Commencement : 2009

To facilitate quarantine of imported vannamei brooders and to ascertain the Specific Pathogen Free (SPF) status of the imported broodstock.

The AQF serves as a corner stone in preventing the entry and spread of known pathogens in the Country through its stringent biosecurity quarantine protcols. The facility is a state of the art quarantine centre created and operated by RGCA. The facility functions under the Animal Quarantine & Certification Services (AQ & CS, Dept. of Animal Husbandry Dairying & Fisheries, Ministry of Agriculture) on a set of Standard Operating Procedures framed by a Technical Committee involving Coastal Aquaculture Authority (CAA), Central Institute of Brackishwater Aquaculture (CIBA), AQ & CS, DADF, National Fisheries Development Board (NFDB), MPEDA & RGCA.

AQF commenced its operation on July 2009 with the introduction of *vannamei* culture in the Country. The facility ensures the specific pathogen free (SPF) status of the imported *vannamei* broodstock for the six OIE listed pathogens (White Spot Syndrome Virus (WSSV), Infectious Hypodermal Haematopoetic Necrotic Virus (IHHNV), Necrotizing Hepatopancreatic Proteo Bacterium (NHPB), Yellow Head Virus/Gill Associated

A view of the Aquatic Quarantine Facility for L. vannamei at Neelankarai

Virus (YHV/GAV), Taura Syndrome Virus (TSV) & Infectious Myonecrosis Virus (IMNV) through its highly biosecured PCR lab and thus plays a pivotal role in restricting possible introduction of pathogens from other countries to India.

AQF has a fully-fledged quarantine infrastructure of 20 quarantine cubicles, 15 receiving areas and 5 packing sections. The three phases of the facility (Phase-I, II & II) housed in separate modules helps to render year round quarantine services to the industry, without slackening biosecurity as phase wise shut down is followed for disinfection and maintenance. The facility also has a well-established quarantine unit for imported vannamei postlarvae. Another unique feature of the facility is it's Computerized Aquatic Quarantine Monitoring System (AQMS) which enables the hatchery operators to reserve the quarantine space through online mode and to keep in track of the entire quarantine process of his broodstock consignment right from its arrival into the facility till its dispatch. The AQMS which keeps the hatchery operator / importer posted on all the information regarding quarantine with utmost transparency is the brain child of President RGCA & Chairman MPEDA, Ms. Leena Nair, IAS.

Activities & Accomplishments

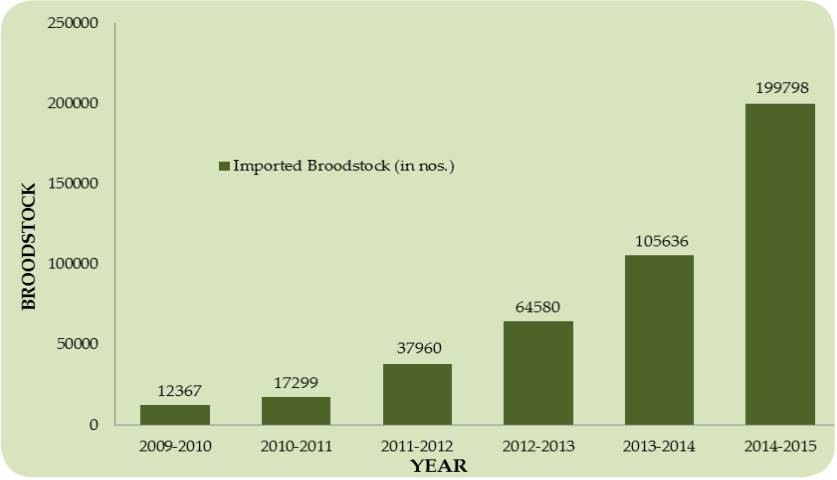
During the period under report, AQF quarantined 199798 numbers of vannamei brooders in 307 batches.

Excluding the extra biomass of 23 nos of M/s. CP, Bhogapuram and the 10 numbers of brooders of M/s. Kings International Pvt. Ltd which were not actually shipped to Chennai though mentioned in their shipment documents, the actual numbers of brooders imported for the period 2014-15 were 199765. The number of broodstock despatched was 193532 nos with a quarantine survival of 96.87%. The total number of cubicles occupied during the period under report was 541. The broodstock samples collected from all the consignments were tested free of the OIE listed pathogens and were ensured Specific Pathogen Free (SPF).

In addition to the broodstock, AQF also quarantined 110000 numbers of *vannamei PL*, imported by RGCA Broodstock Multiplication Centre for *L. vannamei* from M/s. Oceanic Institute, Hawaii, USA in 6 batches during the period under report.

Training Programme conducted by AQF

The operational team of AQF provided hands on training on "Biosecurity Management in *L. vannamei* Quarantine System" on 11-14th August 2014 to CARI official from Port Blair, upon special request from Dr. S. Dam Roy, Director CARI and with the permission of CAA.



Broodstock imported since inception in 2009 to the year 2014-15

Dedicated PL Quarantine Unit for L. vannamei at AQF

Trainees from Dept. of Fisheries, Tamil Nadu observing feeding of Tilapia broodstock at Tilapia Project, Vijayawada

Trainees setting - up broodstock mating hapas at RGCA Tilapia project, Vijayawada

The Technology Transfer Training and Administrative Complex (TTTAC), located at Karaimedu Village, Sirkali, Nagapattinam district functions as the nodal centre for the transfer of professionally, economically and environmentally viable and responsible aquaculture technologies developed by RGCA to the fisher folk, aquaculture farmers, aquaculturists, academicians, students, researchers and entrepreneurs from all over the country. The RGCA headquarters also functions from this complex.

Technology Transfer Training & Administrative Complex

Hands on training session in progress at RGCA – Aquaculture Demonstration Farm, Karaikal

Technology Transfer Training & Administrative Complex

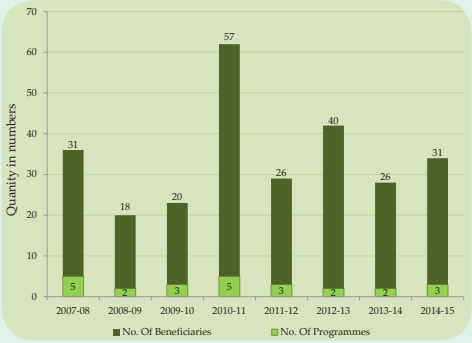
The Technology Transfer and Training division is involved in dissemination of technologies developed at various aquaculture projects of RGCA to the farmers, fisher folk, entrepreneurs and other stake holders in the industry by conducting a series of outreach programmes such as training, seminars and workshops. RGCA also actively participates in fairs and tradeshows where its technologies and activities are showcased for the benefit of the industry. These are organized as per the immediate as well as the long term needs of the Industry. Details of the extension programmes carried out during the year 2014-15 were:

TRAINING PROGRAMMES

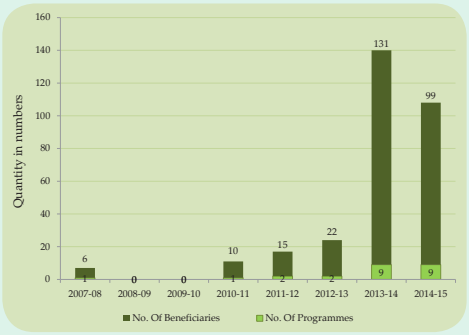
Best Husbandry practices in Asian Seabass culture:

Three training programmes were conducted on Best Husbandry practices on Asian seabass culture during the year 2014-15. Of these, one was conducted exclusively for the Fishery officials of the Kerala State and the other for the benefit of farmers and students. Ten officials participated in the former and twenty-one in the latter. The participants expressed keen interest to make a start of the Seabass Aquaculture in their respective states using seeds from RGCA hatchery. On completion of the programme two trainees procured Seabass fry from the RGCA hatchery for trial farming.

The third training programme was organized exclusively for the benefit of the Dept. of Fisheries, Kerala in which 10 officials participated.



Year wise training programmes on seabass aquaculture



Year wise training programmes on mangrove crab aquaculture

Mangrove Crab Aquaculture

A total of nine training programmes were conducted on Mangrove crab aquaculture during the year 2014-15. These five programmes were exclusively for the benefit of farmers, entrepreneurs, technicians, consultants from various parts of the country including staff of Reliance Foundation, Maharashtra. A total of 58 participants have benefitted from these programmes.

One training was conducted for the benefit of fisher folk from Navi Mumbai, Maharashtra which was organized by MPEDA. Thirteen participants have benefited through this programme.

In addition two training programmes were conducted exclusively for the benefit of 20 officials from the Dept. of fisheries, Kerala.

On completion of the training programmes, many of the participants evinced interest to start up mud crab aquaculture and soft shell crab farming in their respective states.

The center also conducted an awareness programme for the benefit of eight no's of fisher folk including a technical officer from Sindhudurg District of Maharashtra who were involved in an UNDP funded mangrove mud crab project being implemented by NETFISH-MPEDA for mangrove mud crab stock enhancement and eco-friendly aquaculture development.

Breeding, seed production and Grow-out farming of GIFT

During the year 2014-15, seven training

Fisher folk trainees grading crablets at ADF-RGCA, Karaikal

Grading of seabass fingerlings by fisher folk at ADF-RGCA, Karaikal

Fisheries officials of Kerala observing the morphological characters of GIFT brooders as part of their training at RGCA-Vijayawada

Fisheries officials of Tamil Nadu being trained on harvesting techniques of GIFT from rearing ponds as part of their training at RGCA-Vijayawada

Trainees participating in the egg collection exercise at RGCA Tilapia project

programmes were conducted on GIFT tilapia of which two were exclusively for seventeen officials from the Dept. of Fisheries, Tamilnadu and one for eight officials from the Dept. of fisheries, Kerala.

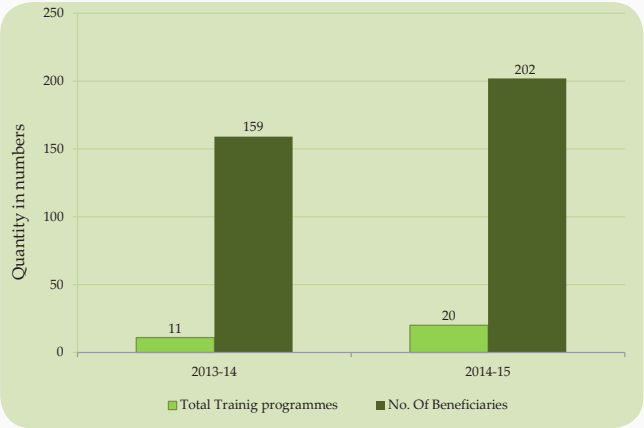
Four training programmes were conducted for the benefit of thirty seven participants comprising entrepreneurs, farmers, consultants, academicians and Govt officials from Andhra Pradesh, Telangana, Maharashtra, Tamil Nadu, Karnataka, Kerala, Chattisgarh and West Bengal.

The participants gave a feedback request to set up nurseries in the State to facilitate seed supply of GIFT tilapia to local farms in order to start up GIFT culture programmes in their respective States.

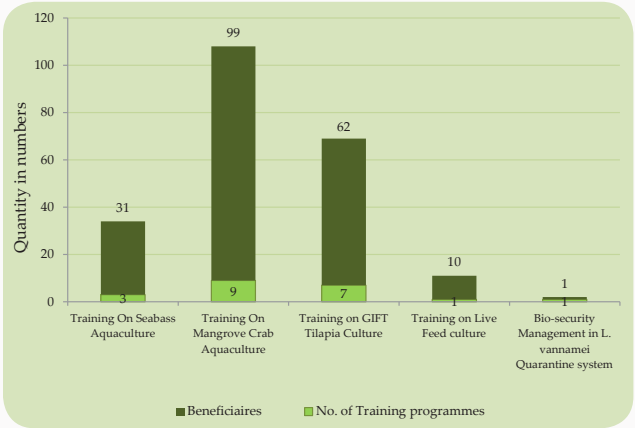
Live feed production for Marine Hatchery operation

One training programme was conducted exclusively for the benefit of ten officials from the Dept. of Fisheries, Kerala. Practical sessions on culture techniques of different kinds of phytoplankton (unicellular diatoms such as *Chaetoceros Chlorella, Nannochloropsis* and *Tetraselmis*) and zooplankton such as Rotifer varieties *Brachionus plicatilis* and *Brachionus rotundiformis,* copepods, and Artemia) were conducted during the training.

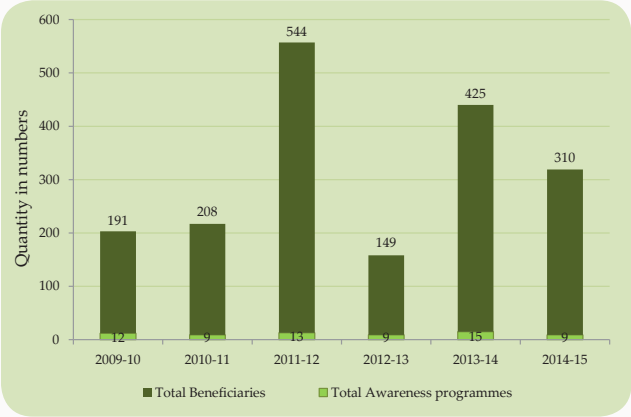
Fisheries officials of Tamilnadu involved in harvesting of GIFT from rearing ponds as part of their training at RGCA-Vijayawada



Training Programmes 2013-14 Vs 2014-15



Training programmes & beneficiaries during the year 2014-15



Awareness programmes & beneficiaries during the year 2009-15

Bio-security Management in *L. vannamei* Quarantine system

A four days training on "Bio-security Management in *L. vannamei* Quarantine System" was organized exclusively for a scientist from Central Inland Agricultural Research Institute (CIARI), A & N islands between 11th – 14th August 2014. This was organised on a special request from the Director, CIARI, Andaman.

FAMILIARIZATION PROGRAMME

During the year 2014-15, nine familiarization programmes on the "Latest Trends in Aquaculture practices of Cobia, Seabass and Mud Crab Aquaculture as well as all new R & D activities carried out by RGCA" were conducted. 310 participants comprising of students, staff, Govt. officials and farmers participated in these programmes and were enlightened on diversified aqua culture programmes of RGCA.

Hands on Training Programmes (2012 - 2015)

Sl. No.	YEAR	Cage culture of Seabass		Mangrove Crab Aquaculture		Breeding, Seed production and Grow-out farming of GIFT Tilapia		Open water cage farming & cage fabrication		Live Feed Culture for Marine hatchery operations		Total Training programmes Conducted	
		No. of Training	No. of Beneficiaries	No. of Training	No. of Beneficiaries	No. of Training	No. of Beneficiaries	No. of Training	No. of Beneficiaries	No. of Training	No. of Beneficiaries	No. of Training	No. of Beneficiaries
1	2012-13	2	40	2	22	-	-	1	23	1	6	6	91
2	2013-14	2	26	9	131	-	-			-	-	11	157
3	2014-15	3	31	9	99	7	62			1	10	20	202

Fisheries officials collecting c rablets from the nursery rearing hapas at ADF - RGCA, Karaikal

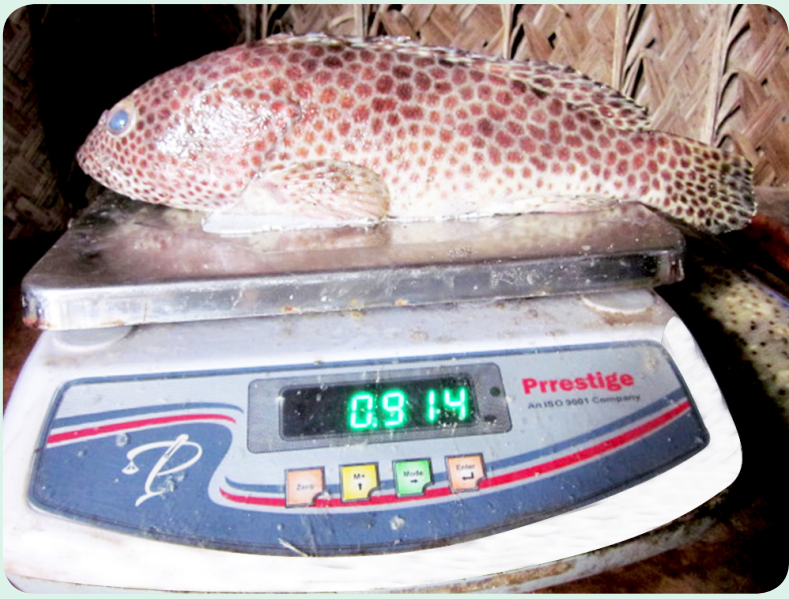
Trainees observing Tilapia harvest at RGCA Tilapia Project, Vijayawada

Officials from Department of Fisheries, Kerala exposed to the maintenance of nursery hapas for mud crab

Fisheries officials from Tamilnadu observing Tilapia conditioning hapas at Vijayawada

Central Aquaculture Genetics Laboratory

The Central Aquaculture Genetics Laboratory (CAGL) of RGCA plays a crucial role in ongoing selective breeding programmes of RGCA by evaluating inbreeding, constructing family pedigree and providing mating plans for breeding stocks. The lab is pursuing population genetics study to find out the suitable founder populations for selective breeding programmes utilizing advanced molecular markers like microsatellites, mitochondrial-DNA sequencing etc. The Genetics lab is conducting research on species, strain and sex identification of prioritized species using diverse molecular markers to resolve taxonomic ambiguity of the species and to identify sex at very early stages of their life cycle. The lab is regularly undertaking trial farming for evaluation of on-farm performance of shrimp families at different geographical locations in India to select the best families for selective breeding programmes. The Genetics lab is assisting RGCA project personnel at



Grouper sample collected from Rameswaram, Tamil Nadu for genetic studies

CAGL-activity-DNA extraction facility

DNA sequencing facility at CAGL

President, RGCA & Chairman, MPEDA, Ms. Leena Nair, IAS on her visit to CAGL

hatchery and farm in fish tagging process using PIT and VIE tags and participating in awareness programmes to enlighten about the importance of aquaculture genetics to aquaculture stakeholders and academe.

During the year 2014-15, 590 individual tissue samples from prioritized aquaculture species (Seabass - 181 nos.; Scampi - 142 nos. and Grouper - 267 nos) were collected for species identification, sex marker development and population genetic study from various geographical locations of India including Kerala, Tamil Nadu, Andhra Pradesh, West Bengal and Andaman coastal waters. Total genomic DNA was extracted from the samples using lab modified traditional phenol-chloroform method. Quality of the extracted DNA was checked by agarose gel electrophoresis method and the quantity was evaluated using Biophotometer before documented them in Gel Documentation System. A total of 8653 Polymerase Chain Reactions (PCR) was performed for amplification of diverse mitochondrial and nuclear gene regions and several species-specific RAPD and PCR-RFLP markers were developed during the process. Sequencing reaction was performed for 430 samples at CAGL using genetic analyzer 3500 for the mtDNA 16S rRNA and COI gene mainly for scampi, grouper, seabass and mud crabs. All the samples were sequenced in both forward and reverse directions and the sequenced regions were aligned and evaluated using The Basic Local Alignment Search Tool (BLAST) for further studies.

Achievements:

❋ Identification of species, strain and sex using molecular markers

The CAGL has developed multiple molecular markers to identify mangrove mud crab species under

genus *Scylla*. Samples from India (*S. serrata* and *S. olivacea)* were compared with the samples *(S. serrata, S. olivacea, S. paramamosain* and *S. tranquebarica)* received from Indonesia, Philippines and Myanmar. The results reconfirmed that Indian coastal waters has only two mud crab species, *S. serrata* and *S. olivacea.*

Six grouper species *(Epinephelus latifasciatus, E. bleekeri, E. clorostigma, E. radiates, Plectropomus laevis* and *variola louti)* were identified from Indian coastal waters based on the sequence analysis of COI and 16srRNA gene region.

The genetics lab has developed molecular markers to identify GIFT and red tilapia strain and sex-specific markers to identify male and female of GIFT species. The unique species-specific sequences will be submitted to NCBI GenBank and the results are to be published in the scientific journals.

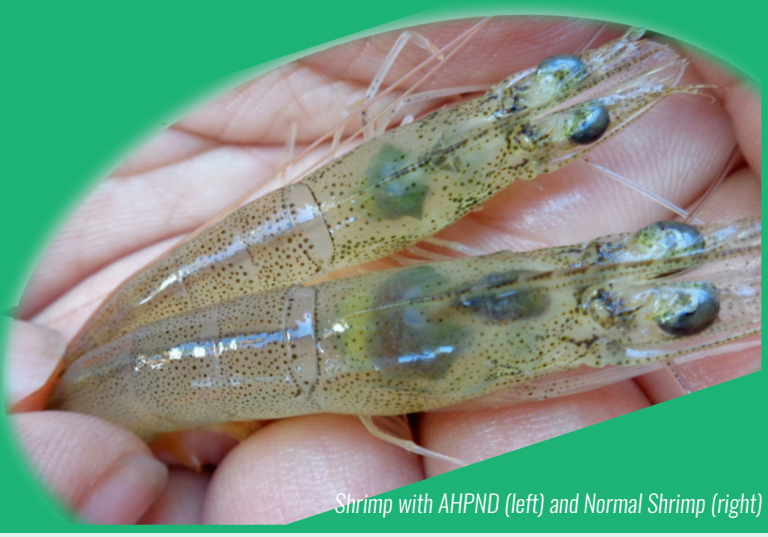
❋ On-farm trial of L. vannamei evaluation stream

During the period, evaluation of fourth and fifth trial farming (ES-4 and ES-5) for *L. vannamei* was completed successfully by the CAGL in collaboration with the scientists from Oceanic Institute, Hawaii, USA. These trial evaluations are meant to find out the best performing *L. vannamei* family suitable for different field conditions in India. The average growth of animals from ES-4 was 19.3g after a cage culture period of 67 days whereas average growth of ES-5 animals was 16.0g after a cage culture period of 41 days. Each evaluation stream contains shrimp from several families maintained at the OI.

❋ Sixteen sequences published in NCBI GenBank

Thirteen unique sequences of grouper and three sequences of mud crabs were published in NCBI GenBank (total 16 sequences published). Details of sequences could be obtained from NCBI web site using following Accession nos: *Epinephelus fuscoguttatus* (KJ607962, KJ607963, KJ607964, KJ607972); *Epinephelus coioides* (KJ607965, KJ607973); *Epinephelus formosa* (KJ607968); *Epinephelus areolatus* (KJ607969); *Epinephelus diacanthus* (KJ607971); *Epinephelus longispinis* (KJ607970); *Epinephelus malabaricus* (KJ607967, KJ607974); *Plectropomus areolatus* (KJ607966) and *Scylla serrata* (KJ607959, KJ607960, KJ607961)

PCR preparation at CAGL



Shrimp with AHPND (left) and Normal Shrimp (right)

Central Aquaculture Pathology Laboratory

RGCA's pathology laboratory earns NABL accreditation and becomes the First Aquaculture pathology laboratory of the Country

The Central Aquaculture Pathology Laboratory of Rajiv Gandhi Centre for Aquaculture (RGCA),at Sirkali has achieved the distinction of becoming the first aquaculture pathology laboratory in the country accredited by NABL (National Accreditation Board For Testing & Calibration Laboratories) as per ISO/IEC 17025: 2005.

This state-of-the-art laboratory was established during September 2011. Since then, the laboratory has been serving the aquaculture industry of the country by providing timely and reliable diagnosis on various diseases encountered during the culture of finfish, shrimps & freshwater prawns.

The laboratory is equipped with all the latest disease diagnostic tools and has three component units for molecular pathology, histopathology and microbiology which together helps in diagnosis of various diseases encountered by the aquaculture industry. The molecular pathology laboratory has been routinely engaged in screening/diagnosis of 16 Crustacean (shrimp/crab) pathogens including OIE listed pathogens besides 3 finfish pathogens.

In addition, the laboratory conducts periodical & need based aquaculture disease surveillance in India for the benefit of the seafood export industry. All the known diseases affecting the shrimp/prawn/ fish are diagnosed at this lab which includes the recently emerged dreaded shrimp disease viz Early Mortality Syndrome (EMS)/ Acute Hepatopancreatic Necrosis Disease (AHPND).

The laboratory is also part of National Surveillance Programme for Aquatic Animal Diseases funded by NFDB and coordinated by National Bureau of Fish Genetic Resources (NBFGR), ICAR, Lucknow.

With the accreditation of NABL, the aquaculture pathology lab has become the only nationally accredited laboratory for aquaculture disease diagnosis.

Accreditation is a voluntary, third party-reviewed process. As part of accreditation, a laboratory's quality management system is thoroughly evaluated on a regular basis to ensure continued technical competence and compliance with ISO/IEC 17025.

Laboratories that are accredited to ISO/IEC 17025: 2005 international standard have demonstrated that they are technically competent and able to produce precise and accurate test result.

The test report from the lab is internationally acceptable and valid.

Research on Diseases

Besides the routine disease diagnosis RGCA Central Aquaculture Pathology Laboratory initiated research on diseases encountered in aquaculture systems in the country with special focus on new and emerging diseases. A brief account on the same is given below:

Chronic low level mortality of *P. vannamei* or Running mortality syndrome

The laboratory has been able to narrow down on the causative agent of chronic low level mortality of *P. vannamei*, commonly known as Running mortality syndromeamong shrimp farmers. This shrimp disease has been pestering shrimp farmers since last couple of years. The cumulative mortality due to this disease is as high as 40 to 60 %. The studies indicate that this is caused by an infectious agent an intracellular bacterium under class alpha-proteobacteria. The pathogen was purified and subjected to challenge study, TEM and molecular characterisation. Further studies on management measures to control the disease are ongoing.

Idiopathic Hyaline Granulomatous Syndrome (IHGS)

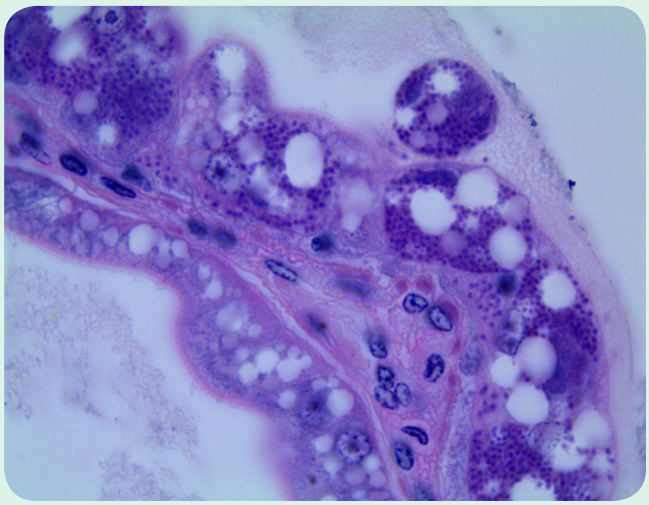
IHGS is a disease observed in *Penaeus monodon* which is of concern for tiger shrimp breeders world over. IHGS is observed in wild *P. monodon* from all over the east coast of India and also in cultured shrimp. RGCA sent samples of *P. monodon* with this new disease in 2006 for investigation to Dr. Donald Lightner , Aquaculture Pathology Laboratory, University of Arizona, USA. Dr.Lightner after analysis of samples found that it is a new disease of unknown aetiology, named the disease based on its key histopathological characteristics as IHGS. RGCA, CAPL has been pursuing research on IHGS and has succeeded in identifying the causative agent of IHGS as Rickettsiae Like organism. An experimental PCR

Oreochromis niloticus infected with Streptococcus sp displaying ocular opacity

has been developed for screening the presence of the pathogen. Further research on management measures is on-going.

Enterocytozoon hepatopenaei (EHP)

Enterocytozoon hepatopenaei (EHP) a *Microsporidian* parasite is found to be associated with slow growing *Penaeus vannamei* and *Penaeus monodon*. Widespread prevalence of EHP is observed from shrimp farming regions of India viz. Balasore, Bhadrak,



Hepatopancreas depicting acidophilic, granular inclusions in the cytoplasm of the tubule epithelial cells. Mayer's H&E stain (100 x magnifications)

Nellore, Gudur, West Godavari Dt., East Godavari Dt., Nagapattinam Dt. , Thanjavur Dt. (n=220). EHP is an endemic pathogen and it is evident by its presence in native cultured *P. monodon* in farming areas where culture of *P. vannamei* is not yet initiated. Affected shrimp farming areas reported severe growth retardation in shrimp crop after crop.

RGCA CAPL identified EHP through histological as well as molecular studies and three unique sequences of EHP SSU rDNA have been submitted to NCBI GenBank (KR021167-KR021169). Histopathological examination of EHP spores appeared as acidophilic structure confined within a vacuole within the cytoplasm of R (reserve), B (blister), F (fibrillar) and E (embryonic) cells. The pathogen was also identified from wild *P. monodon* samples collected from the east coast of India.The presence of the pathogen in shrimp hepatopancreatic tissue was confirmed through in-situ hybridisation & TEM. Further works on the multilocal phylogeny, diversity analysis and disease management of EHP in India is in progress.

Infectious Hypodermal Haematopoietic Necrosis Virus

CAPL also sequenced partial region of non-structural Gene II of IHHNV (Infectious Hypodermal and Hematopoietic Necrosis Virus) from IHHNV infected *P. monodon* samples and 5 unique sequences has been submitted to NCBI- GenBank (KP883303 - KP883307).

White Muscle Disease (WMD)

White discoloration of muscle and associated mortality during grow out has been termed by shrimp farmers as White muscle disease. White muscle disease has been observed in *P. vannamei* from all major shrimp farming regions of the country. Investigations on this disease were conducted in affected farms (n=55). Hemolymph, muscle and Hepatopancreas were subjected to microbiological analysis. The detailed study showed that Vibrios are the major pathogens associated with the disease conditions. *V. parahaemolyticus, V. alginolyticus* and *V. harveyi* were confirmed by 16 S rDNA sequencing.

Zoea mortality syndrome

Investigation on *P. vannamei* zoea stage mortality was initiated. Preliminary studies indicate *Vibrio alginolyticus* as major bacterial species associated with the disease.

Ring Test participation

CAPL has successfully participated in the Ring test conducted by OIE reference laboratory, University of Arizona in August 2014 and February 2015.

Dr. S.R. Ranganathan

Aquaculture Library

RGCA Library is housed at the birth place of Dr.S.R. Ranganathan, Father of Library Science in India

A state-of-the art library, solely devoted to Aquaculture and allied subjects has been developed at RGCA. This aquaculture library, the first one of its kind in India, in addition to catering to the information needs of the scientists in Aquaculture R&D at the various centres of RGCA is also committed to serve the aquaculture information seekers within and outside the Country on aquaculture and allied subjects.

The library has an impressive collection of both print and online resources including books, journals, technical reports and various publications with separate sections for farmed species across the world with special reference to species farmed in Asia. In addition the library provides information resources on different aquaculture systems across the world.

This library has been further strengthened during this year with the additions of latest books in field of aquaculture and allied subjects. The library also subscribes to reputed international and national journals and provides online access to all scientists and staff of RGCA.

The library maintains a separate section for "Dr. E. G. Silas Endowment Library". The endowment library houses more than 6000 aquaculture and fisheries books, journals, rare publications.

Most of the operations in the library have been computerised. Online Public Access Catalogue (OPAC) is available in the INTERNET via Institute's web site.

RGCA is proud to mention that our Aquaculture Library is housed in the birth place of Dr. S.R. Ranganathan at Sirkazhi, Tamil Nadu.

Staff using the Online Public Access Catalogue (OPAC) in the library

Journals display rack at the library

Organising committee of ITS 2014 with the members of the expert panel

Mr. Angel D Rubio addressing the participants of ITS - 2014

Ms. Leena Nair, IAS lighting the ceremonial lamp at India Tilapia Summit – 2014 at Vijayawada, AP

Seminars and Workshops

INDIA TILAPIA SUMMIT 2014

December18, 2014 - Vijayawada

"INDIA TILAPIA SUMMIT – 2014", the first ever International Seminar in India on Tilapia Aquaculture and Trade was organized by Rajiv Gandhi Centre for Aquaculture (RGCA), the Research & Development arm of the Marine Products Export Development Authority, Govt. of India on 18th December 2014 at Vijayawada in Andhra Pradesh, the aquaculture hub of the Country. This Biennial event was organized by RGCA to sensitize Indian Tilapia farmers, entrepreneurs, scientists, industry practitioners/stakeholders, policy makers, planners and the academe on Tilapia farming across the globe, the technological developments in production & processing, global markets, current trends etc. and also to harness the enormous potential of this species for aquaculture diversification thereby contributing to the export basket of the Country . Shri. Y.C. Thampi Sam Raj, Project Director RGCA welcomed the guests, speakers and delegates to the Tilapia India Summit 2014.

The event was inaugurated by Ms. Leena Nair, IAS, President RGCA and Chairman MPEDA by lighting the traditional lamp. In her inaugural address, President RGCA expressed concern that though Seafood exports from the country had touched an all-time high of 5 billion USD, it was farmed shrimp that was the major contributor and other species such as Cobia, Sea bass and Mud Crab were yet to create any significant impact on exports. Ms. Nair also pointed out that if just 10% of the existing Freshwater farming area in the state of Andhra Pradesh was used for Tilapia farming, the state would be able to produce over 12 lakhs metric tons of Tilapia for exports worth Rs. 8000 crores. However, several issues pertaining to permission, registration and approval for Tilapia breeding and farming need to be resolved at the earliest to make this a reality. President RGCA also thanked the Fisheries minister and other senior officials of the department for timely steps taken

Participants and Dignitaries of ITS-2014

in this direction.

Dr. Manmohan Singh, IAS, Principal Secretary to the Govt. of Andhra Pradesh presided over the function.

Dr. M. Vijaya Gupta, Former Assistant Director General, World Fish Center and World Food Prize Laureate delivered the Key Note address while Dr. E.G. Silas, former Director of the Central Marine Fisheries Research Institute, former Vice Chancellor of the Kerala Agricultural University and the present Chairman of the Scientific Advisory Committee of RGCA also spoke on the need for promoting Tilapia Aquaculture in the Country.

Mr. Ruel Equila addressing the participants of ITS - 2014

Shri. M. Seetharama Raju, President, AP State Fish Farmers Association delivered felicitation address while Dr. Kolli Premchand and Shri. George Alexander, Tilapia farmers from the states of Andhra Pradesh and Kerala respectively spoke of their success stories on Tilapia farming during the inaugural function.

This event also featured the second edition of the Annual Dr. E. G. Silas Endowment Lecture that RGCA organizes each year as a tribute to the contributions of the living legend in the field of Fisheries and Aquaculture, Dr. E.G. Silas, former Director, Central Marine Fisheries Research Institute, former Vice Chancellor, Kerala Agricultural University and the current Chairman of the Scientific Advisory Committee of RGCA. Dr. Ram C. Bhujel, Director – Aqua Centre, Asian Institute of Technology Thailand, and a household name among Tilapia enthusiasts across the world, delivered this lecture on Seed Production, Grow-out Farming, Health Management and Biosecurity Systems in Tilapia Aquaculture which was received with rapt attention by the participants.

The technical sessions had several international Tilapia Scientists and Market Analysts who delivered lectures on various topics such as the available commercial technologies worldwide with regard to breeding, seed production, grow-out farming systems, disease management, biosecurity requirements, selective breeding, advanced high intensive Recirculation Aquaculture production systems, saline resistant/tolerant strains, the current status of tilapia aquaculture in the world, global markets, market trends and potential for the future.

Dr. Lind Curtis, Scientist, Aquaculture & Genetic Improvement, WorldFish, Malaysia, Prof. Ori Lahav, Technion, Israel, Mr. Ruel Eguia, Aquaculture Farm Manager, CDO Foodsphere Inc., Philippines, Mr.Chee Kiat Inter Sea Fishery (M) Pvt Ltd, Malaysia, Mr. Angel D. Rubio, Chief Analyst and Director of Business Development for Latin America URNER BARRY, NJ, USA and Ms. Shirlene Maria Anthonysamy, Trade Promotion Officer, INFOFISH, Malaysia were the prominent International speakers at the event.

Indian Speakers included Dr. P.E. Vijay Anand, Director – India Animal Feed, Aquaculture and Soy Meal Program, US Soybean Export Council Inc, Dr. P. Routray, Principal Scientist – Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha, Mr.S.Vaitheeeswaran, Managing Partner, Svara Biotechnovations, Tamil Nadu, Mr. U. Murali Anand Varma, Ananda Group, Bhimavaram, Andhra Pradesh, Mr. Arun Kumar, Aresen Biotech & Farms India Pvt. Ltd., Andhra Pradesh and Mr. Jaideep Kumar, Project Manager – Coordination, Rajiv Gandhi Centre for Aquaculture, Tamil Nadu.

Dr. E.G. Silas, Chairman, Scientific Advisory Committee, RGCA receiving the memento from Shri. Manmohan Singh, IAS, Principal Secretary to Dept. of Animal Husbandry and Fisheries, Andhra Pradesh

The technical sessions were chaired by Dr.E.G. Silas, Chairman, Scientific Advisory Committee of RGCA & Dr. Ambekar E. Eknath, Former Director General of NACA, Bangkok and Co-chaired by Shri. P. Mohanasundaram, Director MPEDA and Dr. T.C. Santiago, Retd. Principal Scientist, Central Institute of Brackish water Aquaculture, Chennai and Member, SAC of RGCA respectively.

The final session of the event – the "Panel Discussions", was a highly interactive session, wherein several delegates representing farmer groups, entrepreneurs, potential hatchery operators, processors, govt. officials and members of the academe expressed their views to promote and popularize Tilapia aquaculture in the country and discussed on the impediments that came in the way which needed to be addressed immediately.

The event was a resounding success with a massive participation from across the Country. A total of 324 delegates registered for the event from 12 states of the Country; Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Maharashtra, Odisha, West Bengal, Chattisgarh, Telengana, Goa, Pondicherry and Madhya Pradesh and includes Aqua farmers, Hatchery operators, exporters, entrepreneurs, aquaculture professionals, Govt. officials and members of the academe. This turnout is a true reflection of the pulse of the Indian Aqua farmer and his need for diversification of Aquaculture.

The suggestions obtained during the panel discussions as well as the recommendations made by the expert panel would enable to take relevant decisions to hasten the efforts in popularizing Tilapia aquaculture in the country.

Project Director Shri. Y.C. Thampi Sam Raj felicitating Shri. M. Seetharamarajan, President, AP state fish farmers association

Second Edition of **Dr. E. G. Silas Endowment Lecture** delivered by Dr. Ram C. Bhujel

Dr. E.G. Silas addressing the gathering

Dr. Ram C. Bhujel, Director, Aqua centre, Asian Institute of Technology, Bangkok, Thailand delivered the second edition of Dr. E. G. Silas endowment lecture during "India Tilapia Summit 2014 held at Vijayawada, Andhra Pradesh on December 18, 2014.

Dr Bhujel presented the overview of tilapia farming in SE Asia and globally, with special emphasis on AIT's tilapia hatchery technology which is spreading all over the world benefiting many countries and their farming communities. He posed a question why India was not taking benefit of it. He also highlighted the revenue generating potential of modern tilapia farming giving examples of some hatcheries in Thailand that generate up to US$10,000 per day

RGCA organises Dr. E. G. Silas Endowment Lecture each year by bringing reputed International/ National Scientists to speak on current issues or topics that are highly relevant to the Aquaculture Industry in the country. This Annual Lecture is a tribute to the invaluable contributions of Dr. E. G. Silas, one of the most revered personalities in the field of Fisheries and Aquaculture Research sector in India. Dr. Silas, in his illustrious career has served as the Director of Central Marine Fisheries Research Institute and as Vice Chancellor of Kerala Agricultural University and is currently the Chairman of the Scientific Advisory Committee of RGCA. The First Edition of Endowment lecture was delivered by the renowned Shrimp Pathologist Dr. Donald V. Lightner during 2013.

Dr. Ram C. Bhujel, Director, Aqua-Centre, Asian Institute of Technology, Bangkok, Thailand delivering the 2nd edition of the Dr. E.G. Silas Endowment Lecture

Workshop cum Training on Shrimp Disease Diagnosis- 2015

RGCA organised a Workshop cum training programme on shrimp Disease Diagnosis on 2nd and 3rd February 2015 at Technology Transfer Training and Administrative Complex, RGCA-HO, Sirkali. Dr. Linda Nunan, former Assistant Staff Scientist, Aquaculture Pathology Laboratory, University of Arizona, USA, was the resource person for this programme. The participants of this training programme were from the various sectors of Aquaculture industry viz. shrimp hatchery, shrimp feed companies, disease diagnostic labs, state fisheries dept. and academicians belonging to Tamil Nadu, Andhra Pradesh, West Bengal and Lakshadweep. The programme had both theory and practical sessions. Dr. Linda Nunan updated information on current diseases of shrimp Aquaculture industry viz. AHPND (Acute Hepatopancreatic Necrosis Disease) and EHP (Enterocytozoon hepatopenaei). The programme was highly interactive with participants sharing their field information and getting their queries clarified by the expert. The practical session provided hands on training to participants on sampling and preservation of samples for disease diagnosis, DNA extraction, PCR technique, gel electrophoresis and interpretation of result.

Practical Classes in progress

Participants of the programme

Short Seminar on EMS AHPND

A one day Refresher Short Seminar on EMS / AHPND was conducted by RGCA on 4th May 2014 at its Technology Transfer, Training and Administrative Complex. Twenty four officials from MPEDA, NETFISH and NACSA participated.

Major Events of the Year

RGCA participates in AQUA AQUARIA 2015 at Vijayawada

The congregation of farmers and delegates at the Aqua Aquaria 2015 were provided with a visual treat at the pavilion of Rajiv Gandhi Centre for Aquaculture, the Research & Development arm of the Marine Products Export Development Authority. A massive independent hangar of 30m x 30m size was setup by RGCA to showcase the various activities carried out by the centre in aquaculture technology development and dissemination.

There was a marked deviation from conventional trade shows and fairs as huge tanks and enclosures exactly as in hatchery and farming systems were set up that displayed several species of large marketable sized finfish and shellfish from RGCA facilities such as Asian Seabass, Tiger Grouper, Orange Spotted Grouper, Cobia, Tilapia, Black Tiger Shrimp, *L. vannamei* etc. Fry, fingerlings and juveniles of the above, as well as Artemia were also displayed in attractive lighted aquarium tanks.

However, the major attraction in the pavilion was a Mangrove Mud Crab Sanctuary where RGCA created near natural conditions of the Mangrove Crab habitat. All these enclosures with both saline and freshwater systems were supported by RAS – Recirculation Aquaculture Systems. RGCA scientists explained the operation and

Hon'ble Chief Minister of AP Shri. Chandra Babu Naidu inaugurating the RGCA pavilion

Hon'ble Chief Minister of AP Shri. Chandra Babu Naidu trying to catch a Cobia at RGCA pavilion

the functioning of these high tech systems to the visitors of the show.

A model of the Aquatic Quarantine Facility displaying receiving area, quarantine cubicle and the quarantine Lab was also set up. Activities of the NABL accredited Central Aquaculture Pathology Laboratory as well as a miniature version of a Marine Algal Lab with live mass algal cultures was exhibited. A set up of an Aquaponics system - growing aquatic animals such as tilapia and plants in an integrated system, with participation from an entrepreneur was also a major attraction at the pavilion. Square shaped HDPE Cages for open water bodies of actual dimensions as well as a model of a circular cage were displayed for the benefit of entrepreneurs and farmers interested in Cage farming. Attractive handouts/pamphlets on RGCA activities and services were also provided to the visitors.

Hon'ble Chief Minister of AP Shri. Chandra Babu Naidu displays a netted shrimp catch

Visitors at the model of Mangrove Mud Crab sanctuary

Demonstration classes on Asian Seabass and Mud Crab aquaculture as well as on Cage fabrication, installation and Sea cage farming were held at the venue for the benefit of the delegates participating in the event. The RGCA Scampi and Tilapia Farm was also the venue for the field trip organized by MPEDA for the benefit of delegates.

Glimpses of RGCA pavilion

Hon'ble Chief Minister of AP Shri. Chandra Babu Naidu and Ms. Leena Nair IAS, President RGCA viewing farm reared tilapia

Model of Mangrove Mud crab pen sanctuary exhibited

Shri. Y. C. Thampi Sam Raj, Project Director, RGCA along with the team of RGCA staff receiving the special award from Ms. Leena Nair, IAS, President RGCA

"Machlipatnam, a seafood stall set up by RGCA

While the RGCA pavilion was the cynosure of all eyes at the AQUA AQUARIA 2015, at Vijayawada, "Machlipatnam", a seafood stall set up by RGCA in the venue grounds quietly attracted thousands of seafood lovers who thronged the stall to relish the mouthwatering seafood delicacies served. The runaway success of the stall, first introduced during the previous edition of AQUA AQUARIA in 2013, inspired RGCA to set up the same again with more varieties of seafood.

Delicacies of fish and shrimp in the tastiest Andhra cuisine prepared from fresh farm produce from the R & D farm of RGCA and served at the stall, attracted large crowds throughout the duration of the event. The stall attempted to induce the public to try out new varieties of fish other than the conventional Carps and Basa fish. The menu included a choice of whole plate sized fried Tilapia, Tilapia Kebabs and nuggets made from tilapia fillet, preparations with Seabass and Cobia steak as well as Shrimp. Items of the menu had a typical Indian flavor that appealed equally to the delegates who had come from all across the country. The stall also provided takeaway packs and had a frozen fish counter where all

these fish were made available in ½ Kg and 1 Kg frozen packs.

RGCA's Machlipatnam, as it did during the previous edition of Aqua Aquaria in 2013 made a great impact on the public and would definitely achieve its objectives in popularizing the new varieties of fish, both as a candidate species for farming as well as to make them sought after varieties in the domestic markets.

The Domestication of Tiger Shrimp Project of

RGCA commenced the supply of SPF Tiger Shrimp Broodstock

Hon'ble Chief Minister of Andhra Pradesh, Shri. Chandrababu Naidu handing over SPF Tiger Shrimp Broodstock to the Hon'ble Fisheries Minister of AP Shri. P. Pulla Rao

RGCA commenced the supply of SPF Black Tiger Shrimp Broodstock to commercial Shrimp Hatcheries on trial basis. To mark the commencement of this landmark event, broodstock produced by RGCA was released by Shri. Chandrababu Naidu, the Hon'ble Chief Minister of Andhra Pradesh during the inaugural function of Aqua Aquaria 2015 held at Vijayawada on the 20th February 2015 by handing over the stocks to Shri. P. Pulla Rao, Hon'ble Agriculture Minister Andhra Pradesh.

›› Anup Mandal, Mathews Varkey, Anjali K. Mani, Sobha P.

Infrastructure Developments

Creating state-of-the-art infrastructure and strengthening and upgrading existing ones to keep up with the advances in aquaculture technology development worldwide has been RGCA's forte since its establishment in the year 1995. Such facilities are models that can be replicated by entrepreneurs of the country. Unlike other sectors, infrastructure development for Aquaculture applications requires a holistic approach so as to provide conductive & bio-secure environment for effective husbandry management all through the year in all environmental conditions. Most facilities of RGCA meet these standards. This year RGCA added some latest machinery to its facilities to put them in par with the best in the world. The details of Infrastructure development activities at various projects of RGCA developed/commissioned during 2014 -15 across the country are briefed below:

Aquatic Quarantine Facility for *L. vannamei,* Neelankarai, Chennai

Upon commissioning of all the 20 quarantine cubicles with independent Recirculation Aquaculture System, the following filtration systems were successfully commissioned in the facility

High Efficiency Particulate Air (HEPA) filters

HEPA filters made of 100% glass microfibre fire retardant media are used which are efficient in blocking 0.3 micron and larger particles at a minimum efficiency of 99.97%. The first Air that comes out of a HEPA filter is of Class 100.

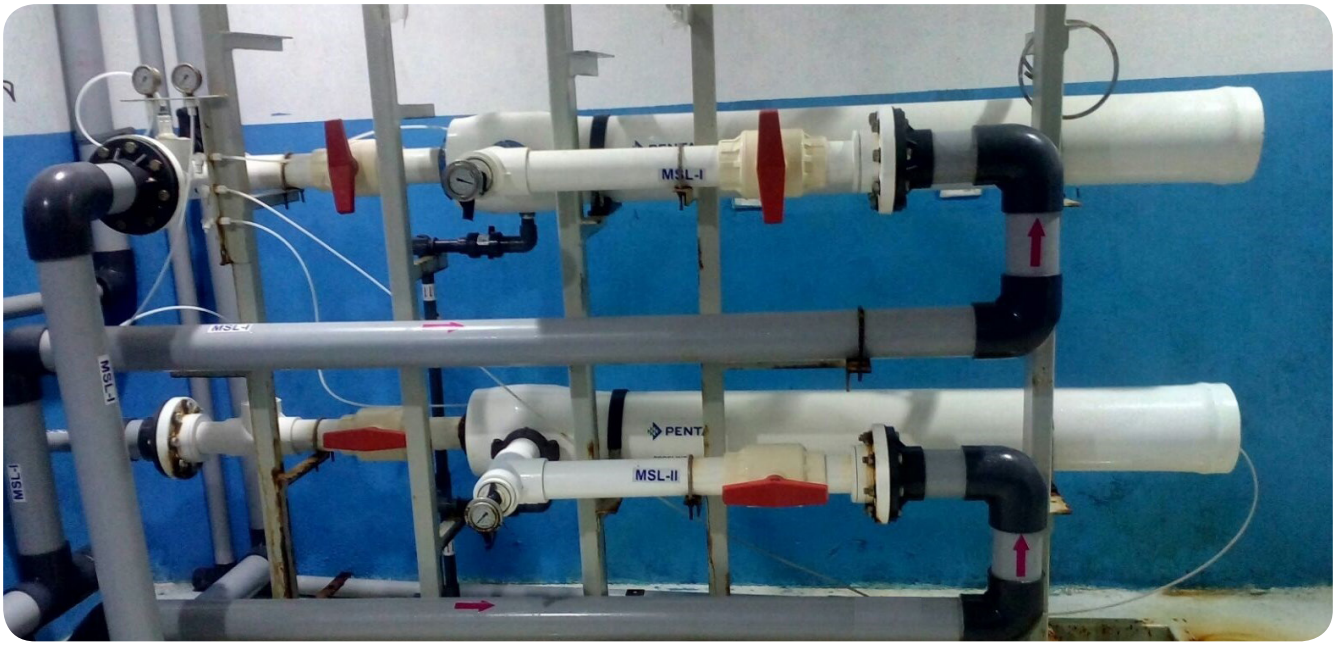
View of the Pergola at RGCA headquarters

High Capacity Pleated Cartridge

The assembly of the pleated cartridge with an outside in flow provides maximum flow rates with the lowest possible pressure drop. These cartridges manufactured with polypropylene media achieve 99.98% efficiency.

Technology Transfer Training & Administrative Complex (TTTAC)

Additional infrastructure facilities viz. Pergola, Compound Wall, parking sheds etc were created at TTTAC, during the period under report.



High capacity pleated cartridge

High efficiency particulate Air filter

Publications from RGCA Team

Hon'ble Chief Minister of Andhra Pradesh Shri. Chandra Babu Naidu released the Proceedings of the International Seminar on Mud Crab Aquaculture & Fisheries Management (ISMAF) 2013 at Aqua Aquaria 2015

Emilia T Q., Estepa, F D P., Thampi Samraj, Y C, Mandal A (Eds) (2015) Proceedings of the International Seminar- Workshop on Mud crab Aquaculture and Fisheries Management, 10-12 April 2013, Rajiv Gandhi Centre for Aquaculture, Sirkali, & SEAFDEC, Philippines

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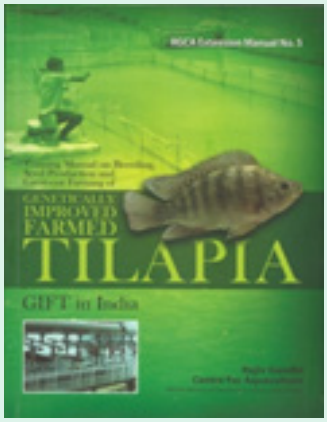
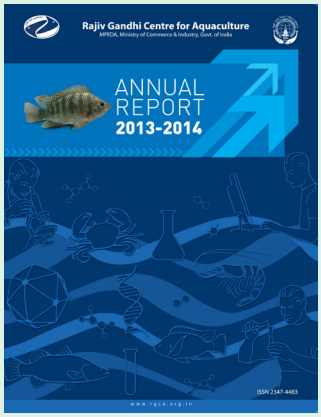


Appala Naidu B, Mathews Varkey, Srinivasa Rao P, Ganavel M, Gunasekaran U, Sivakumar P S, Lakshmana Rao, Senthil G, Jaideep Kumar and Thampi Sam Raj (2014) Breeding, seed production and grow – out farming of Genetically Improved Farmed Tilapia (GIFT) in India. Rajiv Gandhi Centre for Aquaculture, Sirkali.

82 Pages; Paperback full colour

RGCA Extension Manual No. 5.

ISBN:978-81-929898-0-8



RGCA 2015. Annual Report 2014-15

Rajiv Gandhi Centre for Aquaculture,

Sirkali, Tamil Nadu.

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›› Ganesh K and Thampi Sam Raj, Y. C.(2014) Mangroves crabs going to extinct?'. Popular article in Jalakarshakan, Malayalam magazine published from Kerala.

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›› Jaideep Kumar, Appala Naidu, Srinivasa Rao, Mathews Varkey, Remany, M.C. and Thampi Sam Raj, Y. C. (2015) Prospects of GIFT Tilapia Aquaculture in India. *Souvenir Aqua Aquaria India 2015held at* Andhra Loyola College campus, Vijayawada, Andhra Pradesh during 20-22nd February 2015, MPEDA, Cochin, pp. 107-113.

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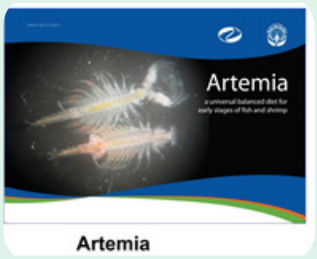
›› Thampi Sam Raj, Y. C., Jayagopal, P., Dinesh Kumar, H. (2015) Development of specific pathogen free *Litopenaeus vannamei. Souvenir Aqua Aquaria India 2015 held at* Andhra Loyola College campus, Vijayawada, Andhra Pradesh during 20-22nd February 2015, MPEDA, Cochin, pp. 67-76.

The Under mentioned colourful leaflets in English & Telugu released and distributed at Aqua Aquaria 2015



Artemia

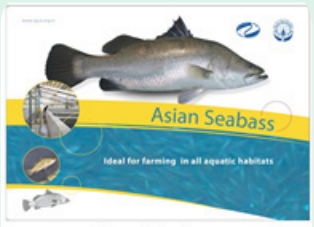
Cobia

SPF L.vannamei Broodstock

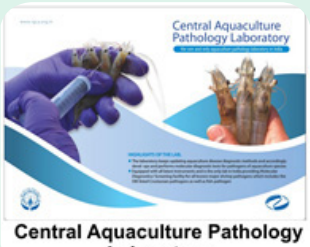
Mangrove Mud Crab

High Quality Tiger Shrimp Seeds

RGCA's for the Indian Aqua Farmers



Asian Seabass



Central Aquaculture Pathology Laboratory

Participation in

Fairs and Expositions

10th Indian Aquaculture and Fisheries Forum

RGCA has participated in 10th Indian Aquaculture and Fisheries Forum (10 ifaf)12 - 15 November, 2014 organized by AFS-IB, Mangalore, India in collaboration with NBFGR at Lucknow, India. About 2000 people comprising mostly scientists, academicians and scholars from various parts of India have attended the exhibition held during this Forum.

Dr. K. K. Vijayan, Director, CIBA visiting RGCA stall at 10th Indian Aquaculture and Fisheries Forum

A stall was put up in the exhibition in which flexi charts showing brief details of all RGCA projects were displayed with special focus on GIFT tilapia. The diagnostic services of CAPL and extension services of TTAC wing of RGCA were highlighted on the charts. The ongoing genetic programmes in RGCA were also illustrated with photographs. Live GIFT tilapia fry and scampi all male PL were displayed in glass aquaria.

Species diversified culture activities under taken by RGCA for sustainable Indian aquaculture were briefly explained to the visitors of the forum. A scientific paper on " Aquaculture genetics and RGCA's initiatives" was also presented during the event.

Krishimela - 2014

RGCA participated in Krishimela-2014 from 19 - 21 November, 2014 organized by University of Agricultural Sciences at Gandhi Krishi Vignan Kendra (GKVK) campus, Hebbel, Bengalore. RGCA put up a stall at the Expo and displayed live Tilapia specifically for the Inland farmers in the region for short duration freshwater crops.

Registrar. Karnataka Agricultural & Vertinary University visiting RGCA stall at Krishimela 2014

Aqua Aquaria India 2015

RGCA actively participated in the Mega Event - The 3rd edition of "Aqua Aquaria India 2015" that was organized by MPEDA from 20 – 22 February 2015, in Andhra Loyola College Ground Campus, Vijayawada, Andhra Pradesh.

(For more details see page no.93)

RGCA Meetings

Executive Committee Meetings

Four meetings of Executive Committee were conducted during the year 2014-2015.

48th EC of RGCA

48th Executive Committee Meeting of RGCA was held on 29th May, 2014 at MPEDA, HO, Kochi. The undermentioned members attended the meeting.

1. Ms. Leena Nair, IAS, Chairman, MPEDA/President, RGCA.
2. Shri. C.Munianathan, IAS, Director/Commissioner of Fisheries, Chennai
3. Dr. A.S Ninawe, Sr.Advisor, DBT, New Delhi
4. Shri. N. Ramesh, ITS, Director (Mktg), MPEDA
5. Shri P. Mohanasundaram, Director, MPEDA
6. Shri. B. Sreekumar, Secretary, MPEDA
7. Smt. Saira Banu K.A, Executive Director, ADAK, Trivandrum
8. Smt. E.V. Deepa, Chief Accounts Officer, MPEDA
9. Shri. Y.C. Thampi Sam Raj, Project Director RGCA

Special Invitee

Shri J. Ramesh, consultant, MPEDA

49th EC Meeting of RGCA

49th Executive Committee Meeting of RGCA was held on 29th September, 2014 at MPEDA, HO, Kochi. The undermentioned members attended the meeting.

1. Ms. Leena Nair, IAS, Chairman, MPEDA/President, RGCA
2. Dr. A.S Ninawe, Sr. Advisor, DBT, New Delhi
3. Dr. (Mrs) B. Meena Kumari, DDG (Fy), ICAR, New Delhi
4. Dr. K.K. Vijayan, Director CIBA
5. Shri. N. Ramesh, ITS, Director (Mktg), MPEDA
6. Shri P. Mohanasundaram, Director, MPEDA
7. Shri. B. Sreekumar, Secretary, MPEDA
8. Shri J. Chandrasekhar, Director of Fisheries, A & N Islands
9. Smt. Saira Banu K.A, Executive Director, ADAK, Trivandrum
10. Smt. Mary Chinnarani, Director, Dept. of Fisheries, U. T of Pondicherry
11. Smt. E.V. Deepa, Chief Accounts Officer, MPEDA
12. Shri. Y.C. Thampi Sam Raj, Project Director I/C, RGCA

50th EC of RGCA

50th Executive Committee Meeting of RGCA was held on 8th December, 2014 at MPEDA, HO, Kochi. The undermentioned members attended the meeting.

1. Ms. Leena Nair, IAS, President, RGCA
2. Dr. A. S. Ninawe, Member, Senior Advisor, DBT
3. Shri. N. Ramesh, Director (M), MPEDA
4. Shri. P. Mohansundaram, Director, MPEDA
5. Shri. B. Sreekumar, Secretary, MPEDA
6. Smt. E. V. Deepa, CAO, MPEDA
7. Shri. C. P. Anirudhan, DD, Fisheries (Rep. of Exe. Director, ADAK)
8. Dr. C. P. Balasubramaniam, Principal Scientist, CIBA (Rep. of Director, CIBA)
9. Shri. Y. C. Thampi Samraj, Project Director, RGCA

Special Invitee

10. Dr. E. G.Silas, Chairman, SAC

51st EC of RGCA

51st Executive Committee Meeting of RGCA was held on 27th March'2015 at MPEDA, HO,Kochi. The under mentioned members of EC of RGCA attended the meeting.

1. Ms. Leena Nair, IAS, President, RGCA
2. Shri. M.C Luther, Director (EP&MP), MOC&I
3. Shri. Rama Shankar Naik, IAS Commissioner of Fisheries, Andhra Pradesh

4. Dr. (Mrs) B. Meenakumari, DDG (Fy), ICAR, New Delhi
5. Shri. N. Ramesh, Director (M), MPEDA
6. Shri. P. Mohansundaram, Director, MPEDA
7. Shri. B. Sreekumar, Secretary, MPEDA
8. Smt. E. V. Deepa, CAO, MPEDA
9. Smt. SairaBanu K.A., Executive. Director, ADAK)
10. Shri. Y. C. Thampi Sam Raj, Project Director, RGCA.

General Body Meeting

Annual General Body Meeting was conducted during the FY 2014-2015

21st Annual General Body Meeting of RGCA was held on 29th September, 2014 at MPEDA, HO,Kochi. The undermentioned members attended the meeting.

1. Ms. Leena Nair, IAS, Chairman, MPEDA/President, RGCA
2. Dr. A.S Ninawe, Sr. Advisor, DBT, New Delhi
3. Dr. (Mrs) B. Meena Kumari, DDG (Fy), ICAR, New Delhi
4. Dr. K.K. Vijayan, Director CIBA
5. Shri. N. Ramesh, ITS, Director (Mktg), MPEDA
6. Shri P. Mohanasundaram, Director, MPEDA
7. Shri. B. Sreekumar, Secretary, MPEDA
8. Shri J.Chandrasekhar, Director of Fisheries, A & N Islands
9. Smt. Saira Banu K.A, Executive Director, ADAK, Trivandrum
10. Smt. Mary Chinnarani, Director, Dept. of Fisheries, U. T of Pondicherry
11. Smt. E.V. Deepa, Chief Accounts Officer, MPEDA
12. Shri. Y.C. Thampi Sam Raj, Project Director I/C, RGCA
13. Shri. K. J. Antony, Joint Director (M), MPEDA
14. Dr. S. Vijayakumar, Deputy Director (Aqua), RC Nagapattinam, MPEDA

Scientific Advisory Committee Meeting

Two Scientific Advisory Committee Meeting was held during the period 2014-2015.

26 th Scientific Advisory committee meeting of RGCA was held on 20th June 2014 at MPEDA, HO, Kochi. The under mentioned members attended the meeting :

1. Dr. E.G. Silas, Chairman SAC
2. Dr. George John, Sr. Advisor, DBT, New Delhi
3. Dr. T. Santiago, Retd. Principal Scientist, CIBA
4. Prof. Dr. T. Balasubramaniyan, former Dean, CAS, Marine Biology, AU, Parangipettai
5. Dr. A. Gopalakrishnan, Principal Scientist & OIC, NBFGR,Kochi unit
6. Ms. Leena Nair, President RGCA – Ex-Officio Member
7. Shri. P . Mohanasundaram, Director MPEDA – Ex- Officio Member
8. Shri. Y.C. Thampi Sam Raj, Project Director, RGCA– Ex-Officio Member Secretary

27th SAC of RGCA

27th Scientific Advisory Committee Meeting of RGCA was held on 8th December'2014 at MPEDA, HO, Kochi. The undermentioned members attended the meeting.

1. Dr. E.G Silas, Chairman, SAC
2. A.S. Ninawe, Sr. Advisor, DBT, New Delhi
3. Dr. A. Gopalakrishnan, Director CMFRI
4. Dr. E. Vivekanandan, Member, SAC

Ex. Officio Member

1. Ms. Leena Nair, IAS, President RGCA
2. Shri. P. Mohanasundaram, Director MPEDA

Ex. Officio member Secretary

1. Shri. Y.C. Thampi Sam Raj, Project Director, RGCA

Special Invitee

1. Dr. Anup Mandal, Manager, CGL, RGCA

Participation in Training Programmes, Seminars and Workshops

Abroad

S. No.	Name of the Staff	Training/Seminar	Organized by	Duration
1	Y.C. Thampi Sam Raj	International World Congress on Shrimp, Vigo, Spain	FAO and CONXEMAR	6th - 9th October'2014
2	Johnson D'Cruz	9th International Aquaculture Form FIACUI 2014, Mexico	Mexican Aquaculture Producers and World Aquaculture Society	4th - 7th November'2014
3	P. Jayagopal V N Biju	9th Symposium on Diseases in Asian Aquaculture, Vietnam	Department of Animal Health (DAH)	24th - 27th November'2014

India

1	V. N. Biju B. Babu, G. Sathiyaraj Mithun Raj Uma Maheswari Jaideep Kumar Karthick Kannan	"AHPND DIAGNOSTICS"	RGCA, Sirkali	2nd – 4th May 2014
2	Anup Mandal	Safety aspects in research applications of ionizing radiation	Bhabha Atomic Research Centre, Mumbai	5th to 13th May 2014
3	B. Babu	Laboratory Management system &Internal Audit as per ISO/IEC 17025: 2005	Centre for Electronics Test Engineering, STQC, Hyderabad	3rd - 6 th June 2014
4	Anup Mandal	Training programme on 'Laboratory Management & QA as per ISO/IEC'	Indian Institute of Quality Management, Jaipur	22th - 25th June 2014
5	G. Sathiyaraj	Electron Microscopy for Life Sciences	Delhi University, Delhi.	7th - 8th July 2014
6	Mithun Raj Anjali K.M	Next Generation Sequencing (NGS) – Bioinformatics and Data Analysis	Anna University, Chennai	15th - 19th July 2014

7	G. Sathiyaraj	Techniques and Applications of Transmission Electron Microscopy	Department of Electron Microscopy, Cancer Institute (WIA), Chennai	22nd August 2014
8	Anjali K. M.	Quality Management System and Internal Auditing as per ISO/IEC, 17025	Centre for Electronics Test Engineering,Hyderabad	9th - 12th September, 2014
9	B. Babu G. Umamaheswari	Advanced Virological techniques in fish disease diagnosis	Fisheries College and Research Institute, Tamil Nadu Fisheries University, Thoothukudi	10th - 19th September 2014
10	K .Dhandapani Damodar. P. N	Open Sea cage Culture	National Institute of Ocean Technology (NIOT), Chennai	4th November 2014
11	Anup Mandal Srinivas Rao DVSN Raju	10th Indian Fisheries and Aquaculture Forum	NBFGR, Lucknow	12th – 15th November 2014
12	V. N. Biju S. Venu	NSPAAD Review meeting	NBFGR, Lucknow	14th - 15 th November 2014.
13	Anjali K. M Sobha P. S	Genomics	Shodhaka Life Sciences Pvt. Ltd Bangalore	15th - 16th November, 2014.
14	DVSN Raju Siva Kumar P S	Krishimela 2014	GKVK, Bangalore	19th -21st November 2014
15	K. Ganesh S. Pandiarajan	Aquaculture of Seabass-Status and way forward for commercial production	CIBA, Chennai	28th January 2015
16	DVSN Raju	Blue Paper Forum-India Aquaculture Pathfinder 2015	United States Soyabean Export Council, Bangalore	5th - 6th February 2015
17	Ganesh, K Siva Kumar P S	Seminar on Aquaponics	Nanniode Palakkad District, Kerala	15th March 2015

Presentations/Lectures made by RGCA team at various forums

>> **Anup Mandal,** Manager, CAGL delivered a Guest Lecturer at National Seminar on "Immuno molecular techniques and its uses in fisheries" organized by CAS, Annamalai University, Tamil Nadu with DBT, Govt. of India and presented paper on "Molecular genetics techniques and their application in Aquaculture: RGCA's initiatives" on 12/09/2014.

* Attended the 10th Indian Fisheries and Aquaculture Forum (10ifaf) and 5th Global symposium in Aquaculture and Fisheries (GAF5) held at NBFGR, Lucknow from 12th to 15th November, 2014 and presented a power point presentation on Genetics in aquaculture: RGCA's initiatives.

>> **B Appala Naidu,** Asst. Project Manager delivered a lecture on GIFT Tilapia during two days training programme on Better management practices on fresh water fish & prawn culture for the benefit of the fishermen under APCBTMP conducted on 17-03-2015 to 18-03-2015 at Vizianagaram hosted by Asst. Director of Fisheries, Vizianagaram Dt.

>> **Damodar. P.N,** Asst. Technical Manager, Sea cage farm, has participated in the Fish farmers awareness programme conducted by MPEDA (RC, Panvel)on the potential farming Mud Crab (Soft Shell Crab Production) & Cage culture of highly valuable Finfishes in Sea, Pond and Reservoirs in Malwan, Maharashtra on 08.08.2014 and delivered a power point presentation to the farmers on the potential of cage culture of Cobia, Sea Bass, Grouper & Tilapia in the Sea, Pond & Reservoirs of Maharashtra.

>> **Ganesh K,** Project Manager participated and presented a paper on Asian seabass aquaculture during the seminar organized by American Soyabeen Association at Bhimavaram, Andhra Pradesh on 30/05/2014.

* Delivered a lecture on Asian Seabass Aquaculture during the training programme on Seabass Culture organized by MPEDA-RC (Aqua), Kochi at Kollengode, Palakkad, Kerala on 18/06/2014.

* Took class on the prospects of Seabass and Mangrove aquaculture at Bharathidasan University, Trichy on 25/07/2014.

* Delivered a talk on training programme on Cage farming and its scope in diversification of aquaculture organized by MPEDA, Nagapattinam on 06/08/2014.

* Delivered a talk on Asian seabass aquaculture during the national training programme organized by College of Fishery Science, Nagpur, Maharashtra on 29/11/2014.

* Organized an awareness campaign on cage farming at Adimalathurai, Trivandrum, Kerala on 30/12/14.

* Presented a paper at the National workshop on aquaculture of seabass - Status and way forward for commercial production organized by Fisheries Technocrats Forum at CIBA, Chennai on 28/01/15.

>> **K.V.Gangadharan,** Assistant Technical Manager presented a paper on 'scope of Asian seabass in aquaculture diversification' during the seminar on "Matsya Samridhi Padhathi" conducted at Malampuzha, Palakkad, Kerala on 05/07/2014.

>> **Johnson D' Cruz,** Project Manager, RGCA, MFHP attended and presented a Power Point Presentation on "Seed Production and sea cage farming of cobia-Initiatives by RGCA" in a seminar "New Innovative Aquaculture Activities (NIAA)" at Bhimavaram, Andra Pradesh on 30.05.2014 organized by USSEC.

Budget and Expenditure

The Sanctioned Budget of Rs.6047 lakhs was earmarked for the projects during 2014-15, Rs.3127 lakhs for capital expenditure and Rs.2920 lakhs for recurring expenditure. The Total fund available during the financial year was Rs.5000.59 lakhs of which amount spent was Rs.856.39 lakhs towards capital and recurring expenditure was Rs.3427.62 lakhs. The Balance fund available as on 31.03.2015 was Rs.716.58 lakhs.

During the financial year, a total amount of Rs.4284.01 lakhs was incurred towards capital and recurring expenditure. The closing bank balance as on 31.03.2015 was Rs.586.31 lakhs and cash balance was Rs.0.01 lakhs.

RGCA Foundation (Corpus Fund)

The Ministry of Commerce and Industry had sanctioned Rs. 25 crores as RGCA foundation Corpus Fund during the 11th Plan period to maintain core group of technical experts for RGCA projects and also to maintain the infrastructure facilities being developed by the centre at Species specific locations across the country. RGCA formed a Corpus Fund Management Committee comprising of senior officers from RGCA and MPEDA to take decisions on the investment of the same. Accordingly the Sanctioned amount of Rs. 25 crores was deposited with the State Bank of India for 1 year with effect from 1st April, 2008 at an interest rate of 9.50%.

During April 2014, the Corpus Fund of Rs. 25 Crores plus the accrued interest amounting to Rs. 42.81 Crores has been deposited with the TNPF & INDC Ltd., at an annual interest of 10% for a period of 1 year with effect from 10th April 2014. The amount at maturity would be Rs. 47.25 Crores.

RGCA FOUNDATION CORPUS FUND DETAILS (2014-15)	Rs. In Lakhs
RGCA Corpus Fund Deposited with Accrued Interest upto April'2014	4280.89
RGCA Corpus Fund with accrued interest as on March' 2015	4725.30
Expenditure for Maintenance of select Core staff & Infrastructure upto March'2015	918.61
Balance Corpus fund amount available as on 31st March'2015	3806.69

MANPOWER

President	Ms. Leena Nair, IAS
Project Director & Secretary cum Treasurer	Shri. Y.C. Thampi Sam Raj

Following Officers/Staff were on rolls at RGCA during 2014-2015.

S. No.	Name	Designation
1	Jaideep Kumar	Deputy Project Director
2	S. Krishna Das	Chief Manager (Accounts)
3	A.G. Arif	Project Manager(Works)
4	Dr. Anup Mandal	Project Manager-Genetics
5.	K.Muraleedharan	Project Manager (P & A)
6.	B.Narasimha Rao	Project Manager
7.	V.N Biju	Asst.Project Manager
8.	DVSN Raju	Asst. Project Manager
9	G. Rajeesh	Asst. Accounts Manager
10	D. Rajesh	Asst.Accounts Manager
11	B. Thiripura Sundari	Jr. Project Manager (P&A)
12	K. Maheswaran	Accountant
13	K. Arumugam	Accountant
14	M. Mahadevan	Accountant
15	K. Marieswaran	Accountant
16	K. Rajendran	Administrative Assistant
17	U. Chinnadurai	Driver
18	C. Elamparuthi	Asst.Project Manager (Works)
19	G. Uma Maheswari	Asst.Tech.Manager
20	B. Babu	Asst.Tech.Manager
21	Mithun Raj	Asst.Tech.Manager
22	K.V. Ravikumar	Accountant
23	Dr. L. Mohan Kumar	Asst. Librarian
24	S. John	Library Assistant
25	L. Ruban	Asst. Tech. Manager
26	Ananda jothi	Asst. Tech. Manager
27	G. Sathiyaraj	Asst. Tech. Manager
28	Sobha P.S	Asst. Tech. Manager
29	Anjali K.M	Asst. Tech. Manager
30	K. Karthik Kannan	Asst. Tech. Manager
31	G.Devika Rani	Accountant
32	P. Babu	Electrician-cum-Mechanic
33	R. Kamalraj	Jr.System Analyst
34	R.Ganeshamurthy	Asst.Tech.Manager
35	Lanka Praveen	Technician
36	K.Ajeeth	Technician
37	Anu C Jose	Technician

TECHNOLOGY TRANSFER & TRAINING, SIRKALI

38	V. Shanmuga Arasu	Asst. Tech. Manager
39	S. Elangeswaran	Asst. Tech. Manager

SENIOR RESEARCH FELLOW-NFDB PROJECT

40	VS.Venu	Sr.Research Fellow
41	K.Gayathri	Sr.Research Fellow

SEABASS & MUD CRAB HATCHERY, THODUVAI

42	Dr. K.Ganesh	Project Manager
43	S. Arul Raj	Assistant Project Manager
44	D.Y.S. Krishnamurthy	Asst. Tech. Manager
45	M. Saravanan	Asst. Tech. Manager
46	R. Senthil Kumar	Electrical cum Mechanical supervisor
47	A.S. Vasudevan	Mechanical cum Electrician
48	K.V Gangadharan	Asst. Technical Manager

49	R. Murugesan	Asst. Technical Manager
50	K. Velmurugan	Asst. Technical Manager
51	S. Viswanathan	Asst. Technical Manager
52	P.U. Sujith	Accountant

AQUACULTURE DEMO FARM, KARAIKAL

53	S. Pandiarajan	Project Manager
54	T. Sundaresan	Asst. Technical Manager
55	K. Sateesh Kumar	Asst. Technical Manager
56	Dr. G.K Dinakaran	Asst. Project Manager
57	S. Rajarajan	Accountant

AQUATIC QUARANTINE FACILITY FOR *L. vannamei*

58	Dr. A.K. Panda	Project Manager
59	D. Kannan	Asst. Project Manager
60	N. Babu Rao	Asst. Project Manager
61	M.C Remany	Asst. Project Manager
62	K. Aadhavan	Facility Manager
63	Daly Cyriac	Asst. Technical Manager
64	Aswini Kumar	Asst. Technical Manager
65	Erra Suresh Babu	Asst. Technical Manager
66	V.Ravikumar	Asst. Technical Manager
67	K. Sankar	Purchase-cum-stores Asst
68	V.Parthasarathy	Accountant
69	Krishnakanth varada Raju	Asst.Technical Manager
70	Sruthi Prem O.C.	Asst.Technical Manager
71	K.Ganesan	Electrician-cum-Mechanic
72	P.Thirunavukkarasu	Technician
73	G.Sreenivasa Rao	Technician
74	Arun Babu	Asst.Facility Manager (Elec)
75	B.Ananth	Accountant
76	Sandeep K.S	Accountant

SCAMPI BROODSTOCK DEVELOPMENT PROJECT, VIJAYAWADA

77	S.Kannan	Asst.Project Manager
78	Dr. Johny T. Varghese	Junior Project Manager
79	K. Lakshmi Narayana	Asst. Technical Manager
80	B. Suresh	Asst. Technical Manager
81	K.K Chinthiah	Asst. Technical Manager
82	P.Srinu	Technician
83	Sathishbabu Manda	Technician
84	G. Ramu	Accountant
85	Hanok Kumar Indupalli	Technician
86	Vikasri Godi	Technician
87	G.P Subba Rao	Electrcian-cum-Mech

TILAPIA PROJECT, VIJAYAWADA

88	B. Appala Naidu	Asst. Project Manager
89	P. Srinivasa Rao	Asst. Project Manager
90	U. Gunasekaran	Asst. Technical Manager
91	V. Subash	Accountant
92	Mathews Varkey	Asst. Project Manager
93	M.Gnanavel	Asst.Technical Manager
94	P.S Sivakumar	Asst.Technical Manager
95	Lakshmana Rao Nayudu	Asst.Technical Manager
96	G. Senthil	Technician
97	Kotharu Rohini Kumar	Electrician-cum-Mechanic

ARTEMIA PROJECT, TUTICORIN

98	M.Samaya Kannan	Asst.Project Manager
99	S. Balachander	Asst. Technical Manager
100	S.Moovendan	Asst. Technical Manager
101	T.Veeramani	Asst. Technical Manager
102	J. Mohanraj	Accountant

MARINE FINFISH HATCHERY PROJECT, POZHIYUR

103	Johnson D Cruz	Asst.Project Manager
104	K.Dhandapani	Asst.Project Manager
105	P.N. Damodar	Asst. Project Manager
106	V.S. Aravind	Asst.Technical Manager
107	G. Karthik	Accountant
108	A.Packiaraj	Technician
109	Arjunan V.M	Technician
110	M.Saravanan	Asst.Technical Manager
111	Amal Joseph	Accountant

HIGH HEALTH SHRIMP SEED PRODUCTION UNIT-II, CHIRALA, AP

112	G. Ramar	Project Manager
113	Kanakam Suresh	Technician
114	A.Janaki Ramaiah	APM (P & A)
115	Kiran Pilli	Technician
116	G.Uma Maheswara Rao	Asst.Project Manager
117	P.L Arun	Electrician-cum-Mechanic

RGCA-SHRRIMP BREEDING PROGRAMME

118	Dr. P. Jayagopal	Senior Project Manager

DTSP – NBC & PPQ, ANDAMAN

119	D.Thinesh Santhar	Project Manager ❖
120	S. Nagaraj	Asst. Project Manager ❖
121	P. Bangaraju	Junior Project Manager ❖
122	G. Sivakrishna	Asst. Technical Manager ❖
123	Binod Gharami	Facility Manager ❖
124	K. Praveen Raj	Asst. Project Manager (P&A) ⊙
125	M. Shailendar	Asst. Project Manager ⊙
126	D. Silambarasan	Asst. Technical Manager ⊙
127	Sarmal K. P	Asst. Technical Manager ⊙
128	Boorada Kishor	Asst. Technical Manager ⊙
129	Nayeem Fuad	Accountant ⊙
130	Dayamay Halder	Asst.Facility Manager (Elec) ⊙
131	P. Krishnaswamy	Electrician-cum-Mechanic ⊙
132	R.Rajan	APM (Civil) ⊙
133	Sheetal Dilip	Technician ⊙
134	John C.E	Asst. Project Manager ⊙
135	I.Rakkaiah	Asst.Project Manager ⊙
136	Sarun John Roy	Technician ⊙
137	J.Ganesh	Technician ⊙
138	T.Yallam Naidu	Technician ⊙

DTSP – *L.VANNAMEI* BMC PROJECT (TASPARC)

139	H. Dinesh Kumar	Project Manager ❖
140	Dr. A. Anand Kumar	Asst. Project Manager ✻
141	Michael Renold Bino	Accountant ❖
142	Varanasi Laxmi	Asst. Technical Manager ⊙
143	CH. Santhosh Kumar	Asst. Technical Manager ⊙
144	Ranjan Kumar Patra	Asst.Project Manager ⊙
145	Ratikanta Mohapatra	APM (P & A) ⊙
146	Lanka Gurumurthy	Techncian ⊙
147	Anish.G	Purchase-cum-Store Asst ⊙
148	DV Ravi Kishore	Technician ⊙
149	Raju Kari	Technician ⊙
150	K.Simhachalam	Technician ⊙
151	L.Sunil Kumar	Technician ⊙
152	TA Nagaraju	Electrician-cum-Mechanic ⊙

DTSP – SBNPC PROJECT (OSSPARC)

153	Boyina Srikanth	Asst. Project Manager ❖
154	Y. Narayanaswamy	Asst. Technical Manager ❖
155	Susanta Kumar Patra	Asst. Project Manager ⊙
156	Tammineni Srinivasa Rao	Purchase-cum-Store Assistant ⊙
157	Haraprasad Panigraphy	Electrician-cum-Mechanic ⊙

GROUPER PROJECT, A & N ISLANDS

158	G. Elumalai	Accountant ❖
159	S.Vijayakumar	Asst. Technical Manager ⊙

❖ Regular Employee of RGCA

✻ Deputation from MPEDA

⊙ Direct Recruitment on contract basis

Visit of Dignitaries

Hon'ble Health Minister of AP using a PIT Tag scanner at the Tilapia Breeding Unit

Hon'ble Health Minister of AP Shri Kamineni Srinivas visited RGCA's Tilapia Breeding Unit at Vijayawada on 18.02.2015

❋ Mr. Anthony George Smith & Mr. Christopher Smith, Dragon Baits, UK, visited RGCA - *L. vannamei* Broodstock Multiplication Centre, Visakhapatnam on 22.02.2015.

❋ Mr. Douglas G. Drennan and Dr. James M. Ebeling, M/s. Aquaculture Systems Technologies, L.L.C, New Orleans, LA, USA, visited RGCA - *L. vannamei* Broodstock Multiplication Centre, Visakhapatnam on 15.05.2014.

❋ Mr. James M Ebling, Dr. Douglas Drennen&RAS, consultant, Tucson, AZ, USA accompanied by Dr. Jayagopal, PM, DTSP, RGCA visited RGCA Marine Finfish Hatchery at Pozhiyoor on 18.05.2014 in connection with the planning and installation of recirculation Aquaculture Systems for cobia brood stocks and larval rearing sections.

❋ Mr. Boswell, Field officer, Information & Broadcasting Department visited RGCA Marine Finfish Hatchery at Pozhiyoor on 02.09.2014.

❋ Dr. Harko Bhagat, Chairman, Baharibounty Group, Tanzania, visited our mangrove crab hatchery facilities at Thoduvai on 12.09.14 for setting up a hatchery at Tanzania.

❋ Shri. P.M. Pandian IAS, Principal Secretary, Fisheries, Govt. of Kerala., & P. Sahadevan, Executive Director, FIRMA visited RGCA Marine Finfish Hatchery at Pozhiyoor on 26.10.2014.

❋ Dr. Chin How Cheang, Scientist, from Singapore visited RGCA Seabass hatchery at Thoduvai on 27.11.2014.

❋ Nishi, Japan & Mr. Jobi, AAA visited the hatchery facility visited RGCA Marine Finfish Hatchery at Pozhiyoor on 16.01.2015.

Addresses of **RGCA Projects**

Administrative Complex

Y.C. Thampi Sam Raj, Project Director
Rajiv Gandhi Centre For Aquaculture
(MPEDA, Ministry of Commerce & Industry, Govt.of India)
3/197, Poompuhar Road, Karaimedu Village,
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Fax : +91 4364 265218
Email : rgcaho@gmail.com
Website : www.rgca.org.in

Seabass Hatchery Project

K.Ganesh, Project Manager
Rajiv Gandhi Centre For Aquaculture
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Seabass/Mud Crab Hatchery Project,
Koozhaiyar Road, Thoduvai, Thirumullaivasal, Sirkali Taluk,
Nagapattinam district – 609 113. Tamil Nadu, INDIA

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Mud Crab Hatchery Project

S. Arul Raj, Asst. Project Manager
Rajiv Gandhi Centre For Aquaculture
(MPEDA, Ministry of Commerce & Industry, Govt.of India)
Mud Crab Hatchery Project,
Koolaiyar Road, Thoduvai, Thirumullaivasal,
Sirkali Taluk, Nagapattinam district – 609 113
Tamil Nadu, INDIA

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Shrimp Breeding Projects

P. Jayagopal, Senior Project Manager
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Domestication of Tiger Shrimp Project (NBC)

D. Thinesh Santhar – Project Manager
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Pilot Scale Broodstock Multiplication Centre

Boyina Srikanth – Asst. Project Manager
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Pilot Scale BMC& High Health Seed Production Unit
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High Health Shrimp Seed Production Unit - Chirala

G. Ramar – Project Manager
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High Health *P. monodon* Seed Production Unit - Chirala
Vadarevu- 523 157
Chirala Mandal, Prakasam District
Andhra Pradesh

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Pre-Primary and Primary Quarantine Unit

M. Shailender, Asst. Project Manager
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Andaman and Nicobar Islands, INDIA

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L. vannamei Broodstock Multiplication Centre

H. Dinesh Kumar - Project Manager
Rajiv Gandhi Centre For Aquaculture
(MPEDA, Ministry of Commerce & Industry, Govt.of India)
The Andhra Pradesh Shrimp Production and Research Centre (TASPARC),
Bheemuli Beach Road, Mangamaripeta,
Chepalauppada – 531 163.
Bheemunipatnam Mandal, Visakhapatnam District,
Andhra Pradesh.

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Grouper Project

D. Thinesh Santhar – Project Manager
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Pilot Scale Artemia Project

M. Samaya Kannan, Asst. Project Manager
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Pilot Scale Artemia Project
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Aquaculture Demonstration farm

S. Pandiarajan - Project Manager
Rajiv Gandhi Centre For Aquaculture
(MPEDA, Ministry of Commerce & Industry, Govt.of India)
Aquaculture Demonstration Farm,
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Union Territory of Pondicherry
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Aquatic Quarantine Facility for L. vannamei

Amiya Kumar Panda, Project Manager
Rajiv Gandhi Centre For Aquaculture
(MPEDA, Ministry of Commerce & Industry, Govt.of India)
Aquatic Quarantine Facility for *L. vannamei*
TNFDC Hatchery Complex, Beach Road,
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Scampi Broodstock Development Project

Jaideep Kumar, Techical Head
Rajiv Gandhi Centre For Aquaculture
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Scampi Broodstock Development & Tilapia Project
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Tilapia Project

Jaideep Kumar – Technical Head
Rajiv Gandhi Centre For Aquaculture
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Scampi Broodstock Development & Tilapia Project
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Marine Finfish Hatchery Project

Johnson D Cruz - Project Manager
Rajiv Gandhi Centre For Aquaculture
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RGCA Marine Finfish Hatchery Project
Kollemcode Road, Poovar Via, Pozhiyoor, Vizhinjam,
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Infrastructure Development Division

A.G. Arif - Project Manager
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Technology Transfer & Training Division

Jaideep Kumar – Project Manager (I/c)
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Registered Office

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Harvested GIFT Tilapia at RGCA Tilapia Project, Vijayawada