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2015-16



Rajiv Gandhi Centre for Aquaculture

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RGCA

Annual Report 2015-16

Published by

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Dr. A. Jayathilak, IAS

From the President's Desk

Greetings from RGCA!

Aquaculture sector of the Country has been growing steadily since the implementation of the first five year plan period. The sector has contributed immensely to the nutritional security, GDP, improved livelihood status and enhanced export revenue of the Country. The sustainability of the industry has been catalysed by RGCA through its applied research and sustainable technologies, which I feel elated to share through the Institute's Annual Report.

The year 2015-16 of the twelfth plan period has been a year of success and endeavours for RGCA as in the previous year. Commendable progress was made in the flagship projects of RGCA. The Domestication of tiger shrimp (*Penaeus monodon*) project achieved success in production of Specific Pathogen Free (SPF) broodstock and nauplii which were supplied to the industry for production trials. This research breakthrough achieved by the project, would be a major respite for the shrimp farming sector from production loss, if desirable results are obtained, as

currently, wild caught broodstock, is the only source for *P. monodon* farming.

The Institute in one of its efforts to switch onto diversified aquaculture also achieved remarkable success in production of fingerlings of the fourth generation of the selectively bred Genetically Improved Farmed Tilapia (GIFT). The stock were supplied by the project to the Satellite Breeding unit at Krishnagiri of Tamil Nadu State Fisheries Department. The Project also supplied 0.3 million seeds of GIFT to registered/approved farms in Tamil Nadu state.

This year too, RGCA had proven its capability to serve the shrimp sector by producing substantial quantity of "Broodstock Multiplication of *L. vannamei*". The facility located at Vishakhapatnam, Andhra Pradesh foresaw the need of high quality SPF vannamei brooders and supplied 39,520 nos. of broodstock at a relatively subsidized cost, to the industry.

RGCA has also been responsible for the development of a strong base for aquaculture technology in the form of capacity building.

This was evident in the Capacity building workshop on “Shrimp Disease Surveillance” conducted during this year by the Central Pathology Lab of the Institute at Vijayawada for the benefit of AP state fisheries officials. A booklet encompassing the details on major diseases, diagnostic and control measures were also released during this programme.

Pioneering attempts were also made in the technology front of Sea bass, Mud Crab, Artemia, Cobia, Seabass, Scampi, and Grouper projects. Our relentless efforts helped us to produce 2.45 million seeds of Asian Seabass (*Lates calcarifer*) and recorded a percentage increase in seed supply by 22.24 % than the previous year. Similarly, the mangrove mud crab hatchery also achieved success in production of 9.11 lakhs of crab instars and supplied 8.77 lakh seeds to various beneficiaries including farmers, private entrepreneurs and various research organisations.

The Central Aquaculture Genetics Lab (CAGL) of the Institute was accredited by NABL and became the first Aquaculture Genetics lab of the Country to earn the NABL accreditation. Progress in applied field oriented research was also made in the field of Genetics by developing a molecular tool for species identification of mangrove mud crabs. A one-day International seminar on Genetics and Sustainable Aquaculture (GSA-2015) as part of the 3rd Dr.

E.G. Silas Annual Endowment Lecture was also conducted during this year. The seminar kindled awareness on the crucial role of genetics and selective breeding in aquaculture systems among the stakeholders of the aquaculture industry of the country, besides providing a platform for the researchers and scientific community to interact with internationally acclaimed Aquaculture Geneticists during the event.

Empowerment of Women Self-help groups, Outreach programmes and societal development based programmes have been the priority activities of RGCA since its inception. Keeping up with this trend, the Institute successfully conducted training and demonstration farming programmes through its Technology Transfer Training Wing and Aquaculture Demonstration Farm facility. A field level training programme conducted this year, exclusively for the benefit of Women Self Help Groups on “Artemia cyst and biomass production in land based Aquaculture systems” is an example of this. Apart from this, thirty four other training programmes were also conducted on various aspects of aquaculture, for the benefit of over 450 beneficiaries.

Importance of the Aquatic Quarantine Facility for *L. vannamei* (AQF), operated by the RGCA in safeguarding the nation from biosecurity threat due to the introduction of *vannamei* shrimp cannot be over

emphasized. During the routine disease screening process of the imported *vannamei* stock, the AQF recorded the presence of an OIE listed pathogen- Infectious Hypodermal Haematopoietic Necrosis Virus (IHHNV), in an SPF bonafide consignment imported to India, for the first time, which helped the regulatory bodies to take appropriate measures in preventing the entry of this particular pathogen into the hatchery through imported stock. The facility quarantined 1,69,458 numbers of *L. vannamei* brooders in 250 batches with a fairly good quarantine survival.

Commendable achievements were made in all the projects of RGCA and are reported in the achievements briefed under each project head. The work reported is due to the support from all staff of RGCA. I thank them profusely for their untiring efforts. Success could not be achieved but for the support from the Scientific Advisory Committee and Executive Committee of RGCA and as well as from the Ministry of Commerce & Industry. My thanks to all of them. It has been a pleasure sharing our experience and we promise to come back with many more activities to report in future.

Dr. A. Jayathilak, IAS
Chairman MPEDA &
President RGCA

Date : 30.10.2016



RGCA at a Glance

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

The Centre plays a crucial role in the development of various sustainable aquaculture technologies for seed production and grow out farming of various export oriented aquatic species. The technologies developed by RGCA are bio-secure, eco-friendly and traceable. The Centre has also developed a state-of-the-art Technology Transfer and Training Centre for disseminating the technologies developed at its various projects established at different locations in the country to promote the aquaculture industry of the country. The 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 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. Chairman MPEDA is the President RGCA. Ms. Leena Nair, IAS, was President RGCA and the Chairman of its Executive Committee till May 2016. Subsequently, Dr. A. Jayathilak, IAS, assumed charge as President RGCA. The members of the Executive Committee are:

- Dr. A. Jayathilak, IAS, Chairman, MPEDA
- Dr. Joykrupa Jena, DDG, ICAR, New Delhi
- Shri Ajith B.Chavan, Director (EP & MP)
- Dr. P. Paul Pandian, Fisheries Development Commissioner, New Delhi
- Dr. A.S Ninawe, Sr. Advisor, New Delhi
- Dr. K.K.Vijayan, Director CIBA, Chennai
- Shri Rama Shankar Naik, IAS, Commissioner of Fisheries, Hyderabad
- Smt. Beela Rajesh, IAS, Commissioner of Fisheries, Chennai
- Shri M. A Narmawala, IAS, Commissioner of Fisheries, Gujarat

- Shri J. Chandrasekhar, Director of Fisheries, A & N Islands
- Shri K. Rengaraju, Joint Director (Inland Fisheries), Chennai
- Shri U.S Sajeew, The Executive Director, ADAK, Thiruvananthapuram
- Smt. Mary Chinnarani, Director, Pondicherry

- Shri N. Ramesh, ITS, Director (Mktg),
- MPEDA Director, MPEDA
- Shri. B. Sreekumar, Secretary, MPEDA
- Smt. E. V. Deepa, Chief Accounts Officer, MPEDA
- Shri. Y.C. Thampi Sam Raj, Project Director, RGCA

The Technical/ Scientific programmes involved in 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.

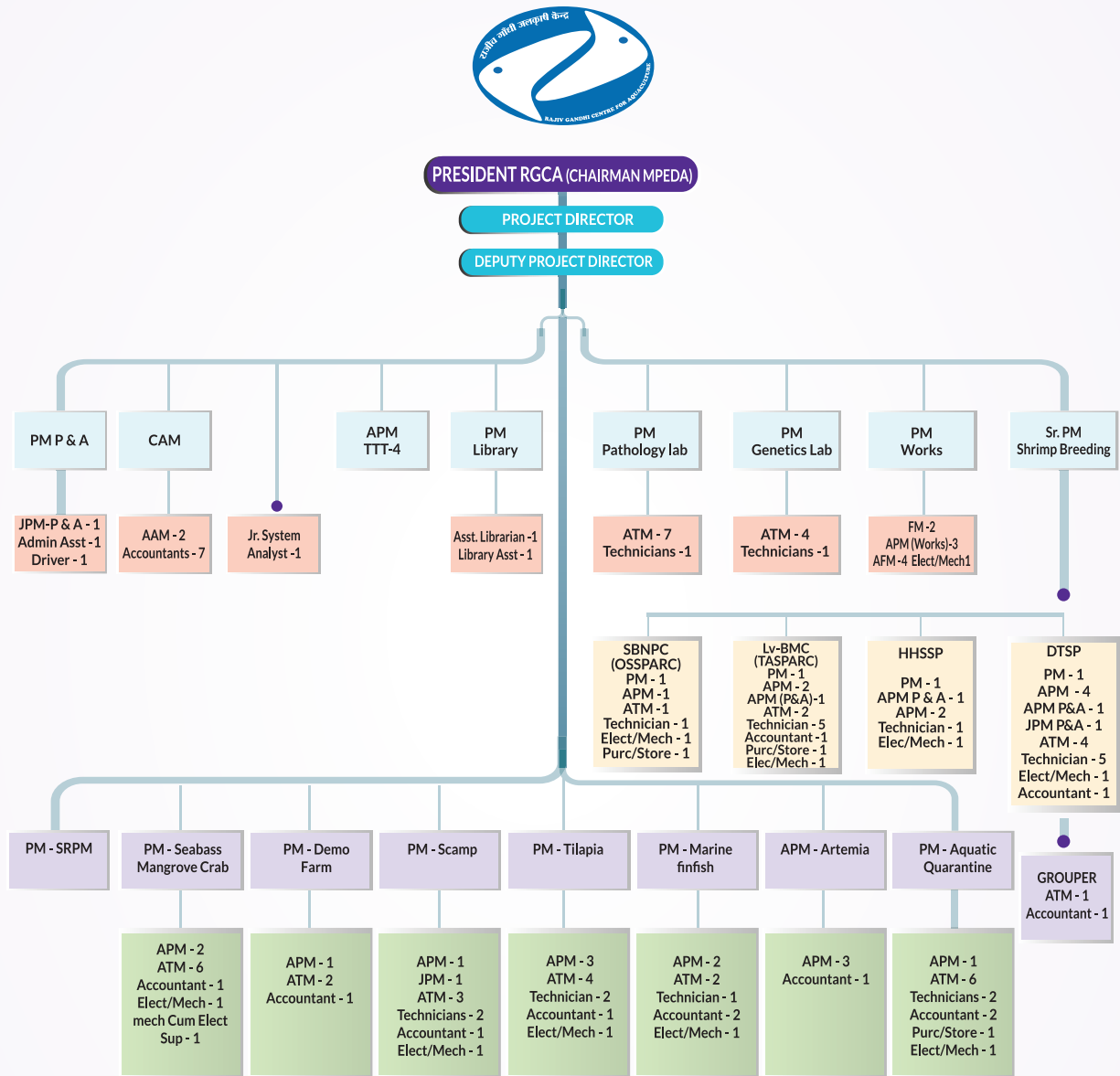
The members of the Scientific Advisory Committee of RGCA are:

- Dr. E.G. Silas, Former VC, Kerala, Agriculture University & Director, CMFRI, Chairman, Scientific Advisory Committee
- Dr. George John, Vice- Chancellor, Birsa Agricultural University, Jharkhand
- Dr. Joykrushna Jena, DDG (Fy), ICAR, New Delhi
- Dr. A.S Ninawe, Sr. Advisor, Department of Bio-Technology, New Delhi
- Dr. T. Balasubramaniyan, Dean & Director, CAS Marine Biology, Parangipettai

- Dr. A. Gopalakrishnan, Director, CMFRI, Kochi
- Dr. T.C Santiago, Retd. Principal Scientist, CIBA, Chennai
- Dr. E. Vivekanandan, Retd. Principal Scientist, CMFRI
- Dr. A. Jayathilak, IAS, (Leena Nair, IAS), President, RGCA – Ex-officio member
- Director (M), MPEDA – Ex-officio member
- Shri. Y.C. Thampi Sam Raj, Project Director, RGCA



Organizational Structure



CAM - Chief Accounts Manager; Sr.PM - Senior Project Manager; PM - Project Manager; pm (SRMP);
 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 establish Technology Development Centres in Aquaculture in various locations in India for developing and disseminating 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 research Institutes by joining hands with the concerned scientists and disseminate the same through



Pompano rearing in cages in a pond

extension, education and demonstration programmes.

- To assist National Institutes, agencies both in public as well as in private sectors for developing innovative technologies which are having scientific application.
- To undertake execution of Aquaculture projects entrusted by Government agencies/ departments such as the Department of Bio-Technology (DBT), Department of Ocean Development (DOD), 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 inland water bodies through ranching with hatchery reared young ones for sustainable development of fisheries.
- To introduce proven aquaculture technology of the selected species which are commercially successful elsewhere in the world but not yet introduced in India. The centre will buy the technology from national or international source, blend the same under Indian conditions with local technology if available and sell the same to Indian entrepreneurs after assuring the commercial viability.



Ongoing Projects & Locations

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

- **Seabass Hatchery Project**
Thoduvai, Nagapattinam District, Tamil Nadu
- **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 and OSSPARC, (The Odisha Shrimp Seed Production, Supply and Research Centre), Gopalpur-on-sea, Odisha
 4. 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**
Pozhiyur, Thiruvananthapuram, Kerala
Muttom, Kanyakumari District, Tamil Nadu
- **Grouper Project**
Kodiaghat, South Andaman
Sea area of Rutland Island, South Andaman
- **Technology Transfer Training and Administrative Complex**
Sirkali, Nagapattinam District, Tamil Nadu.

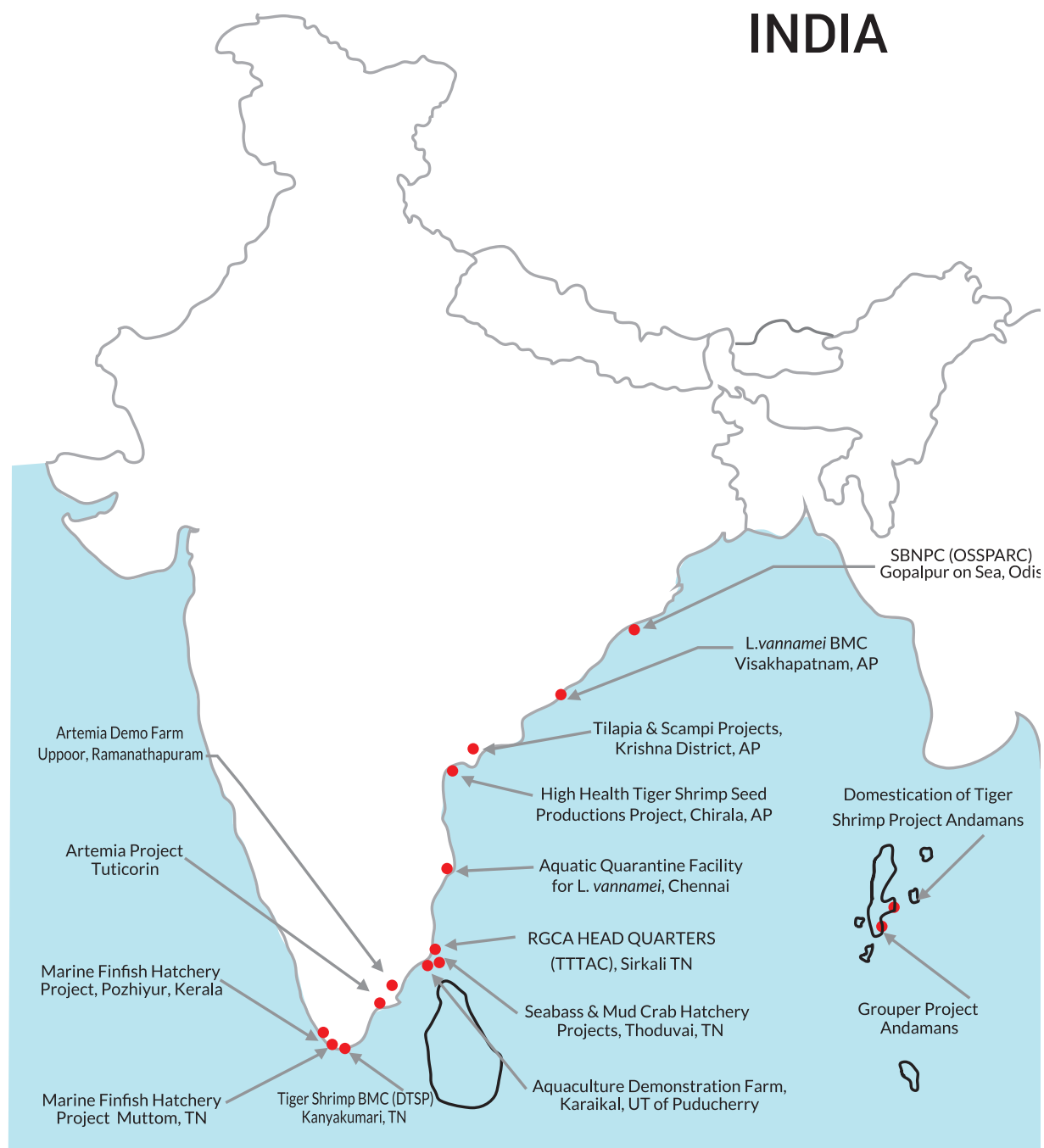
The Head Quarters of RGCA functions from this complex

Aquatic Quarantine Facility (AQF) for *L. vannamei*
Neelankarai, Chennai, Tamil Nadu

(Please refer page 111 for full addresses of the project facilities)

RGCA

Project Locations





Executive summary

Realizing the importance of aquaculture in providing food security, alleviating poverty and generating income to the Country, Rajiv Gandhi Centre for Aquaculture, the R & D arm of MPEDA, prioritized research in terms of diversification, societal development and sustainability through its ongoing twelve projects being operated in twenty one different locations across India. All the projects executed by RGCA are focused on developing and promoting sustainable aquaculture technologies which could yield export revenue to the country. The ensuing report provides a summary of the major research outcome and accomplishments recorded in these projects, for the year 2015– 16.

Seabass hatchery enhances seed production and supply:

The Seabass hatchery facility at Thoduvai, Nagapattinam District, recorded a production of 6.65 million larvae of Asian Seabass (*Lates calcarifer*) with year round breeding. About seven successful spawnings were obtained from captive spawners reared in improvised photo-thermal controlled

Recirculation Aquaculture Systems (RAS). The hatchery distributed 2.46 million Seabass seeds to farmers, Research Institutes, and various other aquaculture related organizations across eight states in the country. The current review period, recorded a percentage increase in seed supply by 22.24 % than the previous year.

Enhanced production of Mud Crab (*Scylla serrata*) instars with green-water rearing systems:

The Mangrove Mud Crab Hatchery facility of RGCA, at Thoduvai, Nagapattinam, produced 9.11 lakhs of crab instar (crab seed) of size range of 0.4-0.6 cm through twenty eight production cycles. The increased seed production by the hatchery indicated success in standardization of technology for crab seed production through the adoption of green water system and use of probiotics in larval rearing. The hatchery supplied 8.77 lakh seeds to various beneficiaries including farmers, private entrepreneurs and various research organisations.



Mud crab farm at RGCA



Demonstration farming of Mud crab and nursery rearing of Asian Seabass and Pompano:

The Aquaculture Demonstration Farm (ADF) at Karaikal reared instars and megalopa of mud crab (*Scylla serrata*) obtained from RGCA hatchery in nursery hapas. The farm supplied about 1.832 lakhs crablets to farmers and Self Help Groups (SHGs) apart from various fisheries departments and research organisations. The ADF also demonstrated rearing of Crab instars to Crablets in Hapas and Crablets to Crabs of marketable sizes in Hapas/Pens/Open ponds as a part of aquaculture outreach programmes. Nursery rearing of early fingerlings of seabass (*Lates calcarifer*) and pompano (*Trachinotus blochii*) in cages deployed in ponds were also demonstrated by this project.

SPF Tiger shrimp (*Penaeus monodon*) broodstock produced for the first time in the Country:

The Domestication of Tiger Shrimp Project produced and supplied Specific Pathogen Free monodon broodstock for

the first time in the country. The project produced six families of second generation (G2), seventeen families of fifth generation (G5) and two families of third generation (G3) of *Penaeus monodon* respectively during the period under review. A batch of SPF stock was also supplied by the facility to the High Health Tiger Shrimp Seed Production Unit (HHTSSPU) of RGCA located in Chirala, Andhra Pradesh for High Health (HH) shrimp seed production.

Production and Supply of Selectively bred Scampi Broodstock and all male scampi seeds

The Scampi (*Macrobrachium rosenbergii*) broodstock development project developed a total of sixty five Neofemales (females that yield all male progeny) which included 60 progenies from Kerala strain and 5 from West Bengal strains respectively. About 10 batches of larval cycles were also being maintained in the hatchery for their reconfirmation as Neofemales. The Project also supplied a total of 1,97,600 nos of Scampi seeds (including 75,500 all-male seeds) and



1,820 nos of selectively bred second generation broodstock to scampi hatcheries and farmers.

Artemia Cysts and biomass production

The project produced 283.430 Kgs of wet cysts and 542.9 kg of Artemia biomass respectively, during the period under report. Out of this, 31.363 Kgs of dry cysts and 497.50 kg of frozen Artemia biomass were supplied to Ornamental Fish breeding units, Shrimp and other finfish hatcheries after requisite quality evaluation assays.

Production and supply of SPF *P. vannamei* broodstock

The Broodstock Multiplication Centre for *L. vannamei* at Vishakhapatnam, Andhra Pradesh recorded a supply of 39,520 numbers of SPF vannamei broodstock in fifty eight consignments to approved vannamei hatcheries. The facility imported a total of 5 batches of SPF vannamei PL comprising of 90,000 larvae from M/s. Oceanic Institute, Hawaii, during the period under report and reared to high quality SPF brooders for distribution to the hatchery operators.

Progress in selective breeding programme in all male GIFT seed production

The Tilapia Project facility

at Vijayawada, successfully completed the mating programme of the fourth generation of Genetically Improved Farmed Tilapia (GIFT). A mating strategy was designed for the yield of the best performing families, which resulted in seventy-four successful spawnings. The facility produced over five million all-male tilapia seeds and supplied 2.4 million seeds to registered/approved farms across various states for farming purpose. The fingerlings of the selectively bred G-4 generation GIFT broodstock were also supplied by the project to the Satellite Breeding unit at Krishnagiri of Tamil Nadu State Fisheries Department as per the consultancy agreement. The Project also supplied 0.3 million seeds of GIFT to registered/approved farms in Tamil Nadu state.

Multi species marine finfish seed production and open sea cage farming

The Marine finfish hatchery project at Pozhiyoor, Thiruvananthapuram has well developed infrastructural facility for seed production of high value export oriented fishes such as Cobia (*Rachycentron canadum*), Pompano and Seabass. During the period under review, six successful spawnings were recorded from captive cobia

brooders which yielded around 55,922 nos. of 30 dph (day post hatch) fingerlings. From this, a total of 33,602 fingerlings were supplied to farmers, Fisheries Research Organizations and Fisheries Departments. The project also established a sea cage farm at Muttom, Kanyakumari District, Tamil Nadu for grow out farming trials of multi species with seeds produced from various RGCA hatcheries. During the current review period, the facility produced 2.65 metric tons of market sized Seabass from RGCA hatchery produced seeds and supplied 2.38 metric tons of Seabass fish to an exporter. Pompano fingerlings were also produced and supplied by this facility during the period under review.

Production of F1 generation of Tiger Grouper

The Grouper Project Facility at Andaman, developed twenty four F1 generation tiger grouper (*Epinephelus fuscoguttatus*) broodstock from the fingerlings produced at the RGCA grouper hatchery at Kodiaghat, South Andaman. The Project is on the move to initiate a multi species grouper hatchery, for which Rapid Environment Impact Assessment (REIA) study has been completed by the National Institute of Ocean Technology (NIOT).

First report on the presence of an OIE pathogen in an SPF bonafide vannamei consignment imported to India

In the current review period, the Aquatic Quarantine Facility for *L. vannamei* (AQF) which facilitates quarantine services under the Animal Quarantine & Certification Services reported the presence of an OIE listed pathogen, (IHHNV) in an SPF declared stock imported to India. The pathogen was detected in the imported SPF vannamei consignment, for the first time during its routine screening process. The results of the IHHNV screening test was further validated and confirmed by the Aquatic Animal Health & Environment Division of CIBA, the referral lab of AQF. As the samples of the broodstock imported from the supplier was tested positive, the consignment was incinerated as per the direction of the TC of AQF operation. AQF thus proved its mettle in preventing the entry of this particular pathogen into the hatchery through imported stock. During the period under report, the facility quarantined 1,69,458 numbers of *L. vannamei* brooders in 250 batches. The overall quarantine cubicle occupancy was 61.61 % and no quarantine space crunch was observed during this year.

Technology dissemination through training and outreach programmes

The Technology Training & Administrative Centre (TTAC) of RGCA conducted a battery of training programmes on various aspects of aquaculture such as farming, seed production, feed production and disease diagnosis. The training was imparted to beneficiaries including researchers, students, farmers, entrepreneurs and lab personnel. The current review period recorded thirty four training programmes conducted for a total of 496 beneficiaries.

Development of multiple molecular markers for taxonomic identification of mud crab species (*Scylla* spp)

The Central Aquaculture Genetics Lab (CAGL) has developed multiple molecular markers to identify mangrove mud crab species under the genus *Scylla*, for the benefit of aquaculture sector of the Country. During this period under report, the CAGL generated species-specific profile for samples collected from India (*S. serrata* & *S. olivacea*) and compared with the samples (*S. serrata*, *S. olivacea*, *S. paramamosain* and *S. tranquebarica*) received from Indonesia, Philippines

and Myanmar. Based on this profile, about one hundred and fifty mud crab samples were analysed for species identification. The Lab also provided assistance for shrimp species identification for MPEDA, other projects of RGCA besides conducting studies on sex marker development and population genetics of high value aquaculture species.

Valuable diagnostic services rendered by CAPL to the aquaculture sector

The Central Aquaculture Pathology lab (CAPL) imparted routine disease diagnostic services, besides actively being involved in National Surveillance Programme for Aquatic Animal Diseases. The findings of the surveillance studies conducted by CAPL on the microsporidian infection (*Enterocytozoon hepatopenaei*) cautioned the shrimp farmers to take necessary management measures to minimize its incidence and further spread across the country. The lab screened 407 samples of finfish and shellfish, received from the industry for various target pathogens.



Grow out farming of soft shell crabs in tide fed pond at RGCA



R & D Project Highlights



Seabass Hatchery Project

Project Location : Thoduvai, Sirkali, Nagapattinam District, Tamil Nadu

Year of Commencement : 2000

Scope of the Project

Species diversified aquaculture is essential for sustainability of the aquaculture sector and as well as to support local aquaculture production. RGCA as its mandate initiated the seabass hatchery project in this backdrop, so that excessive uneven utilization of a particular resource which can lead to ecological imbalance is reduced. Seabass known by the scientific name *Lates calcarifer* is an important food fish which has high market value. The fish inhabits coastal seas, estuaries and lagoons. Realizing the potential of this species, RGCA

set itself into the development and technology dissemination for seed production of seabass. The project envisages year round supply of Seabass seed to the aquaculture industry for augmenting aquaculture production mainly through cage farming in earthen ponds, open water systems and Coastal waters.

Description of the facility

The Project facility of the Seabass hatchery is established on a 13.2 acre area at Thoduvai village, Sirkali Taluk, Nagapattinam District. The



Broodstock housing tank with RAS



Grading of seabass fingerlings

hatchery unit comprises of dedicated sections for Quarantine, Broodstock housing, Spawning and rearing areas. The facility has a full-fledged live feed unit for Micro algae, Rotifer and Artemia culture. Supporting systems for seawater intake and treatment, fresh water intake, reservoirs, overhead tanks, filtration, aeration and power back up systems are also in place. The hatchery has an annual capacity to produce 2-3 million seed (2 cm size) per year.

Futuristic infrastructure facilities equipped with RAS (Recirculation Aquaculture Systems) with thermo and photo controls have also been established for broodstock maintenance.

Activities and Accomplishments

The summary of the project activities recorded during the current review period were as detailed below:

Broodstock Collection & Quarantine

In order to enhance the brooder population available in the hatchery, wild caught brooders were recruited into the existing stock. A total of three Seabass brooders were recruited during the period under report. The brooders were introduced into the existing stock after due quarantine of forty days. Quarantine serves to remove attached ectoparasites, if any, such as, flukes and as well as to condition the wild caught stock to feeding before being introduced into the biosecured broodstock housing section. The quarantined and conditioned stock were maintained in broodstock housing tanks fitted with Recirculation Aquaculture System (RAS). This facilitates maintenance of constant water quality parameters and in turn ensures a congenial environment for the fish to be in sustained maturity condition. The existed stock at the facility during the period under report was fifty numbers of brooders.



Breeding and Seed production

The Seabass spawned successfully in the Spawning section of the hatchery equipped with Recirculation Aquaculture System (RAS) and photo-thermal controls. The spawning tanks provided with photo - thermal controls helped to keep the stock in extended maturation phase (EMP). This unique facility served the hatchery for year round spawning of seabass beyond the normal breeding season.

From seven spawnings during the period under report, 6.65 million larvae were obtained and stocked in larval rearing tanks. A total of 2.46 million Seabass seeds (fry & fingerlings) were supplied to the farmers, Universities, Research Institutes, Fisheries Departments, ICAR organizations, MPEDA and RGCA Demonstration programmes. The overall survival rate from hatching to seed production was recorded as 37 %.

Details on Spawning and Larval Rearing

| | |
|--|--------------|
| Spawns occurred during 2015-16 (Nos) : | 7 |
| Hatchlings stocked (Nos) : | 6.65 million |
| Seeds (Fry/Fingerlings) supplied (Nos) : | 2.46 million |
| Survival rate (%) : | 37 |

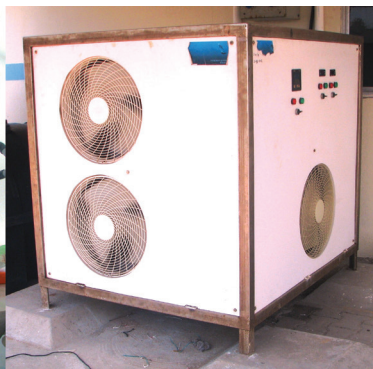
Reinforcement of supporting systems in the hatchery:

The hatchery improvised its infrastructure by addition of supporting systems such as heaters, chillers, and ozone generators during the period under report. New oxygen distribution lines were provided in the seed packing area. To meet the growing demand from the industry for seabass

fries and fingerlings, the hatchery retrofitted additional broodstock tanks with heat and chiller unit to maintain broodstock in optimum water quality parameters to facilitate easy conditioning and spawning in captivity.



Heat & chiller unit for BH & packing section



Ozone generator for water treatment

Supply of Seabass seeds

The hatchery supplied seeds to eight states in the country. The beneficiaries from these states were mainly farmers, Private entrepreneurs, Research organisations and representatives from Government and non-government bodies.

The supply of seeds during this year recorded a

percentage increase of 22.24 % over the previous year (figure 1).

The details of seed supplied by the hatchery to various states of the Country are provided in table 1.

Table 1: Supply of Seabass seed

| CATEGORY | Tamil Nadu | Andhra Pradesh | Kerala | Karnataka | Maharashtra | Goa | Odisha | Haryana | Gujarat | TOTAL |
|-----------------------------------|---------------|----------------|---------------|--------------|--------------|------------|-------------|--------------|-------------|----------------|
| Farmers | 172135 | 1872226 | 19077 | 19090 | 0 | 500 | 4460 | 10000 | 7000 | 2104488 |
| Government Organizations | 2700 | 0 | 13748 | 0 | 0 | 0 | 0 | 0 | 0 | 16448 |
| NGO/Pvt. Company | 31018 | 0 | 192744 | 0 | 38094 | 0 | 0 | 0 | 0 | 261856 |
| Universities /Research Institutes | 700 | 0 | 0 | 0 | 4000 | 0 | 0 | 0 | 0 | 4700 |
| MPEDA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RGCA | 6040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6040 |
| CMFRI | 6000 | 0 | 0 | 59000 | 0 | 0 | 0 | 0 | 0 | 65000 |
| TOTAL | 218593 | 1872226 | 225569 | 78090 | 42094 | 500 | 4460 | 10000 | 7000 | 2458532 |

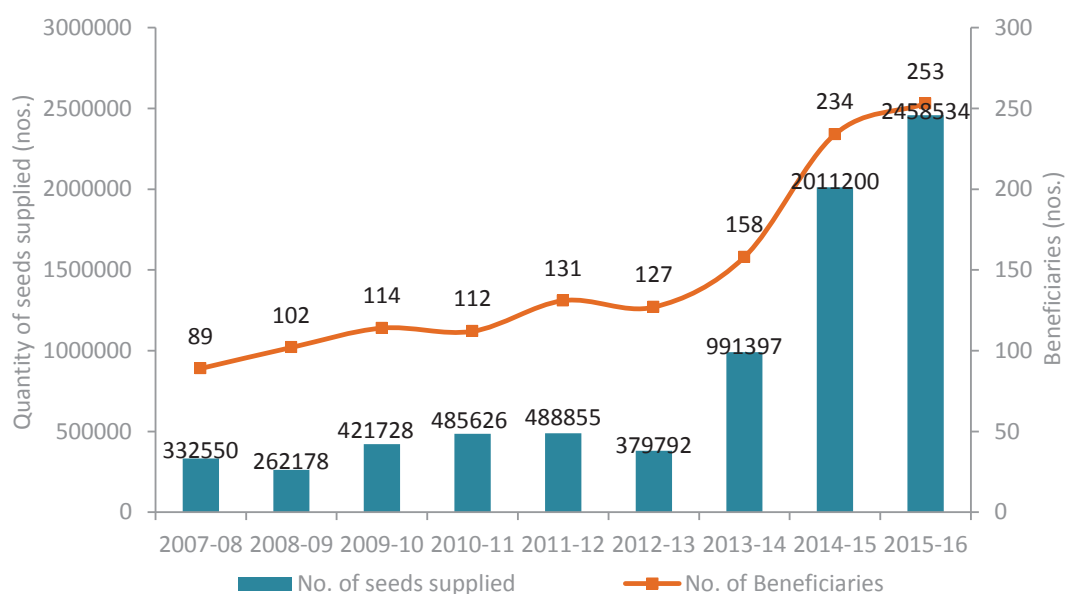


Figure 1: Year wise Supply of Seabass seed from RGCA hatchery



Mangrove Mud Crab Hatchery Project

Project Location : Thoduva, Sirkali, Nagapattinam District,
Tamil Nadu

Year of Commencement : 2004

Scope of the Project

Mangrove Mud crab (*Scylla serrata*), is highly sought as quality food for consumption in domestic and international markets. They fetch high market value due to their excellent taste, texture and nutritive value. Exploitation of crabs and degradation of their natural mangrove and wetland habitats affect the wild stocks as well as the livelihood of the coastal people dependent on this resource. The double-edged demand (wild market size capture and juvenile capture for aquaculture) for mud crabs in addition to mangrove degradation urged RGCA to establish a Pilot Scale mud crab hatchery, which is the first of its kind in India.

The project focusses to augment the aquaculture production of Mangrove mud crab, by standardizing the seed production technology and to implement ranching programmes in order to enhance the natural stock in the wild.

Description of the facility

The Mangrove Mud Crab hatchery of RGCA is a state-of-the-art facility equipped with all infrastructure facilities for continuous seed production. It is designed with a capacity to produce around one million Crab instars per annum. This facility is the only one of its kind in India and consists of dedicated Broodstock holding and hatching areas, larval rearing and live feed sections with all required ancillary support systems.



Activities and Accomplishments

Details of Broodstock collection, quarantine, Spawning and Hatching, Seed (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 110 matured female and 4 male crabs in the size range of 550 to 850gms were collected from coastal areas of Andhra Pradesh, Kerala, Andaman & Nicobar Islands. These were quarantined at the facility prior to conditioning 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 for seed production.

Spawning and Hatching

During the period under report, fifty seven successful spawnings were obtained at the hatchery and four nos. of gravid females were obtained from

the wild. 116 million of Zoeae were produced from 35 spawners and 25 million healthy zoeae from the above were stocked for larval rearing and the remaining 91 million were ranched into the nearby open sea and estuary.

Seed Production

The period under report recorded twenty eight production cycles through which approximately 9.11 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 around 10%. The steady increase in survival rates over the years provides ample scope for viable commercialization of crab seed through hatchery production.

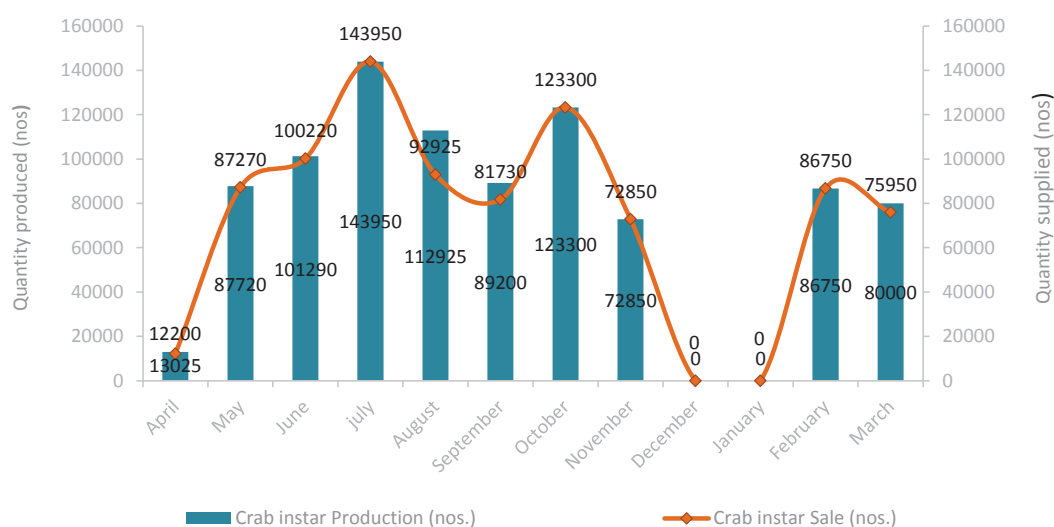


Figure 2: Month wise Mangrove crab instar production and supply



Promotional supply of crab instars

To popularize crab aquaculture and to augment production, the hatchery produced crab seed (Table.2) were provided to farmers at a subsidized rate of Rs.2/-. The quantity of crab instars produced

and supplied during each month is depicted in figure 2. The details on supply of crab instars to different category of buyers are shown in Figure.3. Overall supply details indicated an increase in supply during the current review period when compared to the previous years (Figure.4)

Table 2 : Category-wise supply of crab instar

| Category | Number of Instars Supplied(Lakhs) |
|--|-----------------------------------|
| Farmers from the States of Andhra Pradesh, Tamil Nadu, West Bengal, Odisha, Kerala and Maharashtra | 4.05 |
| UNDP Mangrove Pen culture Project, Maharashtra | 0.48 |
| CIBA, Chennai | 0.05 |
| Aquaculture Demonstration Farm of RGCA, Karaikal for Nursery rearing | 4.19 |
| Total | 8.77 |

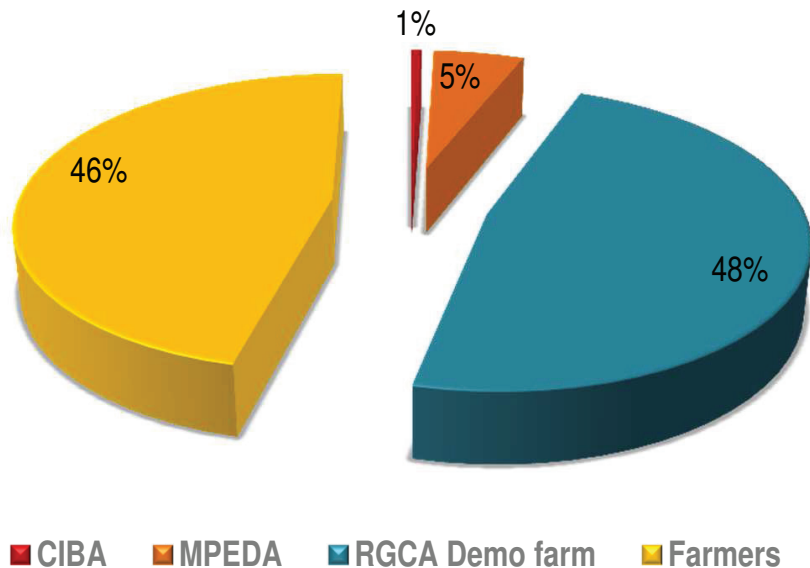


Figure 3. Category wise supply of crab instar from the RGCA hatchery

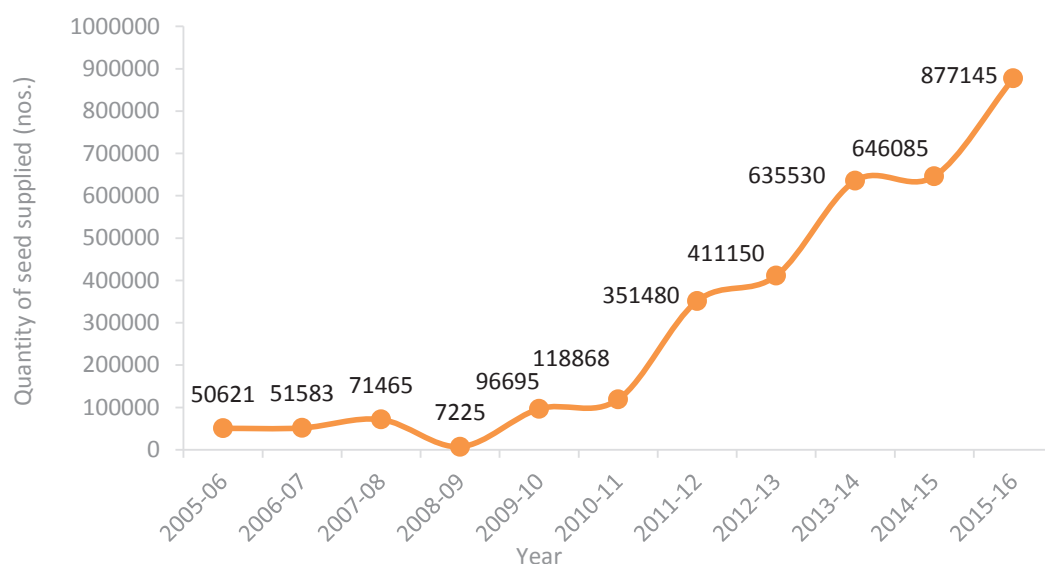


Figure 4. Year -wise supply of Crab instar from the hatchery

Reinforcement of supporting systems

During the year under report, one 3HP Blower was added to support the aeration system for normal hatchery operation. An additional DO meter was also procured to intensify the monitoring of DO in larval and other rearing systems. The power supply was equipped with a 100 KVA Servo Stabilizer to safeguard the appliances from power fluctuation.



100KVa Stabilizer



Newly purchased Do Meter



3 HP Blower



Aquaculture Demonstration Farm

Project Location : Karaikal, UT of Puducherry

Year of Commencement : 2000

Scope of the Project

This project was initiated to conduct demonstration programmes to disseminate improved technologies so as to gain higher production of commercially important fish and shell fish. It focusses mainly on the development and demonstration of viable technologies in nursery rearing and grow-out farming of Asian Seabass and mangrove mud crabs in different farming systems such as earthen ponds, hapas, pens, box cages and open ponds.

Description of the facility

The facility has set up demo ponds for conducting aquaculture activities of various fish and shellfish species. The demo farms are located at two separate sites- one at Karaikal in the Union Territory of Puducherry and the other at Mahendrapalli, Nagapattinam District.

The site at Karaikal, is a leased land and has a total extent of 12 acres land with four grow out ponds and one nursery pond (0.20 ha.) of water spread area of 3.90 ha. The project area at Mahendrapalli spreads over an area of 18.72 acres with ten grow out ponds of area 0.40 - 0.70 ha, and located on the banks of the Kollidam River with total water spread area of 5.06 ha.

Activities and Accomplishments

Nursery rearing of crabs and supply of crablets: Crab instars of size 3.0 - 5.0 mm produced at the RGCA hatchery were stocked in nursery hapas and reared to crablets of 2.0 - 3.5 cm. in the demonstration farm. During the period under report, 3.04 lakhs of crab instars from 22 batches and 0.79 lakhs of Megalopa in 4 batches were received from RGCA - Mangrove Mud Crab Hatchery Thoduvai. The crab instars and megalopa received were reared to crablets in nursery hapas deployed in the demo ponds of the farm facility. The percentage of survival obtained from instar to crablet stage was 52.3% and that from megalopa to crablet was 31.4% respectively. About 2,09,000 nos. of crablets were produced and of these, 1.832 lakhs (Figure. 5)

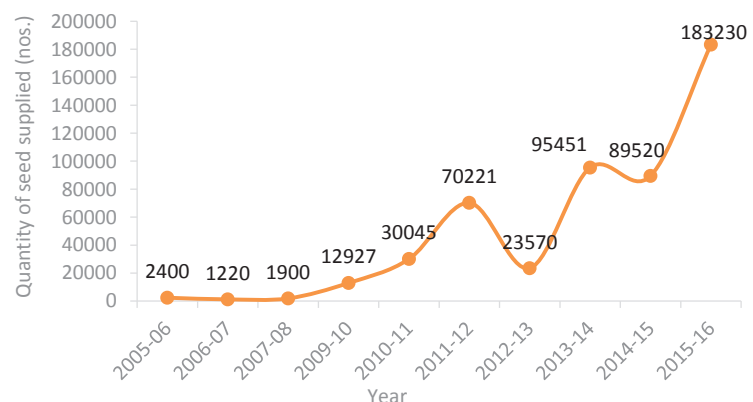


Figure 5: Mangrove crablets supplied from Demonstration farm, Karaikal

were supplied to farmers, Self Help Groups (SHGs) of Mangrove Crab Project at Sindhudurg District, Maharashtra, MPEDA Demonstration programmes and Research institutions (Figure. 6). Crablets reared from the RGCA farm were also supplied to the farmers in the neighbouring states such as Andhra Pradesh, Kerala and Maharashtra with minimal loss.

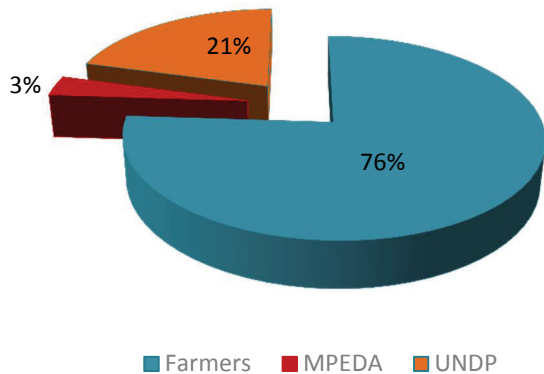


Figure 6: Category wise supply of Crablets from the RGCA demo farm at Karaikal



Nursery rearing of crab instars in hapas deployed in demo ponds



Grading of crablets ready for stocking



Crablets being stocked in demo ponds



Grow-out farming trial of crablets with pellet diet

Trials on mangrove crab farming with artificial pellet diet was repeated by stocking crablets at a density of 0.5 nos./m² in 0.75 ha pond. Around 3,000 nos. of crablets were stocked in the pond during

the period under report. Regular assessment of growth, feed intake, water quality etc. were done throughout the farming period. The crabs attained size range of 350 – 500 gms. within 160 days.



Mud crab farming trials with pellet diet

Soft Shell Crab Farming Trials

Pilot scale experiment on soft shell crab production in a pond with pump fed water was conducted by the facility. About 450 crabs were stocked in 360 boxes and maintained in crab boxes for three month period. Moulded crabs were replaced immediately with fresh crabs. Out of 720 crabs stocked, 616 crabs moulted. The average frequency of moulting varied from 12 – 23 days. A second set of trials was also initiated in a tide fed pond during the period under review. In this, about 220 nos. of juvenile crabs (< 50 gms.) and 500 nos of sub adults were stocked (> 50 gms.) in 770 boxes to study the moulting frequencies. Regular observation on moulting of crabs and monitoring of growth is under progress.



Grow out farming of Soft shell crabs in tide fed pond

Stock Enhancement Programme of Mangrove Mud Crab at Sindhudurg, Maharashtra

Technical guidance by RGCA on farming of Mangrove mud crab in pens and tide fed farms was extended to an UNDP Mangrove Mud Crab project in Sindhudurg, Maharashtra as part of the stock enhancement programme for the proposed third phase of the project. Subsequently, 52,060 seed were supplied and stocked in fourteen stations (8 no's of old sites from first and second phases and 6 new sites in 3 talukas-Malwan, Vengurula and Devgad) during September and November 2015. The farming period is expected to be completed in a year.

The growth recorded in six months duration from one of the culture sites, was 716g at a survival of

52%. Partial harvest and sales were initiated in few sites since March 2016. Technical team of RGCA monitors the progress of the activities of the programme on a monthly basis in addition to the technical guidance offered.

A hatchery to produce 1 million mud crab seeds was proposed in Sindhudurg. In this connection, RGCA requested the Mangrove mud crab expert from SEAFDEC, Philippines Dr. Emilia Qunitio, to visit the site. The proposed hatchery sites were visited along with an expert team comprising of MPEDA, RGCA, NETFISH and UNDP representatives. Out of the three proposed sites, one was identified as the most suitable one for crab farming.

Demonstration of nursery rearing of Asian Seabass

A short demo programme on nursery rearing of early seabass fingerlings of size range 4.0-4.5 cm in cages was initiated during the period under report. Two batches of fingerlings comprising 4,200 nos. and 1,840 nos. were stocked during the month of January '15 and were fed on a diet of imported and indigenous feed for a period of 40 – 45 days. The fingerlings attained growth of 8.5 – 10 cm with survival rates of 98.5 % and 97.4 % respectively.

The grown fingerlings were then stocked and cultured in grow-out cages, each of dimensions 2.0 m x 2.0 m x 1.3 m sizes. The growth attained was

35 - 50 gms size after 76 and 54 days of rearing. The total estimated biomass was in the range of 17.36 and 4.76 Kgs. respectively. 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 as 74.2 %.

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

Farming of Pompano Fingerlings in cages

Demonstration farming of Pompano fingerlings in cages deployed in ponds was initiated in ADF to study the growth rate. About 4,200 Nos. of Pompano fingerlings (7.5 - 8.0 cm.) procured from

Marine Fin fish hatchery project were stocked in 6 cages in pond during the end of the review period and studies are under progress.

Demonstration farming of seabass in cages





Domestication of Tiger Shrimp Project

The Project on Domestication of Tiger Shrimps envisages to provide high quality Specific Pathogen Free (SPF) domesticated stocks of black tiger shrimp – *Penaeus monodon* to the shrimp sector of the Country. This facility was upgraded for full scale production with the following full-fledged project components.

Location of the Project Components and Year of Commencement

- Pre-primary and Primary Quarantine Unit (PPQU): Amkunj, Middle Andaman, A & N Islands : 2009
- Secondary Quarantine Unit: (SQU) Kodyaghat, South Andaman, A & N Islands : 2011
- Nucleus Breeding Centre (NBC): Kodyaghat, South Andaman, A & N Islands : 2014
- Pilot Scale tiger shrimp Multiplication Centre at OSSPARC: Gopalpur on Sea, Orissa : 2011
- High Health Tiger Shrimp Seed Production, Chirala, AP : 2013
- Tiger Shrimp Multiplication Centre: Thekkurichi village, Kanyakumari dt., Tamil Nadu (under development)

Pre-primary and Primary Quarantine Unit (PPQU)

Description of the facility

PPQU is a biosecure facility with an area of 800m². The facility is established at Amkunj, in Middle Andaman, A & N Islands, in close proximity to a major shrimp broodstock landing centre. The PPQU consists of dedicated sections for quarantine, broodstock holding, maturation spawning, hatching, larval and post larval rearing purposes. A fully operational live feed unit, a microbiology lab, highly efficient effluent treatment system, diesel generators for providing power back up, adequate pumps, blowers, filtration, disinfection and other supporting systems are also present.

Operation of PPQU

Tiger shrimp brood stock caught from the wild were segregated for good quality ones and maintained in the PPQU. Each broodstock was reared in a separate 50 litre capacity plastic crates with aeration and continuous flow through system, until initial results of the pathology screening was obtained. Broodstock which were identified free from all known pathogens and with desired characteristics for the breeding programme (size, fecundity, survival etc.) were then selectively bred to produce nauplii.

The nauplii were subsequently reared to Post Larvae in a separate facility in the quarantine unit with periodic screening for the presence of pathogens. On provisional declaration of the PL stock as disease free, the larvae were shifted to Secondary Quarantine Unit (SQU) for further disease screening and grow out operations.

The Project produced sixty three founder families during the period under report. Among these, twenty nine were found to be SPF and transferred

to Secondary Quarantine Unit. The details of the samples collected and screened for the OIE and USMSFP listed pathogens are provided in table 3 and figure.7.

No. of founder families produced : 63

No. of founder families qualified and transferred to SQU : 29

| Month | Brood stock collection from wild in number | IHHNV Positive | Rejection LSNV Positive | Non-Pathological reason | Broodstock collection centre |
|---------------|--|----------------|----------------------------|-------------------------|------------------------------|
| April 2015 | 15 | 4 | 0 | 7 | Diglipur |
| May 2015 | 07 | 0 | 0 | 7 | Diglipur |
| July 2015 | 16 | 7 | 0 | 0 | Bettapur |
| August 2015 | 12 | 4 | 0 | 0 | Bettapur |
| Sep. 2015 | 28 | 8 | 0 | 0 | Bettapur |
| October 2015 | 13 | 4 | 0 | 0 | Diglipur |
| Nov. 2015 | 10 5 | 0 4 | 0 0 | 0 1 | Diglipur Campel Bay |
| Dec. 2015 | 24 | 6 | 3 | 1 | Diglipur |
| January 2016 | 26 | 1 | 3 | 2 | Diglipur |
| February 2016 | 14 | 2 | 3 | 1 | Diglipur |

Table 3: Tiger shrimp broodstock collected from the year 2015-16 for the production of founder families at Primary Quarantine Unit, Amkunj, Middle Andaman

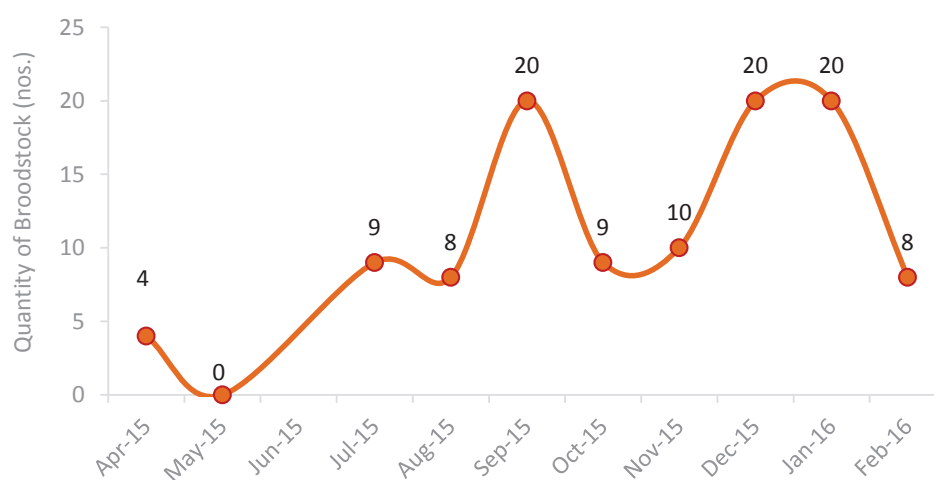


Figure.7. Disease free *P. monodon* stock as per OIE and USMFP list



Secondary Quarantine Unit (SQU)

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

The SQU is designed primarily to receive provisionally qualified founder families from PPQU and to rear them until the stocks are ready for transfer to Nucleus Breeding Centre (NBC) based on the grow out performance and health

status of the families.

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

Activities and Accomplishments

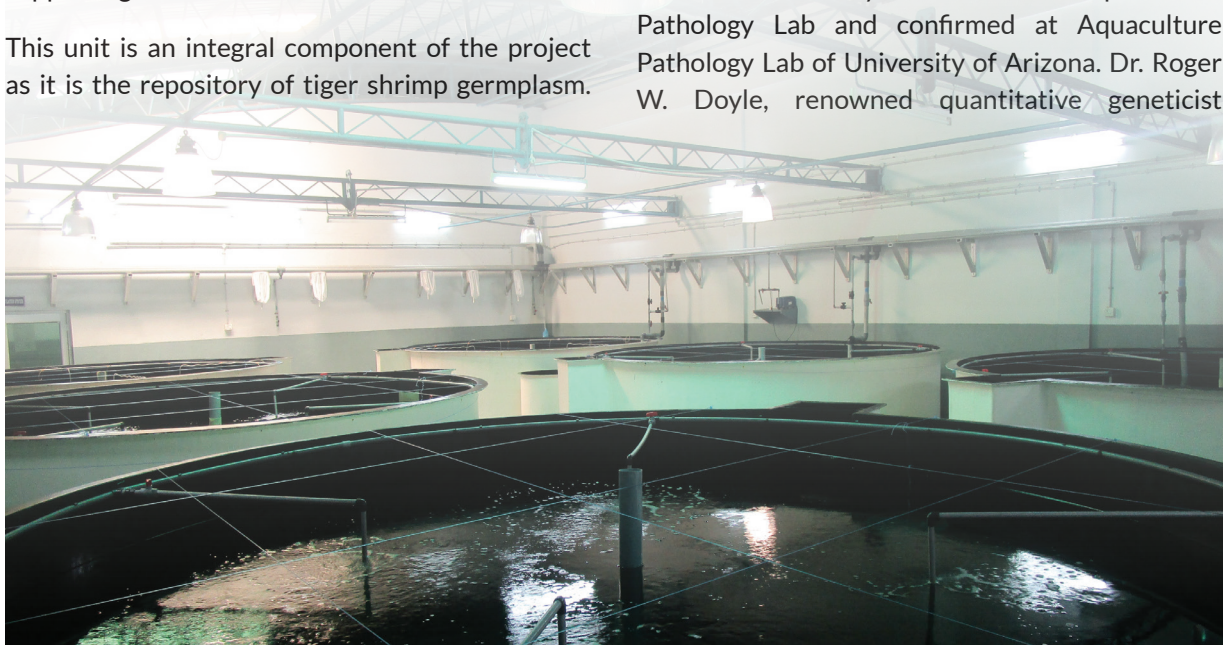
During the period under report, the SQU maintained twenty nine founder families. Those families which qualify the criteria for selection were transferred to Nucleus Breeding Centre to produce successive families.

Nucleus Breeding Centre (NBC)

NBC is one of the largest shrimp selective breeding centres which extends over an area of 8,500 square meters. It consists of dedicated facilities required for maturation, spawning, hatching, larval rearing, live feed production, nursery rearing and grow out of the stocks. The facility is well equipped with Recirculation Aquaculture Systems and other supporting devices.

This unit is an integral component of the project as it is the repository of tiger shrimp germplasm.

This facility maintains SPF tiger shrimp germplasm ranging from fifth 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 its SPF status 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



NBC Nursery Tanks

and RGCA's Central Genetics lab formulates the breeding plan for the selective breeding programme. The major traits that are given thrust during the selective breeding are tolerance to diseases, reproductive performance and growth which have stemmed out from the current economic imperatives of the shrimp aquaculture sector in India.

The selective breeding strategy brings 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 designed in such a way that the breeders selected for production every year are those from the ancestral stock that possess the longest cumulative history of domestication and selection. This facility provides necessary germplasm to pilot scale BMC of RGCA at OSSPARC, Gopalpur on sea, for SPF tiger shrimp broodstock production.



NBC Recirculation System

The current review period recorded the production of Six families from the second generation (G2) lines, Seventeen families of the fifth generation (G5) and two from the third generation (G3). In addition to this, some G5 families were also sent to pilot scale Broodstock Multiplication Centres at OSSPARC and Chirala to rear them to broodstock size and

to supply to the hatchery operators. Periodic disease surveillance were carried out for the shrimp families in DTSP - NBC as per the Standard Operating Procedure. The shrimp samples were tested at RGCA- Central Aquaculture Pathology

Laboratory (CAPL), Sirkali and Aquaculture Pathology Laboratory (APL), University of Arizona. Test reports from both laboratories indicated that the stocks were negative for all known shrimp pathogens.

Bio-secured feed production for shrimp broodstock



Pelletized feed being prepared for shrimp broodstock

During the current review period, 866 kgs of bio-secure high quality shrimp feed was prepared by this unit and provided for feeding shrimps in the NBC and SQU. The feed ingredients used were Anchovies, Tuna fish, Squid (sourced from Andaman Waters), soya flour, wheat flour, soya lecithin, Cholesterol, mineral mix, sea cod liver oil and vitamins etc. Feed was prepared in an in-house feed



mill comprising of equipment such as pulverisers, kneaders, pelletizers, tray driers and electrical steamers. Absence of any crustacean meal is the unique speciality of the feed and is assured of its biosecure quality. Trial feeding experiments proved that the feed produced was much superior in terms of shrimp growth rate and acceptability.

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 Andaman 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

The facility maintained eighteen matured broodstock belonging to the fourth generation (G4) families which had its origin from tiger shrimp NBC in Andaman. Broodstock was certified as SPF for all OIE & US listed pathogens for 4 consecutive generations. Along with these 27 families of the fifth generation SPF tiger shrimps were also produced from the available fourth generation and were being reared. Production in this facility was under strict biosecurity protocols and documented with three standard operating procedures which were audited and approved by international biosecurity auditors.

Broodstock production process included disease surveillance program for OIE listed 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, IHNV, IMNV, MBV, BP, HPV, MoV, NHP, AHPND. Screening for Disease causing pathogens were conducted at RGCA's Central Aquaculture Pathology Lab and Dr. Lightner's 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 introspection 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 Penaeid shrimp.

The facility produced 934 number of males and 679 number of female SPF brood for the first time in the country. The stock was supplied to a private hatchery M/s. Vaisakhi Bio marine Resources (P) Ltd upon signing an MoU primarily for sharing the production data. About 175 females and 350 male SPF stock was also supplied to The High Health Tiger Shrimp Seed Production Unit (HHTSSPU) of RGCA located in Chirala, Andhra Pradesh for High Health (HH) shrimp seed production.

Feedback information on the maturation performance of SPF tiger shrimp brood stock received by M/s. Vaisakhi Bio marine Resources (P) Ltd indicated excellent performance of the broodstock in the hatchery with a reported production of more than 20 million SPF seeds from 175 females by adopting artificial insemination

technique in shrimp maturation. Nauplii production @ 0.5 million per female was reported. Data on the performance of SPF seeds in farms is being collected.

In addition to this, about 0.2 million SPF Nauplii to HHTSSPU, Chirala, for seed production and around 0.4 million of SPF PL's were supplied to farmers in Orissa.



SPF Post larvae of P. monodon supplied to farmers

High Health Tiger Shrimp Seed Production, Chirala, AP

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

Activities and Accomplishments

This facility was established for the production of high health tiger shrimp seeds by screening broodstock from various tiger shrimp landing centres in India. For this purpose, 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 being used for breeding purpose.

Thermocole boxes and battery aerators were supplied to boat operators for collecting quality broodstock from the wild without contaminating the broodstock at the boat or at the landing centre.



Grown up founder broodstock of *P. monodon*

Development of Founder families

During the period under report, 8 founder families were developed from the broodstock sourced from Visakhapatnam - A.P. and Palaiyar - Tamil Nadu. Average body weight of 5 families from Vizag was recorded as 75 grams and 60 grams. Average weight of 25 grams was recorded for 1 family and other 2 families from Palaiyar respectively on completion of 400, 340 and 190 days respectively

Development of fifth generation (G5) SPF monodon brooders

The demand for Specific Pathogen free broodstock by the hatchery owners in Andhra Pradesh has surged in the recent years for the production and supply of SPF shrimp seed to the farming

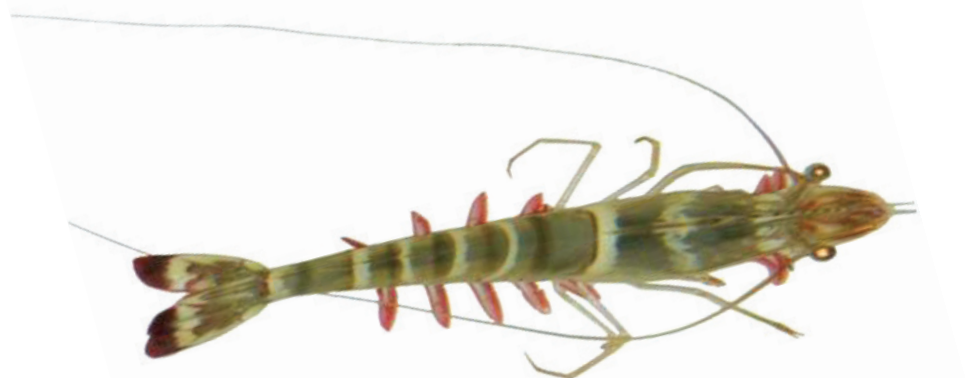
community in India. To meet this requirement by the industry, the project initiated broodstock development under strict biosecurity measures. Post Larvae of ten families of the fifth generation



Sub-adult of SPF G5 broodstock

were brought from Pilot Scale BMC, Odisha and NBC - Andaman to produce broodstock. Targeted to produce 5,000 broodstock in 2016-17. As

on March 2016, an average body weight of the OSSPARC line is 39 grams in 225 days and the Andaman line is 35 grams in 200 days.



P. monodon

Production of quality SPF monodon seeds:

The period under review recorded a production of 36.24 million eggs from 227 spawns. The eggs hatched into nauplii which was estimated as a total of 0.6 million nauplii, which yielded a production of 0.515 million SPF tiger shrimp seeds. The high quality SPF seeds were distributed to the farmers.



Indigenous bio-reactor



Indigenous bead filter

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.



Scampi Broodstock Development Project

Project Location : Hatchery facility at Kankipadu and
Experimental farm at Manikonda,
Krishna District, Andhra Pradesh

Year of Commencement : 2007

Scope of the Project

The Scampi Broodstock Development Project focuses on the development of technologies for All-male Scampi seed production through the production of “Neofemales” that are functionally females which could yield all male progeny on breeding. The Project is also involved with the identification of best Indian strains of

Scampi (*Macrobrachium rosenbergii*) suitable for aquaculture in the Country. The best strains are then selectively bred for the production and supply of disease free (White Tail Disease) and high quality Scampi stocks to hatcheries across the country. Currently, the project is involved with the development of molecular sex markers for early sex determination through molecular methods.

Description of the facility

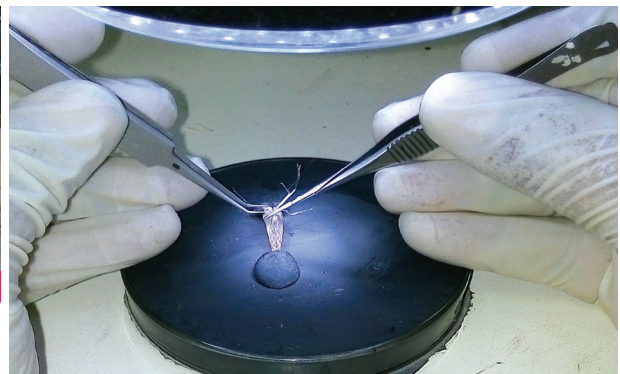
The Project facility comprises of two units; a hatchery facility at Kankipadu, and an experimental farm located at Manikonda, Krishna district, Andhra Pradesh.

The hatchery unit is developed over an area of one acre and consists of separate sections for breeding

of Neofemales, production of seeds, microsurgical and selective breeding operations, holding sections for Neofemales and segregating section for separating suspected neo-females. The facility also has a microsurgical unit, where male post larvae are segregated and subjected to androgenic gland ablation.



SNFs & PNFs in hatchery



Microsurgery of scampi postlarvae

The experimental farm of the Project facility extends over an area of 17 acres, consisting of 36 ponds, each of 250 sqm area and 18 ponds of 500sq.m. area respectively. The smaller ponds of

250 sqm dimensions are utilized for conducting studies on selective breeding experiments and those of 500 sqm are used as broodstock holding ponds, respectively.



Progeny of SNF scampi being reared in hapas at the Project site

Activities and Accomplishments

Microsurgery of Scampi Post Larvae for the development of Neofemale is carried out by early identification of Scampi males (at ages of PL 20 to 25) and subsequent ablation of the androgenic gland. During the period under report 76,968 nos of Post larvae from the Kerala strains were segregated. About 5,149 nos of male post larvae of 20-25 day old were identified and ablated. Similarly, from the West Bengal strain 25,975 nos

of Post Larvae were segregated and 3,411 nos of identified males were ablated. These Post larvae were then subjected to quality checks to determine the percentage of sex reversal. The percentage yield of functional females from males subjected to surgery was assessed and the functional females were subsequently bred with normal males and then the resulting progeny was again screened for all male yields.

Neo female production

During the period under report, the facility developed a total of sixty five Neofemales (females that yield all male progeny) which included 60 from Kerala strain and 5 from West Bengal Strain, respectively. By the end of March 2016, the facility maintained a total of sixty eight neofemales comprising of 61 nos. of Kerala strain and 7 West Bengal strain. About 10 batches of larval cycles from these Neofemales were being maintained in the hatchery for their reconfirmation as Neofemales.



Individual SNF larvication systems for Neofemale confirmation and larvication

Maintenance of suspected Neofemales of Scampi

Sex reversed Scampi produced from microsurgical ablation of androgenic gland are termed as Suspected Neofemales (SNF). The SNFs that have already bred and the progeny awaiting to be confirmed as all male are referred to as Prospective Neofemales (PNF). The hatchery presently holds 139 nos of PNFs from Kerala, 146 nos of SNFs from Kerala and 21 nos of SNFs from West Bengal strains. Apart from these, the experimental R & D farm also recorded a stock of 4,388 nos of Kerala SNFs and 587 nos of West Bengal SNFs, at the end of the period under report.



Suspected Neo females with fully developed ovary

Selective breeding operations

A series of experiments were conducted to selectively breed different strains of Scampi. In one set of the experiments, 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 reared in Quadruplicates in 250 m² ponds. These were then harvested on completion of a culture period of seven months. 20% of the best males and females from each pool of each regions were selected in terms of growth. Accordingly, a

total of 3936 animals were tagged for selective breeding. Thirty best performing 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/m² in the experimental ponds for further rearing. An average body weight of 10 gms was recorded at the end of 82 days of culture.

Similarly, experiments were conducted with the second generation (G2) progeny. Each of the

selectively bred G2 generation of Kerala & West Bengal strains were grouped into three pools and reared in duplicates in 250 m² ponds. These were then harvested after a culture period of DOC around 180 days. 20% of the best performing males and females from each pool of each regions were selected in terms of growth and a total of 2,372 animals were selected for conditioning from Kerala & West Bengal. 30 best performing males

and females from each pool were set up in 240 nos of 100 litre tanks for rotational mating in the hatchery. The G3 generation obtained through this mating process were similarly grouped and stocked at a density of 4 nos/m² in the experimental ponds in duplicates for further rearing. Control population was also maintained in all stages throughout this experiment. The experiment is in progress and the data is being collected at frequent intervals.

Promotional Seed Supply

During the period under report, a total of 1,97,600 nos of Scampi seed (including 75,500 All-male seed) were supplied to six farmers in Andhra Pradesh (Table. 4). The year-wise supply details of the all male and mixed seed types are shown in figure.8. Parameters such as growth, yield and profitability of mixed seed farming were evaluated and compared with the data obtained from all male seed farming of Scampi.

| | 2012-13 | | 2013-14 | | 2014-15 | | 2015-16 | |
|-------|----------|------------|----------|------------|----------|------------|----------|------------|
| Year | All male | Mixed seed | All male | Mixed seed | All male | Mixed seed | All male | Mixed seed |
| Total | 125950 | 0 | 22400 | 236750 | 39800 | 77700 | 75500 | 122100 |

Table 4 : Year wise supply of mixed Scampi and all male seeds

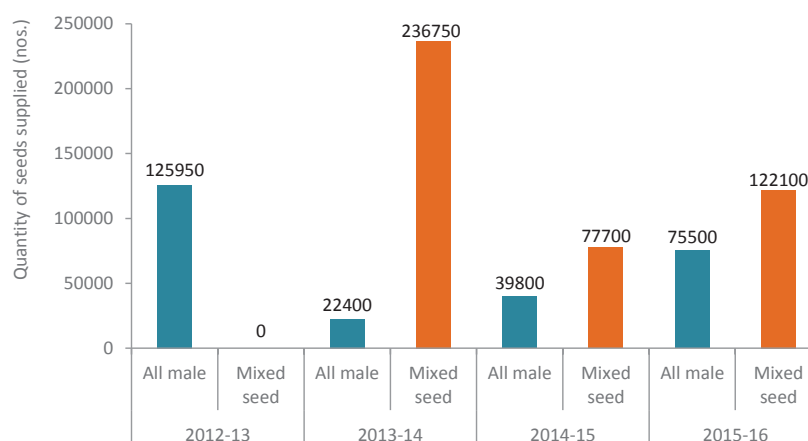


Figure 8 : Yearwise supply of mixed scampi and all male seeds

Supply of Selectively bred SPF Broodstock

The project supplied selectively bred male and female brood stocks along with berried stocks to commercial hatcheries, during the period under review. A total of 1,820 nos of selectively bred G2 generation broodstock were supplied to four private Scampi hatcheries in Andhra Pradesh & Kerala. Excellent positive feedback on the

performance of the RGCA produced stock, in terms of fecundity, fertility, hatching and stage conversions were received from the stakeholders. The encouraging results has motivated the project team to produce and supply more number of brooders in the forthcoming year.



Artemia Project

Project Location : • Tharuvaikulam, Tuticorin, Tamil Nadu
• Uppoor, Ramanathapuram, Tamil Nadu

Year of Commencement : Site (1) 2007 and Site (2) 2016

Scope of the Project

Artemia cysts and nauplii are indispensable larval feed for culture of finfish and shellfish. India, though blessed with vast resource of salt pans and salt water inundated lakes and lagoons, ideal for Artemia aquaculture imports 60-70 tons of Artemia cyst annually for aquaculture use. Salt pans in India occupies 1,77,096 ha of area along the 7,516 km stretch coastline. Utilization of these resources present within the Country, would lessen the

burden of the industry for cysts importation and as well as keep the industry self-sufficient. In this backdrop of utilising these resources for Artemia culture and Cyst production RGCA initiated this project. The prime objective of the Artemia Project is to facilitate technology development for production of Artemia Cysts and biomass through aquaculture in saline salt pan areas and disseminate the same for the benefit of Self-help Groups, Salt producers and entrepreneurs.

Description of the facility

The Artemia Farm at Tuticorin covers over an area of 6.75 ha and consists of production and evaporation ponds. The production ponds are of three types, viz (1) Cyst production ponds (2) Biomass production ponds and (3) Algal production ponds. The first two are either earthen or HDPE

lined ponds. The facility is also equipped with an algal culture unit and a quality control lab for maintenance of Algal strains and quality evaluation of Artemia Cyst/ Biomass, respectively. Separate sections for cyst and biomass processing, packing and storage purposes are also present.



A view of the Artemia ponds at Tharuvaikulam, Tuticorin

Activities and Accomplishments

The current period recorded highest production of artemia cysts (Figure.9) than that observed in the previous years. The facility produced 283.430 kgs of wet cysts, during the period under report. Out of this, about 95 kgs were utilised for dry cyst production and the rest 143 kgs were kept

in drum for diapause. About 31.363 kgs of dry cysts were produced in the current review period and were supplied in nitrogen flushed containers to Ornamental Fish breeding units, Shrimp and other finfish hatcheries after requisite quality evaluation.

Production of Artemia Biomass

Artemia Biomass of quantity 542.9 kg was harvested from the biomass production ponds of the farm, during the review period (Figure.10). Of this, 497.50 kg of frozen Artemia Biomass was supplied to the shrimp hatcheries, ornamental fish breeding units and research organizations. The remaining stock of 142.6 kg is stored for future sale.

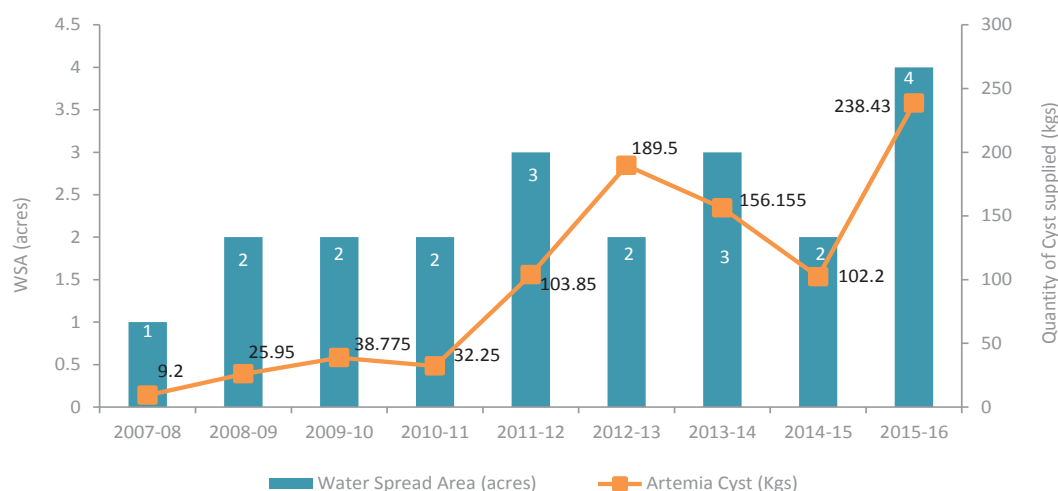


Figure 9: Production trend in Artemia cyst in R&D trials during 2007 -2016

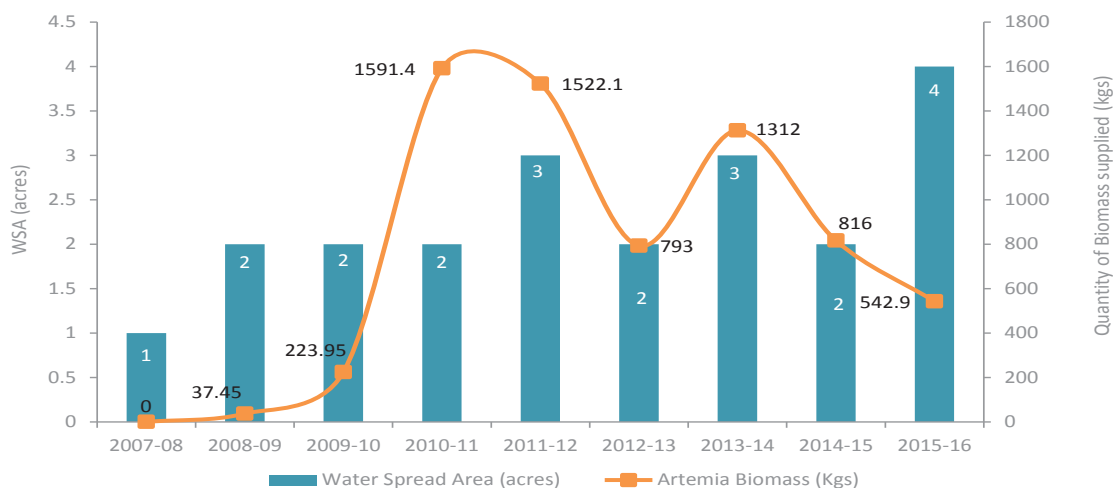


Figure 10: Production trend in Artemia biomass in R&D trials during 2007 -2016



Artemia Demo farm at Uppur, Ramanathapuram District at Tamil Nadu

Construction of Artemia culture and algal culture ponds were completed, during the period under review. The algal ponds were covered with HDPE lining to prevent water seepage. CAA registration certificate was obtained for RGCA Artemia demo farm. The civil works and electrification work in the site were completed. High saline bore wells were erected and required plumbing work was also completed.



Algae ponds covered with HDPE liner at Uppur, Ramnad

Broodstock Multiplication Centre for *L. vannamei*

Project Location : Vishakhapatnam, Andhra Pradesh

Year of Commencement : 2011

Scope of the Project

With the expansion of *P. vannamei* culture in the Country, the importation of SPF vannamei broodstock by the vannamei hatchery operators had also increased. The purchase value of the brooders sourced from the overseas suppliers are exorbitantly high causing an added financial burden to the hatcheries functioning at the small scale level. To minimize these problems, encountered by the vannamei hatchery operators

of the Country, RGCA embarked on a project on Broodstock Multiplication Centre for *L. vannamei* in order to serve the industry by timely supply of quality *L. vannamei* broodstock at a much lower cost and without having to undergo the cumbersome process of documentations involved with importations.

The project focusses to supply High Quality Specific Pathogen Free (SPF) selectively bred brooders of Pacific White Shrimp (*P. vannamei*) with excellent

An aerial view of RGCA BMC for L. vannamei at Visakhapatnam





culture attributes such as good maturation performance, fast growth, disease resistant and better survival. Production of high quality seeds for stocking the farms from the broodstock supplied to the hatcheries, is also ensured through this programme. RGCA has implemented this project in collaboration with M/s. Oceanic Institute, Hawaii, the world pioneers in shrimp breeding and domestication programmes.

The project involves rearing of Germplasm imported from the Oceanic Institute to broodstock under stringent biosecure conditions. The broodstock are then subjected to disease screening before being supplied to the hatchery operators. The facility has a capacity to produce and supply around 60,000 nos. of broodstock to the Industry each year and thus supports the ever expanding shrimp farming sector of the Country.

Description of the facility

The TASPARC (The Andhra Pradesh Shrimp Seed Production, Supply and Research Centre) facility of MPEDA at Vishakhapatnam in Andhra Pradesh was 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, 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.



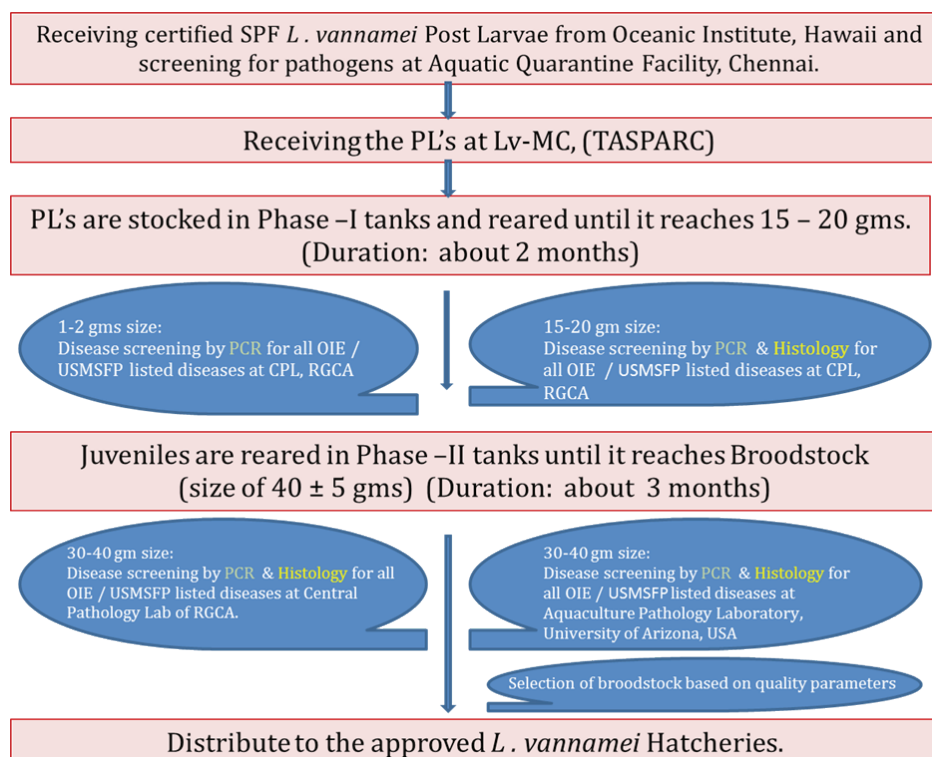
Phase II- *L. vannamei* broodstock rearing system

Activities and Accomplishments

In each cycle, the unit receives around 30,000 nos of SPF PLs of *P. 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, i.e. 6 – 8 months, the Unit provides an average of fifteen thousand numbers of quality *vannamei* broodstock to the hatcheries.

Operational Flow Chart



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

The brooders are screened for the major pathogens viz; WSSV (White Spot Syndrome Virus), TSV (Taura Syndrome Virus), YHV (Yellow Head Virus) GAV (Gill Associated Virus), IMNV (Infectious Myonecrosis Virus), MBV (Monodon Baculo Virus) HPV (Hepatopancreatic Parvo Virus), NHP-B (Necrotizing Hepatopancreatic alpha Proteo Bacterium) / Hepatobacter Penaei, AHPND (Acute Hepatopancreatic Necrosis Disease), CMNV (Covert Mortality Noda Virus), EHP (Enterocytozoon hepatopenaei)

through PCR, RT-PCR & H&E Histology techniques. Each lot/cohort are analysed thrice for the presence of any listed pathogens 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 stage are analysed for the presence of specifically listed pathogens (95% confidence). Non-lethal sampling strategy is adopted 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 1,00,000 PLs/ Juveniles were imported for the production of quality SPF *L. vannamei* broodstock at this facility. About 39,520 numbers of SPF *P. vannamei*

broodstock were produced and supplied by this project to approved Hatcheries in fifty eight consignments (Table.5). The quantity of SPF *P. vannamei* broodstock supplied during each year is provided in Figure. 11.

| Month | Number of Broodstock Distributed (Pairs) | (Nos) |
|---------|--|--------|
| May'15 | 620 | 1240 |
| June'15 | 525 | 1050 |
| July'15 | 470 | 940 |
| Aug'15 | 1300 | 2600 |
| Sept'15 | 1800 | 3600 |
| Oct'15 | 500 | 1000 |
| Nov'15 | 3075 | 6150 |
| Dec'15 | 2480 | 4960 |
| Jan'16 | 7410 | 14820 |
| Feb'16 | NIL | NIL |
| Mar'16 | 1580 | 3160 |
| | 19,760 | 39,520 |

Table 5: Month wise Broodstock Distribution details 2015 '16

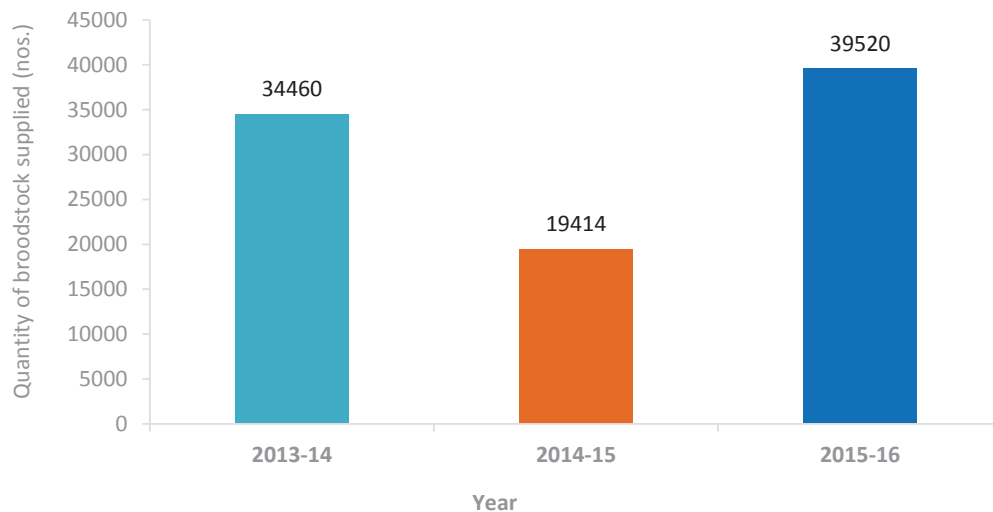


Figure 11: Quantity of *L. vannamei* Broodstock supplied

Evaluation Studies

Prior to importation of the cohorts for the broodstock rearing, an evaluation study in real farm conditions, was conducted with different cohorts obtained from the M/s. Oceanic Institute, Hawaii, USA. This is done to evaluate the growth performance and to identify the cohort/family with best performance in Indian Farming conditions. The evaluation studies are being carried out under the supervision of scientific teams of Oceanic Institute, L-vannamei Broodstock Multiplication Centre and the Central Aquaculture Genetics Lab of RGCA. During the period under report, two such evaluations were

done. First batch consisted of 5,000 juveniles from numerous families imported from Oceanic Institute, Hawaii were stocked in M/s. Sri Aqua Farm, Tuni, Andhra Pradesh and cultured for 47 days. The average size attained was 23.3 gms at the end of the culture period.

The second evaluation study was conducted at M/s. Seven Seas Aqua Farms and Exports Ltd, Srikakulam. In this study, about 5,000 numbers of juveniles were stocked and grown for a month. The average weight recorded was 5.3 gms in 28 days. The baseline data collected were used for selecting families suitable for Indian farming conditions.



Evaluation Study of *P. vannamei* at M/s Sri Aqua Farm, Tuni



VIE tagged shrimp for evaluation study



Tilapia Project

Project Location : Manikonda, Krishna District,
Andhra Pradesh

Year of Commencement : 2008

Scope of the project

Tilapia has been considered as the Food Fish of the 21st century and is popularly known as “Aquatic chicken”. In countries like China, Egypt, Philippines, Brazil, Thailand and Bangladesh, Tilapia contributed substantially to the Food Security Programmes. However, such programmes which harness the potential of this fish is yet to emerge in our Country. Further, commercialization of Tilapia culture is yet to take its shape in India. Considering the immense potential of this fish, to be utilized as a the candidate species which could be cultured to address the food security in general and cheap protein requirement of the growing population of our Country, RGCA embarked on the project on Tilapia in 2008, by establishing a facility at Manikonda village, Andhra Pradesh.

The Project was also launched as a part of RGCA's initiative on species diversification for Aquaculture

in India, with a view to develop and disseminate technologies on Breeding, all-male seed production and Grow-out farming of Tilapia. The Project facility consists of a Genetic Nucleus Breeding Centre of GIFT strain (one of the most successful and popular strains of Tilapia for Aquaculture in the world) established in technical collaboration with World Fish Centre, Malaysia.

A fully pedigreed Selective Breeding Programme that can support emerging Satellite Breeding Centres and Hatcheries across the country through supply of selectively bred high quality germplasm is the key specialty of the project. The project presently holds stocks of Redline GMT (YY Technology) obtained from M/s. Fish Gen, UK. Apart from the supply of broodstock and all male seeds of tilapia, the project also imparts training and offer consultancy services for Tilapia aquaculture.

Description of the Facility

The facility comprises of a farm which extends over an area of 12.7 acres with 20 ponds (10 each of 300 sqm water spread area and 2600 sqm WSA respectively), a reservoir for water storage and conditioning and an effluent treatment pond where water is held for sedimentation before discharge. The Breeding Unit, which is the vital infrastructural component of the facility comprises of 28

Incubation jars of 20 lit capacity. Eggs collected from the mating hapas are stocked in each of the incubation jars until hatching. The facility also contains a separate all-male seed production unit comprising of 14 nos. of 2 MT tanks, which is used to administer hormone fortified feed to newly hatched fry for sex reversal.

An egg incubation facility comprising of 2 lit capacity incubation jars specifically for selective

breeding operations where eggs from individual females are hatched separately is also present.

Activities and Accomplishments

Selective breeding programme of GIFT strain

During the period under report, the mating programme of the fourth (G4) generation which was initiated during the previous year was completed. Eighty three successful spawnings, which yielded 43 unique G4 families, were recorded during this period. About seventy fishes were randomly sourced and tagged from all the forty three, third generation (G3) pools. These were then subsequently released into 4 nos. of 300 m² grow-out ponds at a stocking density of 4.3 nos./m² and reared for a period of 3 months until they attained 250 gms size. The fish were then harvested and the morphometric data of each fish was recorded.

The collected 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. One hundred and twenty nine mating hapas were deployed in the mating pond and the three top ranked fish from each of the forty three G4 families were selected for mating based on the prepared mating plan. This mating strategy yielded 74 successful spawnings which included 36 unique G4 families by the end of March 2016.

Import and quarantine of GIFT Families

In order to expand and reinforce the ongoing selective breeding programme about forty families of GIFT were imported from World Fish Centre and quarantined at the project site.

Experiment on Genetic gain

The main factor considered in breeding programs is growth, which can be assessed in terms of a gain in either weight or body measurements. This experiment was undertaken in December 2013 and is in the third phase, during the period under report. The morphometric traits of GIFT strain selected were evaluated for weight gain in addition to genotypic and phenotypic correlations.

The current review period recorded the initiation of the third phase of the genetic gain

experiment along with the mating activity of the fourth generation (G4) in the Selective breeding programme. A set of sixteen and thirty one mating pairs from the second and third generations (G2 and G3) were selected for mating along with the G4 stocks. The resultant 7 and 12 families obtained from G2 and G3 pools were reared along with the fifth generation (G5) stocks in the communal rearing ponds. Comparative growth performance studies are underway to analyse the Genetic Gain attained by each family.

Production and supply of all male tilapia seeds

During the year under report, five ponds of 2600 m² area were set up for mating GIFT. 35 mating hapas of dimension 10m x 3m x 1m were deployed

in each pond and each hapa was stocked with GIFT Brooders for mating. Egg collection from these mating hapas was performed in 53 batches which yielded approximately 19.1 million eggs. The average hatching rate was recorded as 25%. A total of over five million all-male tilapia seeds



were produced at the facility, out of which about 2.4 million seeds (Figure.12) were supplied to registered/ approved farms or Government Institutes of Tamil Nadu, Andhra Pradesh, Odisha, Chhattisgarh, Karnataka and Kerala for demo farming operations.

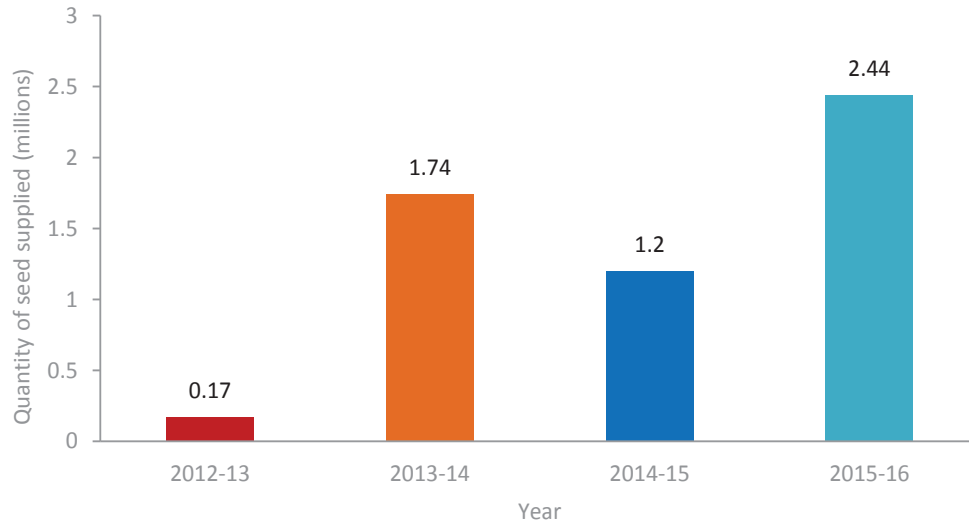


Figure 12: Year - wise supply of GIFT Tilapia seeds

Supply of Germ plasm to Satellite Breeding Unit of GIFT at Krishnagiri, Tamil Nadu

RGCA provides consultancy services for the Satellite Breeding Unit of Tilapia of Tamil Nadu State Fisheries Department at Krishnagiri District. For this purpose, the experts from RGCA Tilapia Project designed a mini breeding unit with 12 nos of 20 litre capacity hatching jars at TNFD site. The jars were serially connected to a Recirculation Aquaculture System (RAS) and biofiltration unit.

Selectively bred *GIFT* broodstock fingerlings belonging to the fourth generation were grouped into four cohorts and were supplied by the project to the Satellite Breeding unit. Rotational mating of best broodstock was performed for next generation cohort and broodstock for all male seed production.



Broodstock being handed over to Satellite breeding Unit at Krishnagiri



Broodstock being maintained at the breeding unit, Krishnagiri

All male Tilapia seed production at Krishnagiri

During the period under report, one pond with 8 nos of mating hapas was prepared and stocked with broodstock @ 30 females and 15 males for mating. Egg collection from these mating hapas was performed in 17 batches which yielded approximately 0.9 million eggs. The average hatching rate was recorded as 59%. About 0.57 million all male seeds were produced at the facility, out of which 0.3 million seeds were supplied to registered/approved farms in the Tamil Nadu state.



First batch of all-male Tilapia seeds produced by Tamil Nadu State Fisheries Dept. at Krishnagiri



Marine Finfish Hatchery Project

Project Location : Pozhiyoor, Thiruvananthapuram, Kerala

Year of Commencement : 2008

Scope of the project

The project envisages to develop and disseminate aquaculture technologies of high valued export oriented marine finfish species such as Cobia (*Rachycentron canadum*), Pompano (*Trachinotus blochii*) and other marine fish. The Project has taken Cobia as the candidate species for research on seed production and technology development. The Project was launched in 2008 with the prime focus to produce Cobia seeds and demonstrate open sea

cage farming of Cobia, for the benefit of coastal community and self-help groups.

The Project has a well-established hatchery facility at Pozhiyoor, Thiruvananthapuram, Kerala and a sea cage farm at Muttom, Kanyakumari District, Tamil Nadu for broodstock maintenance and demonstration farming of Cobia



Cobia fingerlings at Pozhiyoor

Activities and Accomplishments

Broodstock Collection and Quarantine

During the period under report, five numbers of farm reared cobia broodstock with size range, 8 – 10kg body weight were shifted from Sea cage farm at Muttom to Marine Finfish Hatchery at Pozhiyoor and were quarantined. In addition to

the above, twenty four healthy sub adult fish in Sea cage farm were also conditioned for broodstock development. A total of fourteen fish were maintained in broodstock holding facility equipped with recirculation system after screening for pathogens such as Viral nervous necrosis (VNN) , Iridovirus and *Photobacterium damsela*.

Spawning and larval rearing

Six successful spawning were recorded during the period under report. About 4.63 million eggs were obtained. Out of these 15.76 lakhs of fertilized eggs were directly stocked in larval rearing tanks which yielded around 55,922 nos of 30 dph (day post

hatch) cobia fingerlings. Out of this, a total of 33,602 fingerlings were distributed to farmers, Fisheries Research Organizations and Departments. The survival rate from egg to 30 dph larvae varied in the range 0.9 – 11.9%.





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 33,602 no's of fingerlings were supplied to nine farmers and three Research Institutes during this period (Figure.13)

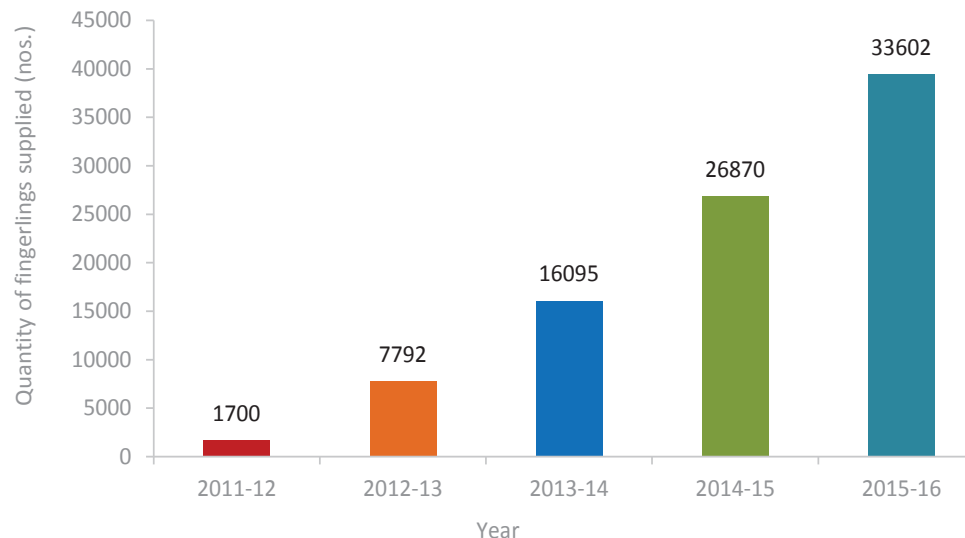


Figure 13: Year - wise supply of Cobia fingerlings by the project facility

Grow-out rearing of Cobia juveniles in sea cage farms:

A total of 9,261 cobia juveniles with size range from 18.2 -23.5cm TL and 30.7 -92 gm body weight were stocked in cages in Sea cage farm at

Muttom. The quantity of Cobia harvested was 10.91 metric tons. From this 2.4 tons of cobia fish in chilled form were exported to European Union by a seafood processor and exporter who procured the harvested stock from RGCA.

Open Sea cage farming of Cobia

As a part of Societal activity, the Project launched pilot scale Open Sea Cage Farming of Cobia at Adimalathura, Thiruvananthapuram on 27.01.2016. The event was inaugurated by Ms. Leena Nair, IAS, Chairman MPEDA and President RGCA. A total of 9872 cobia juveniles of 21-53.4

cm TL were stocked in HDPE sea cages deployed 3 kms off shore.

This activity was implemented for the benefit of fisher community, so as to encourage them to adopt cage culture as an alternative option for sustainable livelihood.

Transport of live cobia juveniles through sea route

A total of 3719 nos of cobia juveniles of size range 800 – 1000gm body weight were successfully transported from Sea cage farm Muttom. The fish were transported in two batches from sea cage farm, Muttom to demo farm at Adimalathura. The cage of 5m x5m x2m dimension attached with net was towed from the cage site using a leased sea worthy vessel. The transit duration was approximately 20 hours, which might probably be the first ever transport of live Cobia via sea route in India. On the destined site at Adimalathura, the fish were stocked in 12.7m dia cages at the open sea cage farm.

Sea cage farming of Asian Seabass

During the current review period, the project carried out grow-out sea cage farming trials with

Asian Sea bass (*Lates calcarifer*) at the RGCA sea cage farm facility at Muttom. Seabass fingerlings produced by the RGCA hatchery at Thoduvai, Sirkazhi Tamil Nadu were reared in these cages. About 5000 nos. of fingerlings of average body weight 18.4 gms were stocked in the cages and cultured for a period of 10 months, on a pellet diet. The mean weight of the fish at harvest was recorded as 960 gms with a survival rate of 90.9 %. The maximum size recorded during the cage culture operation was 1.4 kg. The FCR recorded was 1:1.48. The total yield of seabass produced was estimated as 3.656 (4545 nos) metric tons. From this, a total of 2.38 metric tons of seabass fish were sold to a seafood processor and exporter at Kanyakumari District for export to Switzerland and UK. The project also supplied 1010 Kg of seabass in the size range of 05-1.2 Kg for the Aqua Aquaria India-2015, in which RGCA had set up a seafood stall by name Machilipatnam.



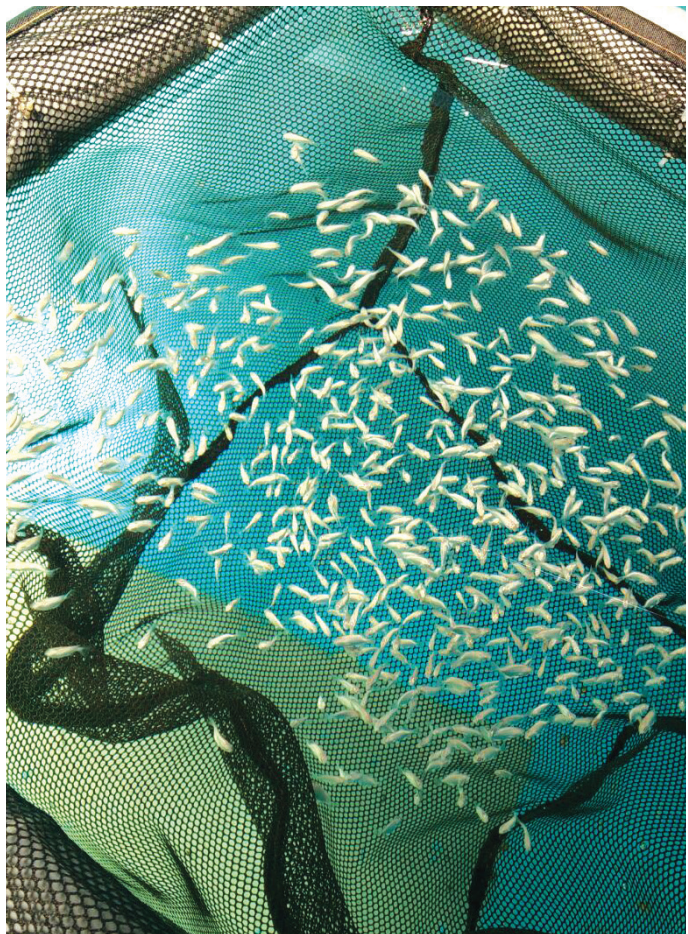
Harvested seabass of 1.4 kg reared on a pellet diet in open sea cage at RGCA farm, Muttom



Broodstock Development of Pompano and Red Snapper

A total of 92 nos. of Pompano (*Trachinotus blochii*) sub-adult fish and 36 nos of Red Snappers (*Lutjanus* sp.) were being maintained in two separate HDPE cages for broodstock development at the RGCA sea cage farm.

Four successful breeding were obtained in Pompano during the period under review and it yielded a total of around 16.6 lakh eggs. Out of these 4.97 lakh of fertilized eggs were directly stocked in larval rearing tanks. Around 65,617 fingerlings in the size range of 1.2-3cms total length were obtained from three batches. The current review period recorded a supply of 39,150 Pompano fingerlings to various beneficiaries comprising of farmers, research organizations such as CMFRI, Fishery Universities, Regional Centres of MPEDA, Aquaculture Demonstration Farms of RGCA and Agency for Development of Aquaculture (ADAK),



Pompano fry and fingerlings at RGCA finfish hatchery at Pozhiyoor



Infrastructure additions

The facility completed entire power upgradation and hatchery renovation works during the period under review. Construction of additional hatchery facilities are under process.

Grouper Project

Project Location : Hatchery at Kodiaghat, South Andaman and
Sea Cage Farm at Rutland Island, South Andaman

Year of Commencement : 2006

Scope of the Project

Groupers are one of the most important high valued food fish species in the world, notably in Southeast Asia. This fish is abundant in Andaman waters, which provides a relatively pristine environment with many areas apparently suitable for small-scale cage culture of groupers, and a ready supply of broodstock for production of fingerlings.

Andaman waters form the abode for 48 species of groupers that support 43.63 per cent of grouper so far known to science. The characteristics of the fish such as good taste, hardiness in a crowded environment and rapid growth, make them a good candidate for intensive aquaculture. The bulk of production comes mostly from capture. However with the increasing consumer demand and depleting wild

fish populations, the culture of groupers has become imperative and RGCA felt the need for launching a project on Grouper seed production and cage farming in the natural abode of this species itself.

This project was initiated on 2006 to develop technology for breeding, seed production and farming of various species of groupers in floating net cages.

Present status of the Project

The existing leased grouper hatchery facility is being utilized by the Domestication of Tiger

Shrimp Project of RGCA, to maintain founder families. Two acres of land area to construct

grouper hatchery was allotted by the Andaman & Nicobar Administration and is proposed

A view of the open sea cage grouper farm at Rutland Island in South Andaman





to construct a state -of- the- art multispecies grouper hatchery at Rangachang Village, South Andaman after obtaining

clearance from Coastal Regulation Zone Management Authority, Port Blair. This multispecies grouper hatchery

is envisaged to supply hatchery produced grouper seeds to all over India including Andaman & Nicobar Islands.

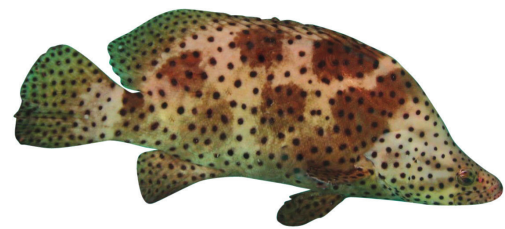
Description of the facility

The sea cage facility comprises of 21 HDPE cage rafts of 3m x 3m dimension moored along with three floating wooden platforms of 5mt x 5mt dimension such as one for watchman shed and two working platform for fish grading, prophylactic treatment, to keep net cages and its accessories. The HDPE cage rafts are being used to hold and condition wild caught grouper broodstock such as Tiger grouper, Mouse grouper, Square tail coral grouper and Orange spotted groupers. This

facility also holds F1 generation tiger grouper and orange spotted grouper broodstock for the breeding programme. In order to transport cage materials and for commutation of the staff, an FRP speed boat propelled with 40 HP out board motor is also in place. The boat has been registered with Department of Fisheries, A & N Administration. The facility has offshore and inshore units for broodstock maintenance and seed production respectively.



Tiger grouper



Mouse grouper



Square tail coral grouper



Orange spotted grouper



Reading RFID tag with a tag reader

Broodstock maintenance in open sea cage facility

Both wild caught and F1 generation grouper broodstock are maintained in good condition in floating net cages. The quantity of different species of groupers maintained in the cages is represented in figure. 14. All the broodstock are tagged with Radio Frequency Information Device (RFID) tags to monitor the spawning performance of individual brooders. Natural spawning is observed regularly

for the Tiger grouper except the month of April and May due to the high temperature. All the brooders are fed with nutritionally balanced frozen fishes mainly mackerel and sardine on alternate days. Squid is fed once in a week to improve gonad development. Fresh water treatment is done once in a month to reduce the attachment of external parasites and epibionts. The broodstock holding net cages are changed once in a month to prevent clogging and to permit free flow of water.

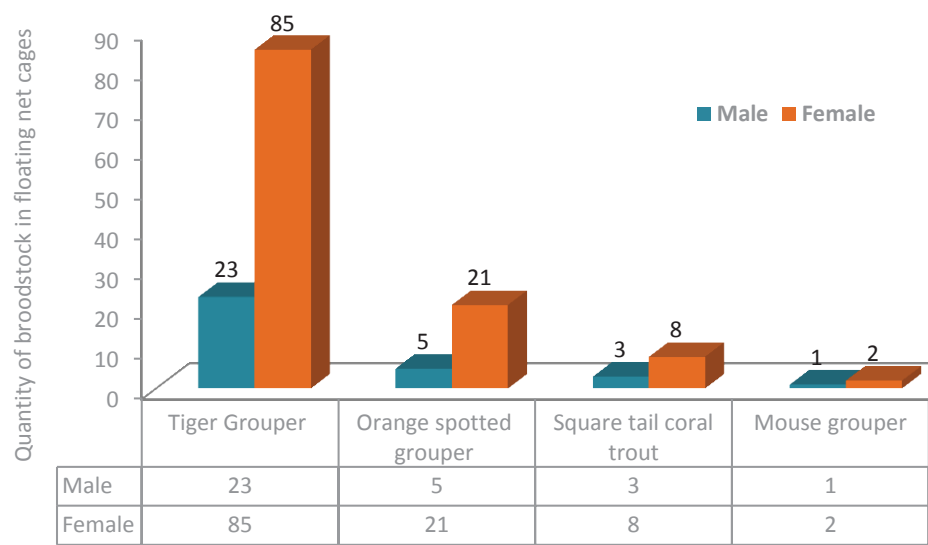
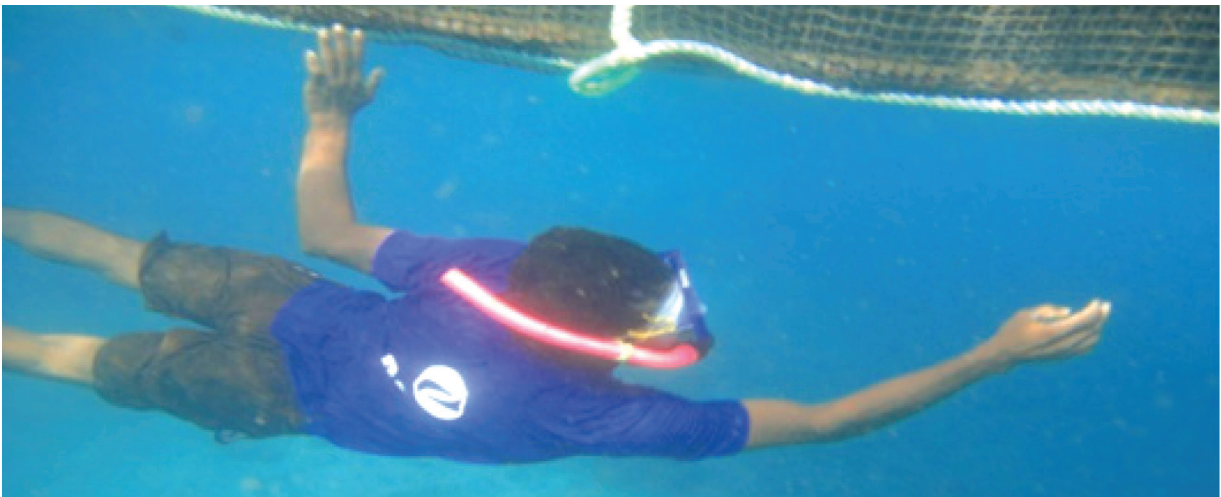


Figure 14: Quantity of Broodstock in floating net cages



Monitoring of net cage by scuba diving



Aquatic Quarantine Facility for *Litopenaeus vannamei* (AQF)

Project Location : Neelankarai, Chennai, Tamil Nadu

Year of Commencement : 2009

Scope of the Project

The Aquatic Quarantine Facility for *L. vannamei* was established with the prime focus to quarantine and ensure the Specific Pathogen Free Status (SPF) of the Pacific white shrimp (*Penaeus vannamei*) that are imported into the Country, for culture. This state-of-the art quarantine facility is created by RGCA-MPEDA to cater to the shrimp industry by

facilitating quarantine services to the imported vannamei broodstock under the Dept. of Animal Quarantine & Certification Services, Dept. of Animal Husbandry Dairying & Fisheries, Ministry of Agriculture & Farmers Welfare. The facility serves to mitigate the risk involved in the introduction of this exotic species and plays an important role for the shrimp health management in the Country.

Description of the facility

The AQF is set up in an ideal location which fulfils all the site requirements to establish a quarantine unit. The facility is in close proximity to the Chennai international airport-(which is currently the port of entry of the stock), good seawater source with less salinity fluctuations, and away from aquafarms/hatcheries/allied aquaculture activities. The AQF commenced functioning on 18th July 2009 after a successful trial run and is in the 7th year of operation, during the period under review. The facility functions at a high biosecurity level and operates on a set of Standard Operating Procedures framed by a Technical Committee involving Coastal Aquaculture Authority (CAA), Central Institute of Brackish water Aquaculture (CIBA), AQ & CS, DADF, National Fisheries Development Board (NFDB), MPEDA & RGCA.

AQF has three phases with 20 full- fledged

quarantine cubicles, 15 pre-quarantine areas and four packing sections. In addition to this, the facility contains a full- fledged high end biosecured disease screening laboratory that screens the imported Vannamei samples for all the 6 pathogens (White Spot Syndrome Virus-WSSV, Infectious Hypodermal Haematopoietic Necrosis Virus-IHHNV, Necrotising Hepatopancreatic Proteobacterium-NHPB, Yellow Head Virus/Gill Associated Virus-YHV/GAV, Taura Syndrome Virus-TSV and Infectious Myonecrosis Virus-IMNV) listed by World Organization for Animal Health, formerly known as Office International des Epizooties (OIE). The facility also has a well-established quarantine unit for imported *L. vannamei* post larvae and a dedicated Computerized Aquatic Quarantine Monitoring System (AQMS) which enables the hatchery operators to reserve the quarantine space through online mode.



A view of broodstock quarantine cubicle for vannamei at AQF, Chennai

Activities and Accomplishments

During the period under review, AQF quarantined 1,69,458 numbers of *L. vannamei* brooders in 250 batches (Figure. 15). The overall quarantine cubicle occupancy was 61.61 % and the number of quarantine cycles recorded was 441. The import data indicated that only 27.76 % of the CAA permitted stock (6,10,464 nos) has been received for quarantine. The number of broodstock despatched was 1,62,116 nos with a quarantine survival of 95.66%.

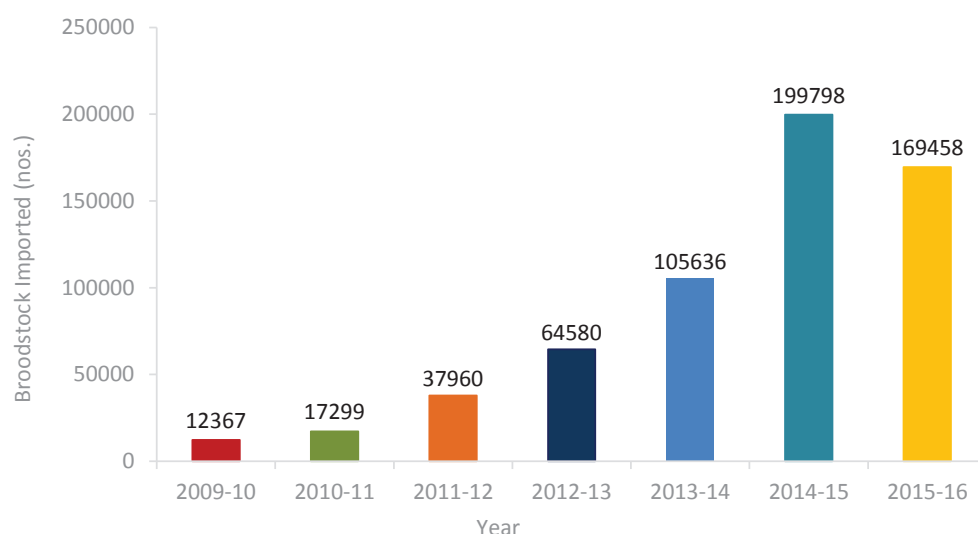


Figure 15: Year- wise import of *P. vannamei* broodstock to India

The facility also recorded the presence of an OIE listed pathogen, (IHHNV) in an SPF declared stock, during the period under report. The results of the IHHNV screening test was further validated and confirmed by the Aquatic Animal Health & Environment Division of CIBA, the referral

lab of AQF. As the samples of the broodstock imported from supplier was tested positive, the consignment was incinerated as per the direction of the TC of AQF operation. AQF thus proved its mettle in preventing the entry of this particular pathogen into the hatchery through the infected



imported stock. Samples from the remaining 249 consignments were tested free of the OIE listed pathogens and ensured as Specific Pathogen Free (SPF) stock.

The facility also opened up six high biomass cubicles which can accommodate and quarantine 25 kg biomass on a trial mode. This was done to address the peak period rush. The trial run was conducted during the month of November 2016 and the results indicated 100 % quarantine survival

on an average, without appreciable deviation of the key water quality parameters from the optimum levels. A modification of the 20 quarantine cubicles to accommodate high biomass is underway. Seven additional cubicles were made available, during the period under review (in December 2015) to combat the natural calamity (Chennai floods) challenge, which occurred during December 2015. This was a relief to the affected hatcheries.

Quarantine of *P. vannamei* postlarvae

In addition to the broodstock, the facility also quarantined 1,00,000 numbers of *L. vannamei* PL, imported by M/s. RGCA *vannamei* Broodstock Multiplication Centre from M/s. Oceanic Institute,

Hawaii, USA in 9 batches during the period under report. Samples from all the 9 batches were tested negative of the 6 OIE listed pathogens.



Prequarantine of a broodstock consignment in progress

Technology Transfer Training & Administrative Complex





Technology Transfer Training Division

The Technology Transfer, Training and Administrative Complex (TTTAC) unit is an integral component of RGCA through which all the scientifically developed technologies of the organisation infuses into the society providing economic and social opportunities besides assuring ecological security. The unit functions from the HeadQuarters of the institute located at Karaimedu Village, Sirkali, Nagapattinam district. The major focal areas of the TTTAC are dissemination of technologies and capacity building.

The TTTAC also plays a pivotal role in showcasing the research activities of RGCA to the aquaculture

sector, through its active participation in trade shows, fairs and expositions. The trademark of TTTAC is its customised outreach and demonstration programmes conducted regularly on various aspects of aquaculture, for the benefit of the industry. The unit is also involved in collection of feedback data from hatcheries, farmers and research organizations that regularly utilizes the services of RGCA in the form of seeds, feed, and consultancy services.

The training programmes conducted by TTTAC during the period under review were

TRAINING PROGRAMMES

Best Husbandry practices in Asian Seabass culture

TTTAC recorded six training programmes on Asian seabass culture in which eighty seven beneficiaries participated (Figure. 16). Two training programmes

on seabass culture, were organized exclusively for the benefit of Fishery officers from the Dept. of Fisheries, Kerala and Andhra Pradesh and

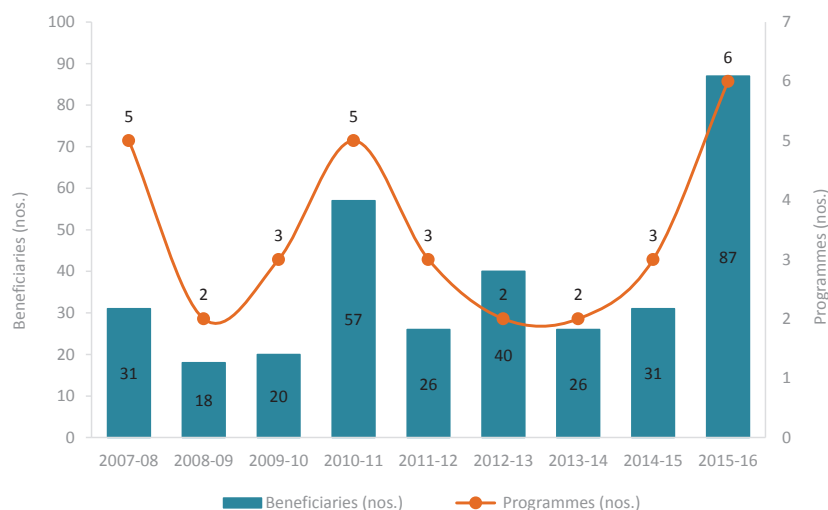


Figure 16: Training programmes conducted on Seabass aquaculture

four other training programmes for the benefit of farmers, entrepreneurs, technicians, consultants and students from various parts of the country. A total of 58 participants were benefitted from these programmes. The participants expressed keen

interest to initiate Seabass Aquaculture in their respective states using seeds produced from RGCA hatchery. After completion of the programme nineteen trainees procured Seabass fry from the RGCA hatchery for trial farming.



Grading of seabass fry by trainees at Seabass hatchery, Thoduvai

Mangrove Mud Crab Aquaculture

A total of eleven training programmes were conducted on Mangrove Mudcrab aquaculture during the period under review (Figure.17). Out of these, six programmes were exclusively conducted for the benefit of farmers, entrepreneurs, technicians, consultants and students from various

parts of the country. A total of seventy participants benefitted from these programmes.

Exclusive training programmes on mud crab culture, for the benefit of officials from the Dept. of Fisheries, Kerala and Andhra Pradesh were also

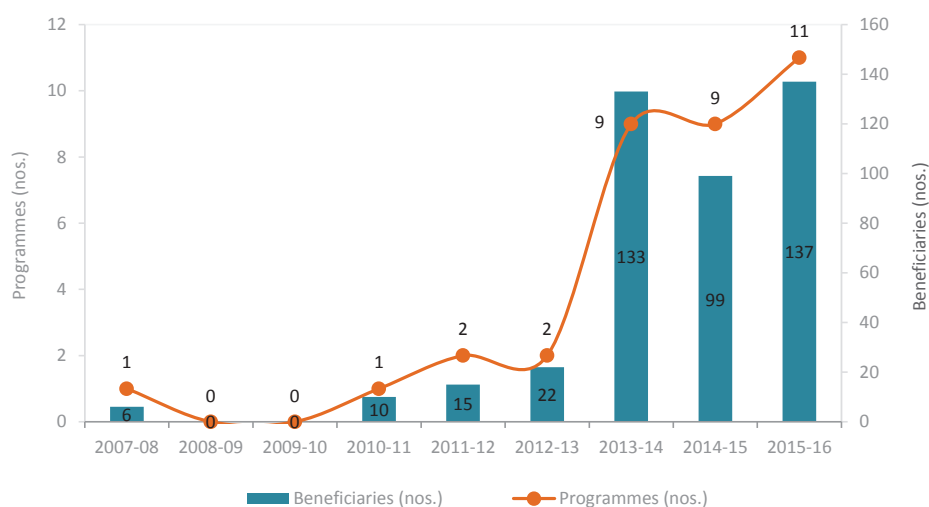


Figure 17: Training programmes conducted on Mangrove mud crab aquaculture



organized in which ten officials participated from Kerala state and nineteen from Andhra Pradesh.

Tailor made capacity development programmes on mud crab culture for the benefit of fisher community from Sindhudurg district of Maharashtra was organised by TTAC, during the period under report. The programme was funded by UNDP and jointly

organised by MPEDA and RGCA. Twenty six participants benefited through this programme.

Another training programme on crab culture and soft crab farming was conducted exclusively for the benefit of 12 officials from the NETFISH, MPEDA.



Officials from NETFISH-MPEDA deeply involved in harvesting crablets for grading



Officials, Farmers & entrepreneur involved in washing and grading of crablets



Breeding, seed production and Grow-out farming of GIFT

During the period under report, eleven training programmes were conducted on Genetically Improved Farmed Tilapia (GIFT) out of which seven programmes were exclusively for officers from the Dept. of Fisheries, Tamil Nadu (Figure.18).

Two training programmes were conducted for Fishery officials from the Dept. of Fisheries, Andhra Pradesh and Kerala. Another set of training programmes were also conducted in two sessions for the benefit of twenty six participants comprising of entrepreneurs, farmers, consultants, academicians from various part of the country.

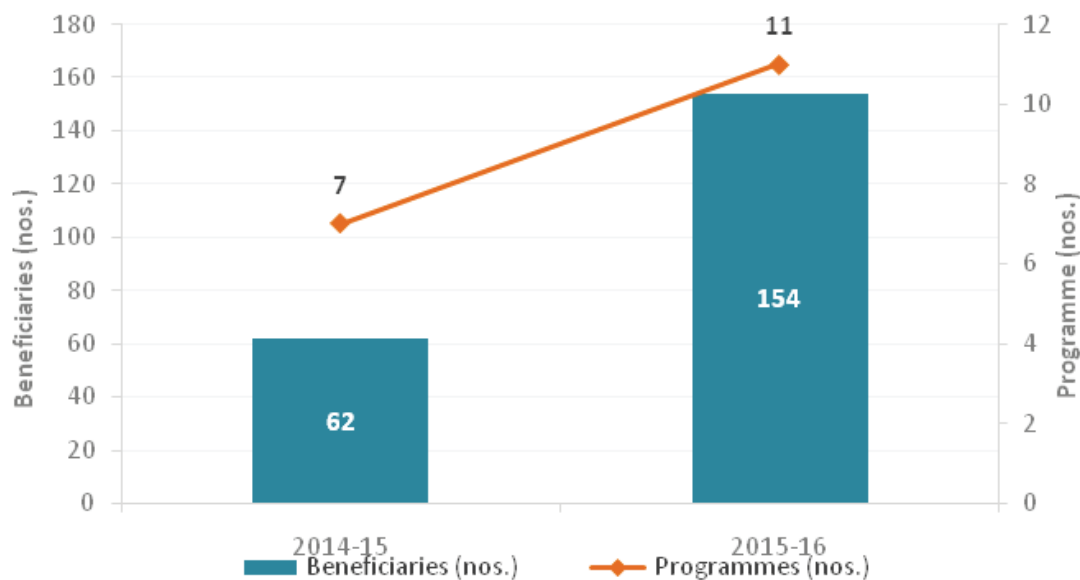


Figure 18: Training Programmes conducted on GIFT breeding and seed production

A Session of the training programme on GIFT breeding and seed production in progress





Fisher folk from Andhra Pradesh involved in the practical session at RGCA, Tilapia project

Aquaculture of “GIFT” in cages

A training programme on Cage culture of “GIFT” was conducted for officials from Dept. of Fisheries, Andhra Pradesh and as well as for the fisher folk beneficiaries. The latter will be involved in Cage culture activities being implemented by the Dept. of Fisheries (DoF), Andhra Pradesh in the reservoirs of 6 Districts in Andhra Pradesh. The trainees expressed interest towards managing and operating Fish cage culture systems.



Open sea cage farming of Cobia at Muttom, Tamil Nadu being visited by fisher folk from AP

Live feed production for Marine Hatchery operation

Student oriented training programmes on live feed production was conducted by TTTAC, during the period under report. The sessions included 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*).



Students involved in a practical session on live feed production training programme

Cage fabrication, Seed production and Open Sea cage farming of Cobia

A training programme on cage fabrication, seed production and cage farming of Cobia, was jointly organized by MPEDA's Regional Centre, Kochi and Marine Finfish Hatchery Project, RGCA, Pozhiyoor for the benefit of fisherfolk from Adimalathura

village, Thiruvananthapuram, Kerala. Trainees expressed interest to implement Cobia farming activities in their regions on the knowledge gained through the training programme.

Training Programme on Shrimp Disease and Diagnosis with special focus on Good Laboratory Practices

Hands on training programme on "Shrimp disease diagnosis with special focus on Good Laboratory Practices" was organized by RGCA at its Technology Transfer Training and Administrative Complex at Sirkali, exclusively for the benefit of the 20 officers from the Department of Fisheries, Andhra Pradesh. This was organized as a part of the Capacity Building Exercise initiated by MPEDA for implementing its vision for the Development of

Aquaculture in Andhra Pradesh.

The programme provided a detailed overview on shrimp diseases and their prevalence in India, emerging diseases across the world, molecular techniques in disease diagnosis, "Good Laboratory Practices", histological methods in disease diagnosis etc. Presentations were given in this regard on 'Viral strains/Genotypes – relevance in diagnosis



Fisheries officials of AP state, attending a Practical session on histology and PCR

and disease severity', highlighting the importance of virulent strains in pathogenesis, bacterial disease diagnosis and management. Presentations stressed on the use of probiotics in *Vibrio* control rather than through antibiotics. The impact of inbreeding and disease susceptibility in aquaculture as well as population structure analysis using molecular markers were also discussed.

An interactive practical session was the most unique aspect of this training through which the participants obtained hands on experience in DNA extraction, amplification by PCR, Gel electrophoresis and interpretation of results for diagnosis of emerging shrimp disease caused by *Enterocytozoon hepatopenaei* (EHP). Sessions

on WSSV diagnosis and sensitization on basic histological techniques were also a part of the training. The programme also included field visits to different research facilities of RGCA such as the Aquatic Quarantine Facility, Sea bass and Mangrove crab Hatcheries and the Aquaculture Demonstration farm.

The faculty for the programme included Dr. Riji John, Professor, Tamil Nadu Fisheries University, Tuticorin, and Dr. Bright Singh, Professor, UGC-BSR faculty, Cochin University of Science and Technology (CUSAT), Shri. V. N. Biju, Project Manager, Central Aquaculture Pathology Laboratory and Dr. Anup Mandal, Project Manager, Central Genetics Laboratory of RGCA.

Participants at the training programme on Shrimp disease and diagnosis



TRAINING PROGRAMMES ON ARTEMIA PRODUCTION AT THE ARTEMIA DEMO FARM

Two training programmes on “Artemia cyst and biomass production in land based Aquaculture systems” was jointly organized by RGCA and MPEDA - RC, Nagapattinam at the Artemia Demonstration farm of RGCA, Uppur, Ramanathapuram Dist, for the benefit of self-help groups. The programme was conducted to familiarize the SHGs with land based aquaculture systems which can be profitably adopted as an alternative livelihood option. Forty women SHGs in two batches (20 participants in each) from in and

around Uppur Village, participated in the three day training programme.

The primary objective of the training was to empower the Socio-economic status of coastal community women Self - Help Groups by providing hands-on training in Artemia cyst and biomass production and also to offer an opportunity to learn about the latest techniques in pond management and implementation of good practices in Aquaculture.



SHGs involved in the practical session on Artemia cyst production

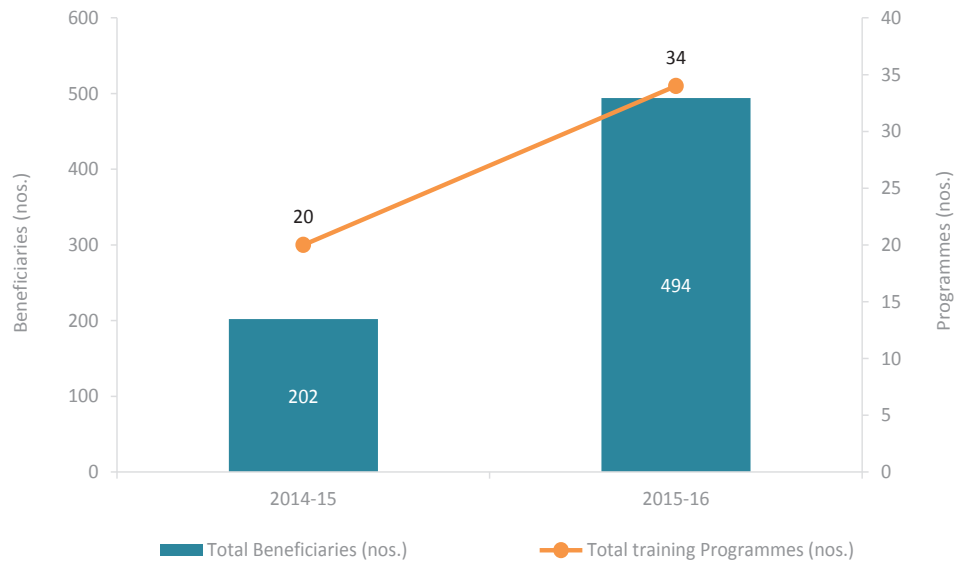


Figure 19: Training programmes conducted by TTTAC during 2014-15 and 2015-16

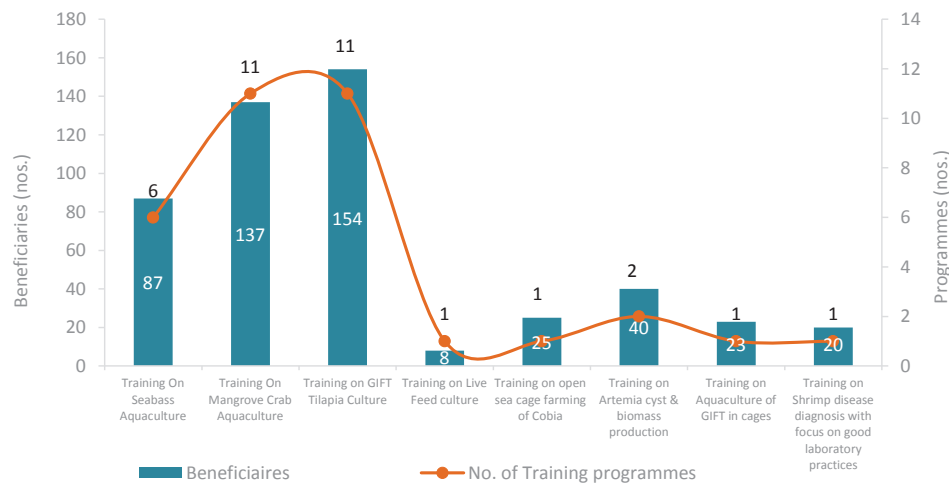


Figure 20: Training programmes in aquaculture conducted during the year 2015-16

Familiarization Programmes

Thirty four familiarization programmes on the “Latest Trends in Aquaculture practices of Cobia, Seabass and Mud Crab Aquaculture as well as on all new R & D activities carried out by RGCA” were

conducted by the TTTAC (Figure 21). About 641 participants comprising of students, staff, Govt. officials, fisher folk, Self Help Group’s and farmers benefitted through these programmes.

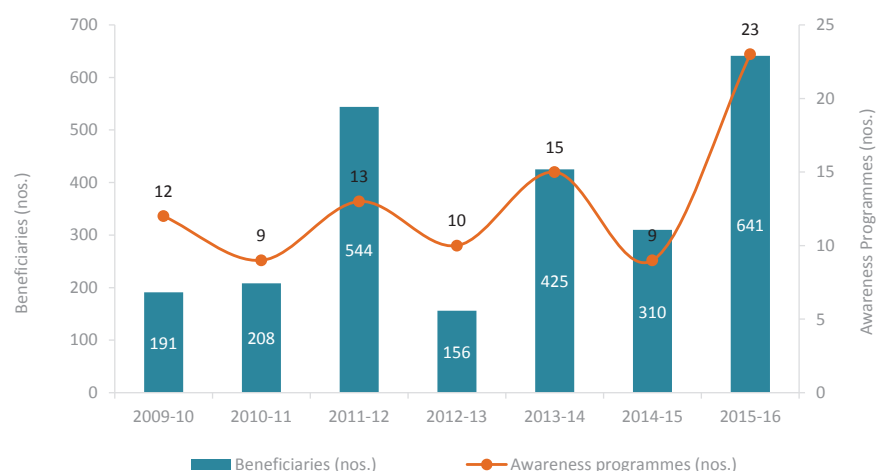


Figure 21: Awareness programmes conducted by the TTTAC

Six day awareness programme on Latest Trends in diversified Aquaculture practices such as farming of Cobia, Seabass, Tilapia and Mud Crab Aquaculture was organized by RGCA for the benefit of Technical officers of the Department of Fisheries Andhra Pradesh. About twenty officials from Dept. of Fisheries, Andhra Pradesh participated in this programme. The participants also visited RGCA Head Office, Seabass & Mud Crab Hatchery at Thoduvai, MPEDA Head Office where they had meeting with President RGCA, MATSYAFED Net factory at Kochi, Kerala, Cobia project at Pozhiyur,

open sea cage farming at Muttom & Cage culture activities in Reservoir by Dept. of Fisheries, Tamil Nadu at Chengalpet.

In conclusion, the TTTAC unit of RGCA has exponentially increased the number of training programmes conducted during the period under review, when compared to the earlier periods (Figure.19). The number of beneficiaries that participated in the training programmes was also substantially high, during the aforementioned period (Table. 6).

| Training Programmes Conducted (2012 - 2015) | | | | | | | | | | | | | | | | | | | |
|---|---------|-------------------------|---------------|---------------------------|---------------|--|---------------|--|---------------|---|---------------|-----------------------------------|---------------|------------------------------|---------------|--|---------------|----------------------------|---------------|
| S. 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 fed culture for Marine hatchery operations | | Artemia Cyst & biomass production | | Aquaculture of GIFT in India | | Shrimp Disease Diagnosis with focus on Good Laboratory Practices | | Total Programmes conducted | |
| | | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries | No. of Training | Beneficiaries |
| 1 | 2012-13 | 2 | 40 | 2 | 22 | 0 | 0 | 1 | 23 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 91 |
| 2 | 2013-14 | 2 | 26 | 9 | 133 | | | | | | | | | | | | | 11 | 159 |
| 3 | 2014-15 | 3 | 31 | 9 | 99 | 7 | 62 | | | 1 | 10 | | | | | | | 20 | 202 |
| 4 | 2015-16 | 6 | 87 | 11 | 137 | 11 | 154 | 1 | 25 | 1 | 8 | 2 | 40 | 1 | 23 | 1 | 20 | 34 | 494 |

Table 6: Year -wise comparison of the training programmes conducted by TTTAC



Central Aquaculture Genetics Laboratory

The period under report recorded the accreditation of the Central Aquaculture Genetics Laboratory (CAGL) by NABL (National Accreditation Board for Testing & Calibration Laboratories) as per ISO/IEC 17025: 2005. Thus, the lab gained the credit of being the first NABL accredited aquaculture genetics laboratory of the country.

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.

The lab plays an essential role in ongoing selective breeding programmes of the organization by evaluating inbreeding, constructing family pedigrees and formulating mating plans for breeding the stocks. Population genetics studies to identify suitable founder populations for selective breeding programmes utilizing advanced molecular markers are also being carried out in the lab. Besides these, the CAGL regularly undertakes trial farming for evaluation of on-farm performance of shrimp

families in different geographical locations in India to select the best families for selective breeding programmes. The Genetics lab also assists various RGCA Projects in fish tagging process and regularly conducts awareness programmes and seminars to disseminate the knowledge of aquaculture genetics for the benefit of the industry and academe.

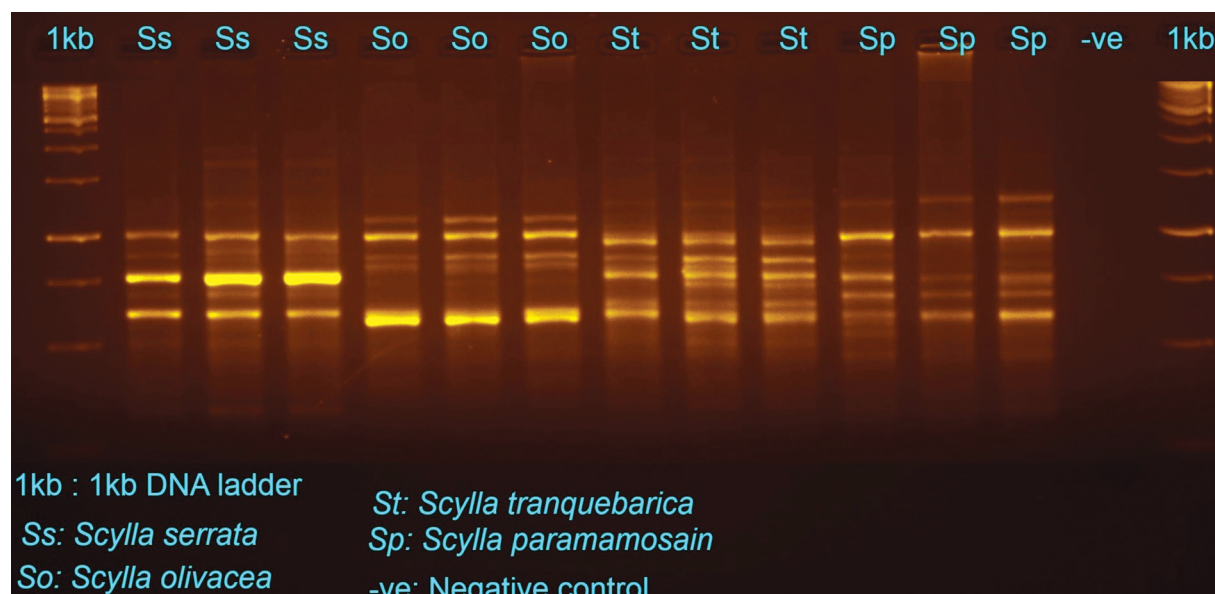
During the period under report, around 875 individual tissue samples from prioritized aquaculture species (Seabass - 181 nos.; Scampi - 142 nos. and Grouper - 267 nos) were collected for species identification, sex marker development and population genetics study from various geographical locations of India. Total genomic DNA was extracted from 1,577 tissue samples using lab modified traditional phenol chloroform method. Quality of the extracted DNA was checked by agarose gel electrophoresis method and quantity by Biophotometer respectively. A total of 17,050 Polymerase Chain Reactions (PCR) was performed for amplification of diverse mitochondrial and nuclear gene regions. Several species-specific RAPD and PCR-RFLP markers were developed during the process. Sequencing reaction was conducted for 742 samples at CAGL using genetic analyser ABI 3500 and analyzed. Unique sequences obtained, were submitted to NCBI GenBank for publication in public domain.

Activities and Accomplishments

Molecular markers for mud crab species (genus *Scylla*)

During the period under report, the CAGL developed multiple molecular markers to identify mangrove mud crab species under the genus *Scylla*. Species-specific profile was generated from mud crab samples collected from India (*S. serrata* & *S. olivacea*) and compared with that produced from

the samples (*S. serrata*, *S. olivacea*, *S. paramamosain* and *S. tranquebarica*) received from Indonesia, Philippines and Myanmar. On the basis of this profile, 150 mud crab samples were analysed for species identification under the NABL scope for the benefit of aquaculture industry.



Molecular markers showing different band patterns in mud crab species

Molecular identification of species using sequencing facility

i) Natural populations of *Artemia* collected in and around Tuticorin were analysed through 16srRNA and COI region gene sequencing. It was found that the population consisted of single species, *Artemia franciscana*.

ii) Eight shrimp samples suspected as *Penaeus semisulcatus*, were received from MPEDA, Cochin centre for species identification using 16srRNA and COI region gene sequencing. Samples were identified as *P. monodon* based on molecular study.

Identification of Indian grouper species

The period recorded the identification of fourteen species of grouper based on the morphology and molecular marker analysis (COI and 16S rRNA gene

region). Unique sequences were submitted to NCBI GenBank for publication.



Thirty-nine sequences published in NCBI GenBank

CAGL has published 92 unique gene sequences in NCBI's public domain out of which 39 grouper sequences were published during the current review period. The GenBank accession numbers for the sequences are: KT921339 to KT921353 (15 sequences) and KT835668 to KT835691 (24 sequences) respectively.

Selective breeding programmes

Apart from involving in the selective breeding programmes of RGCA's GIFT and scampi project, the genetics lab is also involved in maintenance of genetic database for the selective breeding programmes of DTSP-Kodiyaghat, Andaman and DTSP-SBNPC, Odisha facility. Inbreeding co-

efficient was calculated and family pedigree was prepared for both the programmes using LINEAGE software and were provided to the respective projects for conducting breeding programmes

On-farm trial of *P. vannamei* evaluation stream

Trial evaluations in Cages, to identify the best performing *P. vannamei* family suitable for culture in different climatic conditions of India were successfully conducted by the CAGL team at Tuni, Andhra Pradesh with the assistance of scientists from Oceanic Institute (OI), Hawaii. The sixth and seventh trial farming of *L. vannamei* evaluation stream (ES) imported from Oceanic Institute and quarantined at Aquatic Quarantine Facility was done during the period under report.



Evaluation Stream (ES) shrimp being stocked in cages.

Central Aquaculture Pathology Laboratory

The NABL (National Accreditation Board for Testing & Calibration Laboratories) accredited Central Aquaculture Pathology laboratory of RGCA established in September 2011, continued to serve the industry by providing timely and reliable diagnosis services on various diseases encountered during the culture of finfish and shellfish. The lab screens for sixteen crustacean (shrimp/crab) pathogens inclusive of OIE listed ones, besides three finfish pathogens. CAPL has also well-established infrastructure

and amenities to conduct molecular research on pathology, histopathology and microbiology of culture organisms.

The lab also involves in periodical & need based aquaculture disease surveillance in the Country for the benefit of the seafood export industry and is also a partner organization in National Surveillance Programme for Aquatic Animal Diseases (NSPAAD), which is coordinated by NBFGR, Lucknow and funded by NFDB, Hyderabad.

Services rendered by CAPL to the aquaculture industry

a) Disease surveillance: During the period under review, the CAPL conducted disease surveillance studies in major shrimp farming areas of the country and reported high prevalence of the shrimp disease called *Enterocytozoon hepatopenaei* in cultured *P. vannamei* and *P. monodon*. This disease is caused by a microsporidian parasite and is associated with slow growth in shrimps thus incurring loss in production and revenue to the shrimp farmers. The findings of the surveillance studies conducted by CAPL helped to caution the shrimp farmers to take necessary management measures to minimize its incidence and further spread across the country.

b) Disease diagnosis: The period under review recorded the analysis of 407 samples including both fish and shellfish, received from farmers and hatchery operators. The lab conducted 3002 nos. of PCR tests for diagnosis of various shrimp and fish diseases (Table 7), during the period under review.

c) Capacity Building and training Programmes:

The CAPL jointly organized a one day workshop on “Shrimp Disease Surveillance – 2015 and Capacity Building Measures for the Andhra Pradesh State Fisheries officials” at Vijayawada on 1st October 2015 with MPEDA/NaCSA and Department of Fisheries, Andhra Pradesh. The programme specifically catered to the shrimp hatcheries & farmers in AP, which is the aquaculture hub of the Country. The experts from CAPL addressed various issues pertaining to shrimp diseases and diagnosis and delivered technical presentations on the same. A “Handout on Shrimp Diseases and management measures” prepared by RGCA was released by Shri. Ram Shankar Naik, Commissioner of Fisheries, Andhra Pradesh during the event. Demonstration and hands-on training on, on-site sample fixation protocols was provided to the participants by CAPL team. A visit to a shrimp farm was also organized on the following day to provide on-site training on kit preparation, identification and collection of suitable samples at the farm, fixing and



preservation of samples which were demonstrated by CAPL team

During the period under report, the CAPL in association with extension wing (TTTAC) of RGCA organized a hands on Training Programme on

“Shrimp Disease Diagnosis with special focus on Good Laboratory Practices” exclusively for the benefit of 20 officials from the Dept. of Fisheries, Andhra Pradesh from 02 – 06 November 2015 at RGCA, Sirkali.

| S. No. | Pathogens screened | No. of Tests |
|--------------------|---|--------------|
| 1 | White Spot Syndrome Virus (WSSV) | 401 |
| 2 | Infectious Hypodermal Haematopoietic Necrosis Virus (IHHNV) | 401 |
| 3 | <i>Enterocytozoon hepatopenaei</i> (EHP) | 401 |
| 4 | AHPND (Acute Hepatopancreatic Necrosis Disease) | 401 |
| 5 | CMNV (Covert Mortality Nodavirus) | 401 |
| 6 | IMNV (Infectious Myonecrosis Virus) | 292 |
| 7 | LSNV (Laem-Singh Virus) | 16 |
| 8 | TSV (Taura Syndrome Virus) | 292 |
| 9 | YHV (Yellow Head Virus) | 292 |
| 10 | NHPB (Necrotising Hepato Protobacterium) | 6 |
| 11 | NNV (Nervous Necrosis Virus) | 33 |
| 12 | Iridovirus | 33 |
| 13 | <i>Photobacterium damsela</i> subsp. <i>piscicida</i> | 33 |
| Total no. of tests | | 3002 |

Table 7 : Details of disease screening tests conducted for the Aquaculture Industry of the Country during 2015-16

The lab also successfully completed the International level Proficiency test conducted by the Aquaculture Pathology Laboratory, University of Arizona, USA, during the period under review. Apart from the services to the industry, the CAPL also conducted in-house seminars and workshops for RGCA officials, besides imparting technical guidance in disease management measures

for RGCA projects. Various tests mainly PCR, histology and microbiology pertaining to disease screening were performed by the lab, for detecting the presence of target pathogens in outsourced samples as well as from the samples obtained within the RGCA projects. The details on the type and number of tests conducted are tabulated in table 8.

| MONTH | PCR | | HISTOLOGY | MICROBIOLOGY |
|----------------|---------|-------|-----------|--------------|
| | SAMPLES | TESTS | | |
| APRIL 2015 | 411 | 3229 | 323 | 607 |
| MAY 2015 | 131 | 928 | 250 | 774 |
| JUNE 2015 | 218 | 951 | 322 | 773 |
| JULY 2015 | 116 | 870 | 183 | 711 |
| AUGUST 2015 | 208 | 1211 | 164 | 635 |
| SEPTEMBER 2015 | 186 | 1010 | 153 | 707 |
| OCTOBER 2015 | 238 | 1016 | 349 | 531 |
| November 2015 | 166 | 605 | 498 | 781 |
| December 2015 | 321 | 1331 | 282 | 441 |
| JANUARY 2016 | 193 | 1241 | 254 | 781 |
| February 2016 | 235 | 1580 | 346 | 470 |
| MARCH 2016 | 248 | 1392 | 263 | 1134 |
| Total | 2671 | 15364 | 3387 | 8345 |

Table 8 : Details of disease screening tests performed during the period April 2015 to March 2016

EHP infected *P. vannamei* showing differential growth





Aquaculture Library

The Aquaculture Library of RGCA was established in 2012 to provide specialized library and information services to the RGCA staff and to disseminate information to aquaculture researchers, industry, academe, and other organizations. 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. It caters to the needs of Scientific community with its holdings covering the various disciplines of aquaculture and fisheries, viz., shrimp and fish grow-out culture technology, hatchery technology, physiology, nutrition, biotechnology, genetics, pathology, aquaculture engineering, socio-economics and extension.

The library subscribes to 25 International and 12 National journals and provides online access to the literary resources to the scientists and technical officers of RGCA. It maintains a collection of more than 6000 aquaculture and fisheries books, journals, rare publications etc. and is integrated into a separate section - "Dr. E. G. Silas Endowment Library". Access to this large, multidisciplinary and historic collection of literary resources is of benefit to the information users.

The Aquaculture Library of RGCA also maintains regular exchange services with national and

international organizations of mutual interest. Annual reports, Newsletters and Research publications of RGCA are being sent to various research organizations, Universities and Aquaculture industries and the library also receives similar publications from them.

The library has added 237 new books and 37 journals to its existing resources during the period under report. Most of the operations in the library, including circulation of the library holdings have



View of the Aquaculture Library

been digitalized. The library also offers Online Public Access Catalogue (OPAC) via the Institute's web site. A one day workshop on the usage of Aquatic Sciences and Fisheries Abstracts (ASFA) database was also conducted by the library through the Technology Transfer Wing of RGCA, during the period under review.

Infrastructure Development

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. Infrastructure development for Aquaculture applications requires a holistic approach so as to provide conducive & 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 place them in par with the best in the world. The details of Infrastructure development activities at various projects of RGCA developed/ commissioned during 2015-16 across the country are briefed below:

Broodstock Multiplication Centre for *P.monodon* at Rajakkamangalam, Nagercoil

Construction of the BMC for *P.monodon* commenced on December 2015 and progressing

as per schedule. This facility includes a state-of-the-art rearing shed which houses separate Mixed-Cell Raceways for Juvenile and grow out, with a total water holding capacity amounting to 2784 MT, with RAS, lab and other necessary supporting facilities.



Proposed elevation of the Facility



Artemia Demonstration Farm at Ramanathapuram

Construction of the Artemia Demonstration Farm was completed, and commissioned. The Facility is established in 10 Ha. at Ramanathapuram and houses four Algae Scale up and mass culture

Ponds (HDPE lined), 36 Cyst Production & Bio-mass production pond, lab and other supporting infrastructure.



Artemia cyst production tanks

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

The Phase III expansion of the Aquatic Quarantine Facility was expanded with an addition of thirteen

more Quarantine cubicles during the period under review

Seminars and Workshops



GIFT Broodstock being handed over to Dr. S. Vijayakumar IAS, Secretary, Dept. of Fisheries Tamil Nadu by
Ms. Leena Nair, IAS Chairman MPEDA and President RGCA

GENETICS AND SUSTAINABLE AQUACULTURE 2015

the third edition of Dr. E.G. Silas Annual Endowment Lecture

“Inauguration of the 3rd edition of Dr. E. G.Silas Annual Endowment lecture by Ms. Leena Nair, IAS Chairman MPEDA & President RGCA”



The Rajiv Gandhi Centre for Aquaculture (RGCA) organized a one-day International seminar on *Genetics and Sustainable Aquaculture* (GSA-2015) as part of the 3rd Dr. E.G. Silas Annual Endowment Lecture on 10th August 2015 at Chennai, Tamil Nadu.

The seminar was an outstanding effort by MPEDA-RGCA to

instil awareness on the crucial role of genetics and selective breeding in aquaculture systems among the stakeholders of the aquaculture industry of the country. It provided an interactive platform for the researchers and scientific community who attended the programme as internationally acclaimed Aquaculture Geneticists were invited to

deliver talks on various aspects of aquaculture genetics during this event.

Project Director of RGCA, Shri Y.C. Thampi Sam Raj welcomed the gathering and recalled the enormous contributions made by Dr. E.G. Silas towards Indian aquaculture sector and mentioned about his invaluable and unparalleled contributions to all the projects of RGCA.

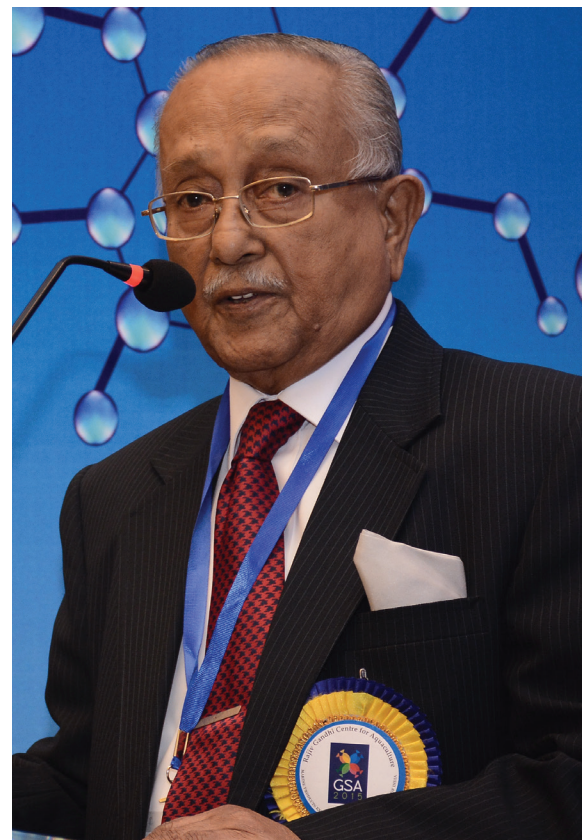


Shri Y.C. Thampi Sam Raj, Project Director RGCA welcoming the gathering

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 lauded the effort of RGCA-MPEDA in the field of applied research and for addressing the current National and International needs of the aqua farmers and fisheries sector. She stressed the importance of the theme of the seminar and the role of Central

Aquaculture Genetics Laboratory (CAGL) of RGCA in the field of aquaculture genetics. The benefits acquired through genetic improvement, importance of selective breeding and the commendable research work done by the Organization in the field of aquaculture genetics with reference to traceability and sustainability for the Indian aquaculture industry were highlighted during her speech.

The Guest of honour of the event, 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 delivered the visionary Key Note address on the importance and opportunities of the wide spectrum of Aquaculture Genetics and biotechnology that could sustain our aquaculture industry. Dr. Silas mentioned about the rapid advances made in the field of genetics that has taken the mankind far beyond the genes, proteins and enzymes. In his speech, Dr. Silas highlighted few strategies that could strengthen several research programmes in aquaculture genetics such as 'genomics in combination with traditional breeding practices', 'hatchery management and seed certification guidelines', 'hatchery escapes and its consequences', 'species prioritization', 'sex determination' and 'gene silencing'. In his concluding remarks, Dr. Silas highlighted about the role of genetics in production of in vitro fish (FACTORY FISH) meat and the futuristic need for the development of In vitro Fish flesh Production System (IFPS) in the Country. He also



Dr. E.G. Silas, Chairman of the Scientific Advisory committee of RGCA delivering the key note address

appreciated the work done by the Organization in the field of Aquaculture Genetics and the manner in which the application of Genetics is infused and implemented into the various on going programmes of RGCA



Release of the inaugural issue of RGCA Quarterly Newsletter

The dignitaries who felicitated the event were the Chief Executive Officer of the National Fisheries Development Board (NFDB) Shri K.N. Kumar, IAS, Dr. S. Vijayakumar, IAS, the Secretary, Department of Animal Husbandry, Dairying & Fisheries, Govt. of Tamil Nadu; Dr. P. Ravichandran the Member Secretary of the Coastal Aquaculture Authority (CAA) of India;; Dr. J.K. Jena Director of the National Bureau of Fish Genetics Resources;; Dr. P. Jayasankar Director of the Central Institute of Freshwater Aquaculture, and Dr. K.K. Vijayan, Director of the Central Institute of Brackishwater Aquaculture.

The seminar turned out to be more markedly significant with the release of inaugural issue of

RGCA Quarterly Newsletter and the first batch of Genetically Improved Farmed Tilapia (GIFT) broodstock.

While the newsletter of the Organization was launched with an objective of providing first-hand information on aquaculture sector of the Country besides providing insights on RGCA project activities the release of GIFT broodstock marked the beginning of initiatives to popularize tilapia culture in the Country, which essentially serves in food security. The first batch of broodstock was supplied to the Country's first Satellite Breeding Centre at Krishnagiri, TN.

The technical sessions of the GSA-2015 were unique and the lectures were delivered by renowned aquaculture geneticists and selective breeding experts. A total of about 280 delegates attended the event from 11 states of the country along with the participants from Abu Dhabi and USA, which again underlines the importance of genetics in sustainable aquaculture.



Workshop on the usage of ASFA and online journals at RGCA

A one day workshop on the usage of Aquatic Sciences and Fisheries Abstracts (ASFA) database and online journals available at RGCA Aquaculture library was conducted on 15th May, 2015 at its Head Quarters at Sirkali. The workshop was organized in order to update the information on online facilities available at ASFA and as well as the new amenities at the RGCA library so that the Scientists of the institute could effectively utilize it for enhancing their literature survey and scientific information. Fifty technical managers of all RGCA projects and MPEDA officials attended the workshop. The workshop was conducted by Proquest, the publishing group of ASFA database. The Project Manager of the RGCA Aquaculture Library briefed up the usage of online subscribed journals and Online Public Access Catalogue available in the Library



Official from Proquest Publishing Group briefing on the facilities available in ASFA

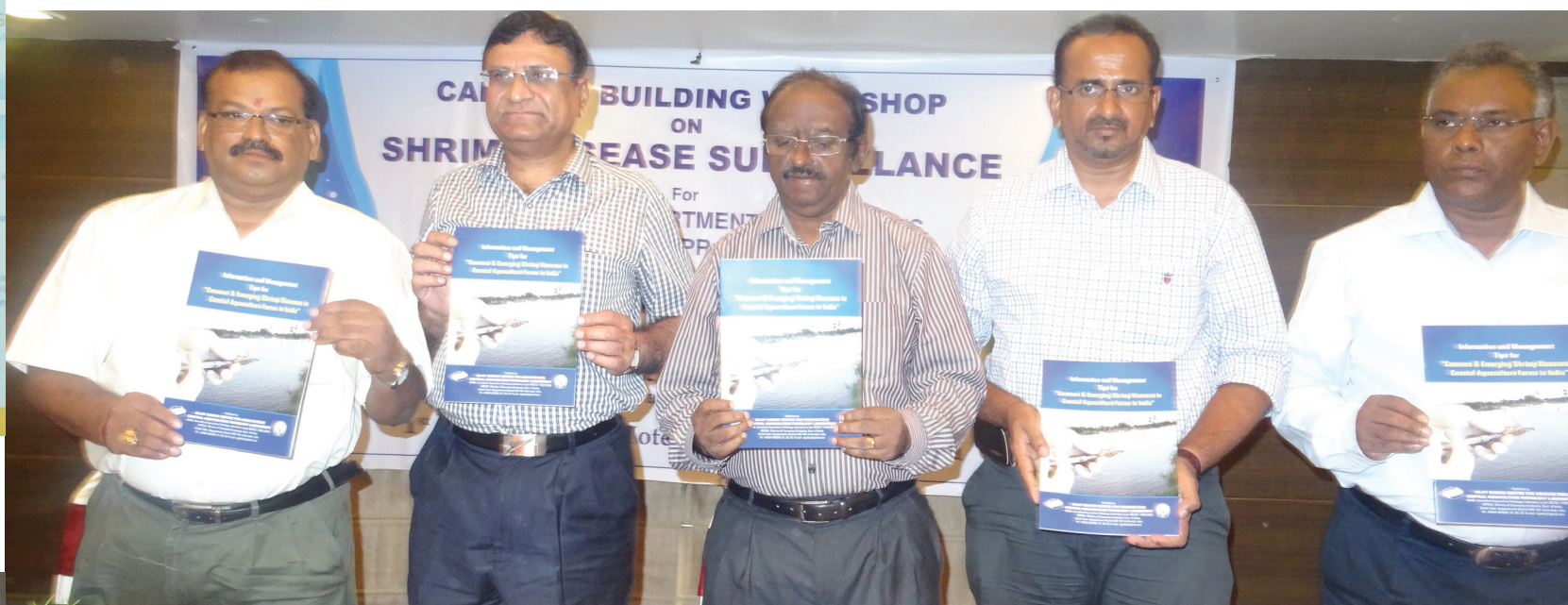


Participants of the ASFA workshop

Capacity Building Workshop on “Shrimp Disease Surveillance”

The Marine Products Export Development Authority (MPEDA), Rajiv Gandhi Centre for Aquaculture (RGCA) and National Centre for Sustainable Aquaculture (NaCSA) jointly organized a Capacity Building Workshop on “Shrimp Disease

Andhra Pradesh and conveyed that the Govt. of Andhra Pradesh under the leadership and vision of the Hon'ble Chief Minister, Shri. Chandrababu Naidu desired to make Andhra Pradesh, the aquaculture capital of the country. Shri. Y.C.



Commissioner of Fisheries released handout on shrimp Diseases during the programme

Surveillance” for the benefit of officers of the Department of Fisheries, Andhra Pradesh on 1st October, 2015 at Vijayawada.

The programme provided a comprehensive insight on the impact of diseases on Shrimp farming in the country, the new and emerging diseases that posed a serious threat to the sector, the efforts taken by MPEDA/RGCA in preventing the entry of exotic diseases into India, measures to manage diseases and the importance of Disease surveillance in the well- being of Shrimp aquaculture in the state.

The Workshop was inaugurated by Shri. Ram Shankar Naik, Commissioner of Fisheries, Andhra Pradesh, who in his inaugural address outlined the immense potential for aquaculture in the state of

Thampi Sam Raj, Project Director, RGCA explained the background and objectives of the surveillance programme and conveyed that Chairman MPEDA wished to provide as much support as possible to boost export oriented aquaculture in Andhra Pradesh and this workshop was a part of the several initiatives in this direction. Earlier, Dr. S. Kandan, Deputy Director, MPEDA RGCA Vijayawada welcomed the guests, invitees and participants to the Workshop.

Dr. Ram Mohan Rao, Assistant Director of Fisheries, AP, explained the role of Department of Fisheries in disease diagnostic services to the sector and the present status of the labs of the Department. While, Shri. V. N. Biju, Asst. Project Manager, CAPL RGCA,



made a presentation on the threat caused by New and Emerging Shrimp Diseases in the country, disease management measures, the concept of SPF shrimp, Broodstock Multiplication Centres, Nucleus Breeding Centre etc., Dr. A.K. Panda, Aquatic Quarantine Officer, RGCA outlined the significant role played by the Aquatic Quarantine Facility for *L. vannamei* at Chennai in ascertaining the SPF status of the imported shrimp stocks. Shri. H. Dinesh Kumar, Project Manager, RGCA LvBMC Vizag, presented the operational details of the RGCA *L. vannamei* Broodstock multiplication centre. Ms. M.C. Remany, Lab-in-Charge, Aquatic Quarantine Facility explained on sample collection, fixation and dispatch procedures. Shri. Jaideep

Kumar, Deputy Project Director, RGCA provided information to the participants on the action plan on disease surveillance.

Demonstration and hands-on training on sample fixation was provided to the participants by Shri. K. Karthick Kannan, Dr. Ganeshmurthy and Dr. S. Venu of the Central Aquaculture Pathology Laboratory of RGCA.

During the programme, a "Handout on Shrimp Diseases and management measures" prepared by RGCA was released by the Commissioner of Fisheries. Shri. Shanmukha Rao, CEO, NaCSA proposed vote of thanks.



A visit to a shrimp farm was also organized the following day to provide on-site training on kit preparation, identification and collection of suitable samples at the farm, fixing and preservation of samples. These were demonstrated by Shri. K. Karthick Kannan, Dr. Ganeshmurthy and Dr. S. Venu from the Central Aquaculture Pathology Laboratory, Sirkali.



Awards & Recognitions

Project Director RGCA honoured at the CAA5, for his pioneering contribution to the development of Cage Aquaculture in the country

The Indian wing of the Asian Fisheries Society, during the International Symposium on Cage Aquaculture in Asia CAA5 organized by the Asian Fisheries Society and Central Marine Fisheries Research Institute, Kochi from the 25th to 28th November 2015 at Kochi, honoured eminent personalities in India who through their innovative R & D efforts had made pioneering contributions for the development of Cage Aquaculture in the

country. Shri. Y.C. Thampi Sam Raj, Project Director RGCA was one of the recipients of the Award. According to a citation read at the event, Shri. Y. C. Thampi Sam Raj has been “a catalyst for bringing in significant noticeable changes in the aquaculture industry of the Country by virtue of his advice, strategic planning and effective implementation on cage aquaculture”.



Shri. Jaideep Kumar, Deputy Project Director of RGCA receiving the award on behalf of Shri. Y. C. Thampi Sam Raj from Dr. Derek Staples, Immediate Past President of AFS, Malaysia in presence of Dr. Gopalakrishnan, Convener, CAA5 and Director, CMFRI. Dr. Jena, DDG, ICAR and Dr. Mohan Joseph Modayil, former member, ASRB



RGCA bags the best paper award in CAA5



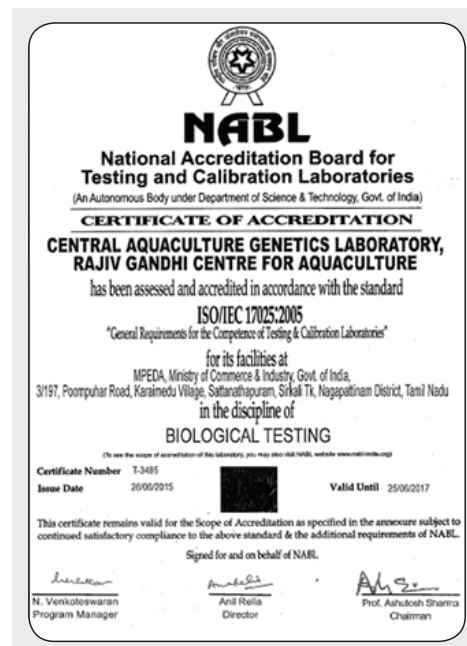
Mr. D. Thinesh Santhar, Project Manager, RGCA receiving the Best Paper award from Dr. A. Gopalakrishnan, Convener, CAA5 & Director, CMFRI in the presence of Dr. J. K. Jena, DDG (Fisheries), ICAR

A paper entitled “Hatchery Seed Production and Cage Farming of Tiger Grouper *Epinephelus fuscoguttatus* (Forsskal, 1775) in Andaman and Nicobar Islands, India” authored by D. Thinesh Santhar, S. Vijayakumar and Y.C. Thampi Sam Raj

and presented at CAA5 under the theme “Breeding and Seed Production” by Shri. D. Thinesh Santhar, Project Manager, DTSP and Grouper project, RGCA, A& N Islands won the best paper award at the symposium.

RGCA's Genetics Laboratory earns NABL accreditation

The Central Aquaculture Genetics Laboratory (CAGL) of Rajiv Gandhi Centre for Aquaculture (RGCA) becomes the first aquaculture genetics lab in the Country and the second laboratory of RGCA to earn NABL (National Accreditation Board for Testing and Calibration Laboratories) accreditation. The lab is well equipped with modern equipment including Genetic Analyzer and thermal cyclers to conduct molecular genetics research. The Genetics lab also plays a pivotal role in on going selective breeding programmes of shrimp, scampi and tilapia projects of RGCA. It also undertakes genetics based population studies for targeted species to determine the founder population for selective breeding programmes.

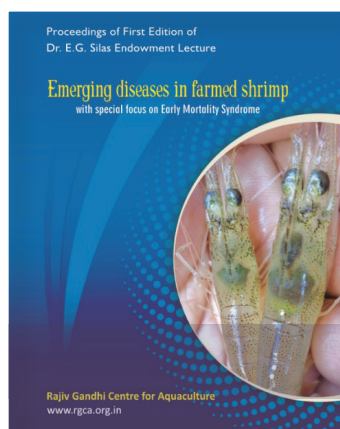


Publications from RGCA Team



RGCA Annual report 2014-15

104 Pages : Paperback full colour
ISSN : 2347- 4483



Biju V N., Raju D V S N., Jaideep Kumar., Remany M C [Eds] [2015]
Emerging diseases in farmed shrimp with special focus on Early Mortality Syndrome: Proceedings of the First Edition of Dr.E G Silas Endowment Lecture , 5th September 2013, Rajiv Gandhi Centre for Aquaculture, Sirkali

82 pages : Paperback full colour
ISBN : 978-81-929898-2-2
Price Rs. 200 plus Postage Rs. 50



RGCA Newsletter Nos.4-5

Released during 2015-16



- Kumaran Ganesh., Thampi Sam Raj., Santhanam Perumal., Pandiarajan Srinivasan, and Arulraj Sethuramalingam. 2015. Breeding, Larval Rearing and Farming of Mangrove Crab, *Scylla serrata* (Forsk., 1775) p163-172. In Santhanam Perumal, Thirunavukkarasu A R, (Eds.) *Advances in Marine and Brackishwater Aquaculture*, Springer, pp262.
- Kumaran Ganesh and Thampi Sam Raj. 2015. Importance of floating pellet feed in seabass farming. *jalakarshakan*, : August, 35-38. (Malayalam)
- Remany. M. C., Daly Cyriac., P Krishnakanth Varada Raju., Sruthi Prem O.C., A K Panda., Jaideep Kumar and Thampi Sam Raj. 2015. Effect of preservatives, temperature and storage duration on stability of nucleic acids of pleopod tissues of *Penaeus vannamei* (Boone) and screening of viral infections. *Indian Journal of Experimental Biology*, 53(10):665-670.
- Johnson D Cruz, Damodar P.N and Thampi Sam Raj Y.C. 2015. Advances made by RGCA in cage farming of cobia *Rachycentron Canadum* in India, p.32. In Sobhana K .S., Sandhya Sukumaran, Kathirvelpandian, A and Rahul G Kumar (Eds.), *Books of Abstracts 5th International symposium on cage Aquaculture in Asia (CAA5)*, Asian Fisheries Society, Central Marine Fisheries Research Institute, Kochi, India, 178pp.
- Thinesh Santhar, D., Vijayakumar, S and Thampi Sam Raj Y. C. 2015. HDPE sea cage culture systems for Andaman Islands, India p.33. In Sobhana K .S., Sandhya Sukumaran, Kathirvelpandian, A. and Rahul G Kumar. (Eds.), *Books of Abstracts 5th International symposium on cage Aquaculture in Asia (CAA5)*, Asian Fisheries Society, Central Marine Fisheries Research Institute, Kochi, India, 178pp.
- Thinesh Santhar, D., Vijayakumar, S and Thampi Sam Raj Y. C. 2015. Hatchery seed production and cage forming of tiger grouper *Epinephelus fuscoguttatus* in Andaman and Nicobar Islands p.83. In Sobhana K .S., Sandhya Sukumaran, Kathirvelpandian, A and Rahul G Kumar (Eds.), *Books of Abstracts 5th International symposium on cage Aquaculture in Asia (CAA5)*, Asian Fisheries Society, Central Marine Fisheries Research Institute, Kochi, India, 178pp.
- Dhandapani, K., Johnson D Cruz and Thampi Sam Raj Y. C. 2015. Advances made by RGCA in breeding and seed production of cobia *Rachycentron Canadum*, p.85. In Sobhana K .S., Sandhya Sukumaran, Kathirvelpandian, A and Rahul G Kumar (Eds.), *Books of Abstracts 5th International symposium on cage Aquaculture in Asia (CAA5)*, Asian Fisheries Society, Central Marine Fisheries Research Institute, Kochi, India, 178pp.
- Kumaran Ganesh and Arulraj. S 2015. Breakthrough in Mangrove Mud Crab seed production. *RGCA Newsletter* 1(1): 17-18.
- Pandiyarajan S. 2015. Improvised packing methodology for crab transport. *RGCA Newsletter* 1(1): 19.
- Kumaran Ganesh. 2016. Aquaculture diversification through Asian Seabass, *Lates Calcarifer*. *MPEDA Newsletter* 3(10): 21-25.
- RGCA. 2016. Broodstock Multiplication in Visakhapatnam. *Aquaculture Asia Pacific*, 12(3): 8-11.
- Remany, M. C., Kirubakaran, R, Daly Cyriac, Krishnakanth Varadaraju, P, Kannan, D, Jaideep Kumar, Sruthi Prem, O. C, Panda, A.K and Thampi Sam Raj Y. C. 2016. Influence of Shipment Induced Stresses on Quarantine Survival of *Penaeus vannamei* (Boone, 1931) Broodstock Imported to India, p.13. In Nandhini, N.J (Ed.), *Books of Abstracts International Conference on Environmental Stress and Aquatic Animal Health (ESAHH-2016)*, Department of Fisheries, Kerala, 86pp.
- Narayanan Biju, Ganesan Sathiyaraj, Mithun Raj, Venu Shanmugam, Babu Baskaran, Umamaheswari Govindan, Gayathri Kumaresan, Karthick Kannan Kasthuriraju, Thampi Sam Raj Yohannan Chellamma. 2016. High prevalence of Enterocytozoon hepatopenaei in shrimps *Penaeus monodon* and *Litopenaeus vannamei* sampled from slow growth ponds in India. *DISEASES OF AQUATIC ORGANISMS*, 120: 225-230.
- Anup Mandal, Jaideep Kumar and Thampi Sam Raj Y. C. 2016. Status of Genetically modified Products in India, p.64-82. Santra, S. C and Mallick, A (Eds). *Recent Biotechnological Applications in India*, ENVIS Centre on Environmental Biotechnology Department of Environmental Science University of Kalyani, West Bengal.

Participation in Training Programmes, Seminars and Workshops

International

| S. No | Name of the Staff | Training/seminar | Organized by | Duration |
|-------|--|---|--|--|
| 1 | Ganesh K, S Pandiarajan, Thinesh Santhar, Boyina Srikanth, Aravind V S and DYS Krishnamurthy | "International training program on Innovative Biofloc Technologies for Disease prevention and Control in Shrimp Farming" | Asian Institute of Technology (AIT), Thailand | 6 – 10 July 2015 |
| 2 | Anu C. Jose | Taiwan International Internship program on Protein purification techniques | Genomic Research Center of Academia Sinica. Taiwan | July 1 st to August 31 st , 2015 |
| 3 | Y.C Thampi Sam Raj, Anup Mandal and V.N Biju. | "Trade Aquaculture Genetic Standards: Enhancing aquaculture security and trade through policies, procedures and standards for certifying origin and genetic composition of broodstock and seed" | NACA, Bangkok | 20 - 23 January'2016. |
| 4 | Johnson D' Cruz & P.N Damodar | Open Sea Cage Culture | M/s Formosa Engineering Applications Co. Ltd, Taiwan | 4 – 9 th March' 2016 |
| 5 | DVSN Raju | Breeding and Grow-out farming of Snakehead (Murrel) | United States Soybean Export Council, Vietnam | 10 th to 16 th March, 2016 |



National

| S. No | Name of the Staff | Training/seminar | Organized by | Duration |
|-------|---|---|---|--|
| 1 | 30 Staff Members from RGCA & MPEDA | Utilization of online ASFA for Scientific Data collection | RGCA at its Head Quarters Sirkali | 15 th May 2015 |
| 2 | Anup Mandal | Summer School on "Advance tools for genetic improvement of aquaculture species: an integrated approach" | ICAR-CIFA, Bhubaneswar | 10-30 th June 2015 |
| 3 | M.C Remya | Workshop on Creative Writing Skills | British Council English Language Centre, Chennai | 7-8 th July'2015. |
| 4 | K. Karthik Kannan | short course on "Molecular approaches in diagnosis and control of emerging and transboundary diseases of freshwater fish and shell fish | CIFA, Bhubaneswar | 17 th to 26 th November'2015 |
| 5 | Jaideep Kumar, Johnson D'Cruz, D. Thinesh Santhar, K. Ganesh, S. Pandiarajan, K. Dhandapani, P.N Damodar, B. Appala Naidu, DVS N Raju, N. Baburao, S. Vijayakumar, V. Shanmuga Arasu, | International Symposium on "Cage Aquaculture in Asia-CAA-2015" | AFS and CMFRI, Cochin | 25 th -28 th November'2015 |
| 6 | Anjali K.M. & Anup Mandal | DTSP Data Management' | Geneticist Dr. R.W. Doyle at DTSP, South Andaman | 5 th -8 th August 2015 |
| 7 | G. Uma Maheswari and G. Sathiyaraj | Basic Confocal Microscopy | Indian Institute of Science, Bangalore. | 27 th December'2015 – 06 th January'2016 |
| 8 | Y.C Thampi Sam Raj, Jaideep Kumar, P. Jayagopal, V.N Biju, B. Appala Naidu, and A. Anand Kumar | AQUA INDIA 2016 | Society of Aquaculture Professionals, Visakhapatnam | 29 th -30 th January, 2016 |
| 9 | K. Ajeeth and S. Renugadevi, | Molecular Level Identification of Marine Fish Larvae for Effective Management of Bio-resources" | CAS, Chidambaram | 23 rd February 2016 |

Presentations / Lectures delivered by RGCA team at various forums

Dr. Anup Mandal, Project Manager, Central Aquaculture Genetics Laboratory, RGCA

- Special lecture at the National level Training program on “Molecular Level Identification of Marine Fish Larvae for Effective Management of Bio-resources” conducted by CAS in Marine Biology, Annamalai University, Parangipettai, on 23rd February 2016.
- Lecture on ‘the importance of selective breeding and quality seeds for sustainable aquaculture’ at various ‘Fish-Farmers seminar/workshops’ organized by NaCSA-MPEDA at different parts of Andhra Pradesh (including Nellore, Guntur, Machilipatnam, Ongole and Malikipuram) from 20-03-2016 to 24-03-2016.

Shri. V.N. Biju, Project Manager, Central Aquaculture Pathology Laboratory

- Lecture on ‘Emerging diseases in Shrimp Aquaculture’ at various ‘Fish-Farmers seminar/workshops’ organized by NaCSA-MPEDA at different parts of Andhra Pradesh (including Nellore, Guntur, Machilipatnam, Ongole and Malikipuram) from 20-03-2016 to 24-03-2016.

Ms. M. C. Remya, Assistant Project Manager of AQF

- Invited talk on “Biotechniques in Aquaculture Disease Management” during the first workshop cum training on biotechnological tools and techniques in aquaculture held at Sathyabama University on 15th October, 2015.

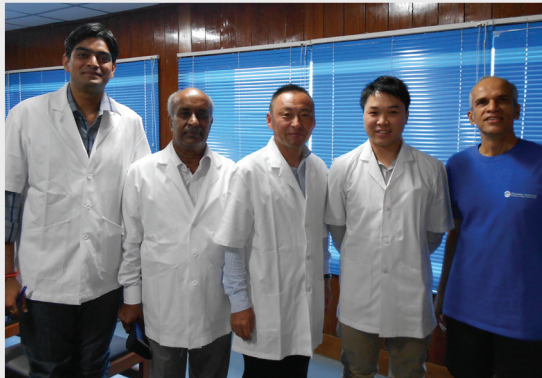
Dr. K. Ganesh, Project Manager, Seabass & Mud Crab Hatchery Project

- Lecture on “Eco friendly aquaculture through Asian seabass, Lates calcarifer and Mangrove crab, Scylla serrata”. National seminar organized by Sacred Heart College, Chalakudy, Thrissur on 16th September, 2015.
- Lecture on “Diversification of aquaculture with special reference to seabass and crab culture”. During the seminar lecture series of Society of Marine Biologists, Department of marine biology, microbiology and Biochemistry, School of marine sciences, CUSAT on 28th July, 2015.

- Lecture on “Eco-friendly and sustainable aquaculture practices of Asian Seabass and Prospects of Mud crab aquaculture” as an alternative livelihood programme for SHG Groups. During the invited lecture on aquaculture diversification organized by Department of Aquaculture, MES Asmabi College, Thrissur on 17th September, 2015.
- Lecture on “Prospects of Seabass farming” organized by RGCA, Marine finfish hatchery at RDO office for the benefit of fishermen community on 14th February 2014.
- Lecture on ‘Prospects of Cage aquaculture in India’ organized by MPEDA, RC, Kochi at Peechi Dam Site, Peechi, Thrissur on 30-11-2015.
- Invited talk on ‘Mangrove crab Aquaculture’ during the state level training programme organised for the Fisheries Staff of Kerala state by DD Fisheries (Brackish water & Training), East Kadungallur, Aluva on 1st December, 2015.
- Invited talk on ‘Asian Seabass Aquaculture’ during the state level training programme organised for the Fisheries Staff of Kerala state by DD Fisheries (Brackish water & Training), East Kadungallur, Aluva on 2nd December, 2015
- Invited talk on ‘Diversification in Aquaculture – Technology initiative by RGCA for sustainable blue economy’ during the international conference on Towards a Sustainable Blue Economy: Production, Strategies and Policies organised by Kerala University of Fisheries & Ocean Studies from 4th-6th February, 2016 at Radisson Blu, Kochi.
- Delivered talk on ‘Live Feeds’. During the State Level – UGC Seminar organised by Dept. of Zoology, Government College for Women (Autonomous), Kumbakonam, Tamil Nadu on 10th February, 2016.
- Delivered talk on ‘Blue revolution through live feed culture’ during the Training programme on ‘live feed culture and its allied industries’ organized by University Business collaboration Centre, Alagappa University, Karaikudi on 26th February, 2016.

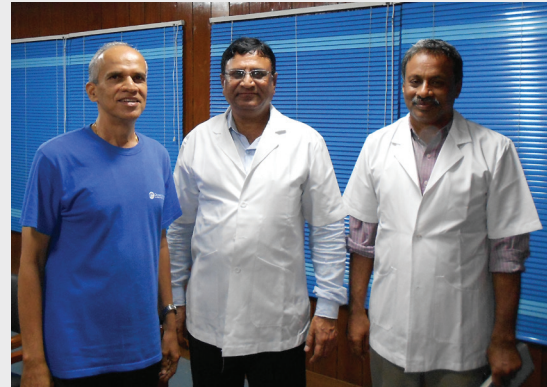


Visit of Dignitaries



Officials visit the RGCA Lv BMC at Vizag

Mr. Daisuke Kanemori & Mr. Takafumi Hashiguchi of M/s. OG Corporation, Japan along with Indian representatives Mr. Swapnesh Vichare, Business Executive & Mr. K. Premachandran, Consultant & former Resident Director of MPEDA at Japan, visited the Lv-MC Facility at Visakhapatnam on 15.06.2015, in connection with seeking the possibility of demonstrating Indoor Shrimp Production System (ISPS) in India



Shri. Rama Sankar Naik, the Commissioner of Fisheries, Government of Andhra Pradesh visited the Lv-MC Facility at Visakhapatnam on 17.06.2015 along with Shri. Koteswara Rao, Joint Director of Fisheries, AP.



Shri. K. N. Kumar IAS, the Chief Executive Officer, NFDB, Government of India visited the Lv-MC Facility on 22.09.2015 along with Dr. Paul Pandian, Executive Director, NFDB.

Following were the comments penned by the CEO, NFDB in the Lv-MC Visitor's book:

"A wonderful facility managed very well by a team of dedicated, competent and committed officials. I am proud of their work, not just as an executive of

the NFDB, but as a citizen of the country. Keep it up!"

Secretary & Joint Secretary DAHDF, MoA visit the RGCA Projects at Lv BMC, Vizag

Shri. Ashok Kumar Angurana, IAS, Secretary and Shri. Aditya K. Joshi, IFS, Joint Secretary (Fy), Department of Animal Husbandry Dairying & Fisheries, Ministry of Agriculture, Govt. of India visited the Lv-MC Facility on 15th October 2015. Shri. Rama Sankar Naik, IAS, Commissioner of Fisheries, Govt. of Andhra Pradesh. Ms. Leena

Nair, IAS, Chairman MPEDA & President RGCA were also present during their visit.

Shri. Y. C. Thampi Sam Raj, Project Director, RGCA, briefed the dignitaries on the development and operations of the facility, highlighting the crucial role played by the RGCA-Lv BMC in the development of Shrimp Aquaculture in the country.

At Tilapia and Scampi Projects, Manikonda, AP



Dignitaries try their hands on holding Tilapia and Scampi brooders at Tilapia and Scampi Projects, Manikonda, AP

The Tilapia and Scampi Projects of RGCA at Manikonda, Krishna District, Andhra Pradesh was visited by Shri. Ashok Kumar Angurana, IAS, Secretary and Shri. Aditya K. Joshi, IFS, Joint Secretary (Fy), Department of Animal Husbandry Dairying & Fisheries, Ministry of Agriculture, Govt. of India on 17th October 2015.

Shri. Jaideep Kumar, Deputy Project Director,

RGCA, provided a detailed presentation on the potential for Tilapia Aquaculture in the country and the preparedness that RGCA had been assuming to support the sector to facilitate speedy development. Project Director RGCA, Shri. Y.C. Thampi Sam Raj sought the assistance of MoA in resolving the impediments that prevented the speedy propagation of Tilapia aquaculture in India.

Secretary, DAHDF wrote in the visitor's book at the project

"Very delighted to visit this facility of MPEDA. Impressed with the high professionalism and quality of work. This centre has the potential to revolutionize aquaculture in this area. My best wishes".



- The Technical Inspection Committee constituted by the Ministry of Agriculture, Govt. of India headed by Dr. S.V. Alavandi, Principal Scientist & Head, CIBA and the members Dr. C.P. Balasubramanian, Principal Scientist, Crustacean Culture Division, CIBA; Dr. M. Muralidhar, Principal Scientist, Environment Group, CIBA; Dr. Vinay Katnani, Scientist, CIBA; Dr. T. Raja Swaminathan, Senior

Scientist, Peninsular & Marine Fish Genetic Resources (PMFGR), Centre of the NBFGR; Shri. S. Mani, Asst. Director (Tech), CAA and Shri. Tarun Kumar Singh, DAH, D&F, Ministry of Agriculture, Govt. of India has visited on 28.01.2016.

- Dr. Zuridah Merican Ph.D, Editor, Aquaculture Asia Pacific, Singapore visited on 02.02.2016.

DTSP-SBNPC, OSSPARC facility, Gopalpur on Sea



A scientist from Arizona University evaluating bio security protocol in the facility

Bio security evaluation of the DTSP-SBNPC facility was done by international experts on 3rd September 2015. The lab and facility was inspected by Pilot Scale BMC facility at OSSPARC, and certified by Dr. Donald Lightner, Professor, Arizona University, USA. The certificate stated that the facility complied with the general bio-security requirement to prevent the introduction and spread of OIE & US listed diseases of Penaeid shrimp.



Mr. Kazuo Udagawa, Fisheries Expert, JICA, JAPAN and Mr. Jitesh Kumar Panda, Development Consultant, Orissa, visited the RGCA Tilapia project on 21-12-2015. They were apprised about the contributions and role of RGCA in the development of Tilapia and Scampi aquaculture in India. The team was on survey tour to collect data on Agriculture, Food Processing (aqua exports in value added forms) and distribution in Andhra Pradesh

Shri. Ramasankar Naik IAS, Commissioner of Fisheries, Andhra Pradesh holding the Tilapia brooder at Tilapia project, Vijayawada



Seabass & Mangrove Crab hatchery facility, Thoduvai



Shri. Rama Shankar Naik, IAS. Commissioner of Fisheries, Andhra Pradesh visited Seabass hatchery on 08.06.2015



Shri. V. V. Iyar, Shri. Jayakumar, Shri. Uma Maheswaran, RAP/IAW/Ministry of Textiles, Chennai visited the Seabass hatchery on 17.02.2016

Dr. Binoy Chakrabarthy, Project Director, Department of Fisheries, Bangladesh visited the Seabass & Mangrove Crab hatchery on 21.02.2016



Aquaculture Demonstration Farm facility, Karaikal



Commissioner of Fisheries, Govt. of AP being briefed upon Sea bass farming in cages on 08-06-2015



District Collector, Karaikal observing crablets on his visit at RGCA Demonstration Farm on 02-06-2015



Aquatic Quarantine Facility for *L. vannamei*, Chennai



Mr. Aditya Joshi , Joint Secretary of Fisheries and Dr. Ravichandran, Member Secretary, Coastal Aquaculture Authority at AQF on 29.04.2015



Dr. P Ravichandran Member Secretary of CAA and Dr. K.K.Vijayan Director of CIBA-Technical Committee members of AQF operation, viewing the stock held in quarantine cubicle at AQF on 15.05.2015



Rama Sankar Naik Das, the Commissioner of Fisheries, A.P in Aquatic Quarantine Facility at Neelankarai, Chennai on 06.06.2015



Mr. K N Kumar, IAS, the Chief Executive Officer, NFDB Hyderabad with the Project Director of RGCA and AQF team at the Aquatic Quarantine Facility, Neelankarai, Chennai on 09.08.2015



Visit of Vietnam delegates to the Aquatic Quarantine Facility for *L. Vannamei* at Chennai on 13.10.2015



Mr. Simon Chung from Gene Reach Biotechnology Corporation delivers lecture on the topic "Quality Control of Diagnosis" at AQF, Chennai on 20.11.2015

RGCA Meetings

Executive Committee Meetings

52nd EC of RGCA

52nd Executive Committee Meeting of RGCA held on the 22nd September 2015 at MPEDA HO, Kochi. The following members attended the meeting

- Ms. Leena Nair, IAS, President, RGCA
- Shri. Rama Shankar Naik, IAS, Commissioner of Fisheries, Andhra Pradesh
- Dr. A. S. Ninawe, Senior Advisor, DBT
- Dr. K. K. Vijayan, Director, Central Institute of Brackishwater Aquaculture
- Shri. B. Sreekumar, Secretary, MPEDA
- Smt. Noorjahan Beevi, Addl Director, Dept. Of Fisheries, Chennai
- Smt. E. V. Deepa, CAO, MPEDA
- Shri. U.S. Sajeev, Executive Director, ADAK
- Shri. Y. C. Thampi Sam Raj, Project Director, RGCA

53rd EC of RGCA

53rd Executive Committee meeting of RGCA held on the 29th March 2016 at MPEDA HO, Kochi. The following members were attended the meeting.

- Ms. Leena Nair, IAS, President, RGCA
- Dr. Joy Krushna Jena, Deputy Director General (Fy), ICAR
- Dr. A. S. Ninawe, Senior Advisor, DBT
- Shri. B. Sreekumar, Secretary, MPEDA
- Shri. K. Rengaraju, Addl. Director, Dept. Of Fisheries, Chennai
- Shri J. Chandrasekhar, Director of Fisheries, A & N Islands
- Smt. E. V. Deepa, CAO, MPEDA
- Shri. U.S. Sajeev, Executive Director, ADAK
- Shri. Y. C. Thampi Sam Raj, Project Director, RGCA

General Body Meeting

The 22nd Annual General Body Meeting of RGCA was held on 22nd September 2015 at MPEDA, HO, Kochi. The following members were attended the meeting.

- Ms. Leena Nair, IAS, Chairman, MPEDA/President, RGCA
- Shri. Rama Shankar Naik, IAS, Commissioner of Fisheries, Andhra Pradesh
- Dr. A.S Ninawe, Sr. Advisor, DBT, New Delhi
- Dr. K. K. Vijayan, Director, CIBA, Chennai



- Shri. B. Sreekumar, Secretary, MPEDA
- Smt. Noorjahan Beevi, JD (Inland Fisheries), Dept. of Fisheries, Chennai
- Shri. U.S Sajeer, Executive Director, ADAK, Trivandrum
- Smt. E.V. Deepa, Chief Accounts Officer, MPEDA
- Shri. Y.C. Thampi Sam Raj, Project Director, RGCA
- Shri. K. J. Antony, Joint Director (M), MPEDA
- Dr. S. Vijayakumar, Deputy Director (Aqua), RC Nagapattinam, MPEDA

Scientific Advisory Committee Meeting

Four Meetings of Scientific Advisory Committee of RGCA were held during the year 2014-15.

28th SAC meeting

28th SAC Meeting of Scientific Advisory Committee of RGCA held on 15th June'2015 at MPEDA, HO, Kochi.

29th SAC meeting

29th SAC Scientific Advisory Committee meeting of RGCA held on 11th December 2015 at MPEDA HO, Kochi.

30th SAC meeting

30th SAC meeting of the Scientific Advisory Committee of RGCA held on the 29th March 2016 at MPEDA HO, Kochi.

31st SAC meeting of RGCA

31st SAC meeting of the Scientific Advisory Committee of RGCA held at 10.30 am on 13th May 2016 at hotel Abu Sarovar Portico, Chennai

Budget and Expenditure

The sanctioned Budget of Rs. 4183 lakhs was earmarked for RGCA projects during 2015-16; Rs. 1513 lakhs for capital expenditure and Rs. 2670 lakhs for recurring expenditure. The Total fund

available during the financial year was Rs. 9,586.69 lakhs and total expenditure was Rs. 9,017.28 lakhs. The closing balance as on 31.03.2016 was Rs. 569.39 lakhs & cash balance was Rs. 0.02 lakhs.

RGCA Foundation (Corpus Fund)

During the 11th plan period, RGCA was sanctioned an amount of Rs. 25 crore as corpus fund towards the maintenance of various infrastructure facilities developed by RGCA and also for maintaining a core group of manpower at RGCA projects. This fund was deposited in nationalized banks and the interest derived from investing the same was utilized to meet the infrastructure maintenance costs of some of RGCA projects. Subsequently, during February, 2016 under the 12th plan RGCA received an additional amount of Rs. 25 Crore to strengthen the Corpus Fund.

During April' 2015, the accumulated Corpus fund of Rs. 47.25 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'2015. This was as per the decision of the RGCA Corpus Fund Management Committee comprising of senior officers from MPEDA and RGCA that is empowered to take decisions on the investment of the same. The amount at maturity would be Rs. 52.16 Crores.

Further, the subsequent sanction of Rs. 25 crores was also deposited with the TNPF & INDC Ltd., for a period of 3 years with effect from 3rd February, 2016 at an interest rate of 9.50%.

| RGCA FOUNDATION CORPUS FUND DETAILS (2008-09 TO 2015-16) | Rs. In lakhs |
|---|-----------------|
| Sanction during XI th Plan period | 2,500.00 |
| Add: Accumulated Interest (upto April'2016) | 2,715.85 |
| Total Accumulated fund (upto 10th April'2016) | 5,215.85 |
| Less: Maintenance costs of Select RGCA projects (upto March'16) | 1,209.00 |
| Balance | 4,006.85 |
| Add: Sanction during XII th Plan period (03/02/2016) | 2,500.00 |
| Balance (as on 31st March'2016) | 6,506.85 |



Manpower

| S. No. | Name of the Staff | Designation | S. No. | Name of the Staff | Designation |
|---|--------------------------|--------------------------------|--------------------------------|--------------------------|-------------------------------|
| RGCA HEAD QUARTERS, KARAIMEDU, SORKALI | | | 31 | Shri. B. Ananth | Accountant |
| 1 | Shri. Y.C Thampi Sam Raj | Project Director | 32 | Shri. P. Babu | Electrician-cum-Mechanic |
| 2 | Shri. Jaideep Kumar | Deputy Project Director | 33 | Shri. S. Elangeswaran | Asst. Project Manager |
| 3 | Shri. S. Krishnadas | Chief Accounts Manager | 34 | Shri. Devika Rani | Accountant |
| 4 | Shri. V.N Biju | Project Manager | 35 | Shri. Edwin Joseph | Project Manager-Library |
| 5 | Dr. Anup Mandal | Project Manager (CAGL) | 36 | Shri. R. Kamalraj | Jr. System Analyst |
| 6 | Ms. B. Thiripurasundari | Junior Project Manager (P & A) | 37 | Shri. R. Ganeshamurthy | Asst. Technical Manager |
| 7 | Shri. K. Rajendran | Administrative Assistant | 38 | Shri. K. Ajeeth | Technician |
| 8 | Shri. U. Chinnadurai | Driver | 39 | Shri. Lanka Praveen | Technician |
| 9 | Shri. Rajesh. D. | Asst. Accounts Manager | 40 | Ms. Anu C Jose | Asst. Technical Manager |
| 10 | Shri. Rajeeesh. G. | Asst. Accounts Manager | DTSP, A & N ISLANDS | | |
| 11 | Shri. Mahadevan | Accountant | 41 | Shri. D. Thinesh Santhar | Project Manager |
| 12 | Shri. Marieswaran K. | Accountant | 42 | Shri. S. Nagaraj | Asst. Project Manager |
| 13 | Shri. Maheswaran K. | Accountant | 43 | Shri. Bangaraju P. | Jr. Project Manager |
| 14 | Shri. Arumugam K. | Accountant | 44 | Shri. G. Siva Krishna | Asst. Technical Manager |
| 15 | Dr. DVSN Raju | Asst. Project Manager | 45 | Shri. Binod Gharami | Facility Manager |
| 16 | Shri. N. Babu Rao | Asst. Project Manager | 46 | Dr. M. Shailendar | Asst. Project Manager |
| 17 | Shri. A. Elamaran | Asst. Project Manager (Works) | 47 | Shri. K. Praveen Raj | Asst. Project Manager (P & A) |
| 18 | Shri. Mithun Raj | Asst. Technical Manager | 48 | Shri. Sarmal K.P | Asst. Technical Manager |
| 19 | Shri. B. Babu | Asst. Technical Manager | 49 | Shri. D. Silambarasan | Asst. Technical Manager |
| 20 | Ms. Sobha P.S | Asst. Technical Manager | 50 | Shri. Boorada Kishor | Asst. Technical Manager |
| 21 | Ms. Anjali K.M | Asst. Technical Manager | 51 | Shri. Nayeem Faud | Accountant |
| 22 | Shri. S. John | Library Assistant | 52 | Shri. Daymay Haldar | AFM (Electrical) |
| 23 | Shri. K.V Ravikumar | Accountant | 53 | Shri. P. Krishna Swamy | Electrician-cum-Mechanic |
| 24 | Shri. L. Ruban | Asst. Technical Manager | 54 | Shri. R. Rajan | APM (Civil) |
| 25 | Shri. K. Karthik Kannan | Asst. Technical Manager | 55 | Shri. Sheetal Dilip | Technician |
| 26 | Shri. E. Anananda Jothi | Asst. Tech. Manager | 56 | Shri. John C.E | APM |
| 27 | Dr. L. Mohan Kumar | Asst. Librarian | 57 | Shri. I. Rakkaiah | Asst. Project Manager |
| 28 | Shri. G. Sathiyaraj | Asst. Tech. Manager | 58 | Shri. Sarun John Roay | Technician |
| 29 | Dr. V. Shanmuga Arasu | Asst. Project Manager | 59 | Shri. J. Ganesh | Technician |
| 30 | Dr. G. Uma Maheswari | Asst. Technical Manager | 60 | Shri. T. Yallam Naidu | Technician |

61 Shri. Abhisheak Shaik Technician

DTSP-HHSSPU-II, CHIRALA

62 Shri. G. Ramar Project Manager
 63 Shri. Susanta Kumar Patra Asst. Project Manager
 64 Shri. Janaki Ramaiah Asst. Project Manager (P & A)
 65 Shri. Kiran Pilli Technician
 66 Ms. Uma Maheswara Rao Asst. Project Manager
 67 Shri. P.L Arun Electrician-cum-Mechanic

DTSP-SBNPC, ODISHA

68 Shri. B. Srikanth Project Manager
 69 Shri. Y. Narayanaswamy Asst. Technical Manager
 70 Shri. Kanakam Suresh Technician
 71 Shri. T. Srinivasa Rao Purchase-cum-Store Assistant
 72 Shri. Haraprasad Panigrahy Electrician-cum-Mechanic
 73 Shri. Ganeshwar Behera AFM (Civil)
 74 Shri. K.E Rajkumar Asst. Project Manager

DTSP-BMC, KANYAKUMARI

75 Dr. P. Jayagopal Sr.Project Manager
 76 Shri. C. Elamparuthi APM (Works)

GROUPEER PROJECT, A & N ISLANDS

77 Shri. S. Vijayakumar Asst. Technical Manager
 78 Shri. G. Elumalai Accountant

ARTEMIA PROJECT, TUTICORIN

79 Shri. Samaya Kannan Asst. Project Manager
 80 Shri. S. Balachander Asst. Technical Manager
 81 Shri. S. Moovendan Asst. Technical Manager
 82 Shri. J. Mohan Raj Accountant
 83 Shri. Sunith Shine Asst. Technical Manager

AQUATIC QUARANTINE FACILITY, CHENNAI

84 Dr. Amiya Kumar Panda Project Manager
 85 Shri. D. Kannan Asst. Project Manager
 86 Smt. M. C. Remy Project Manager-SRPM
 87 Shri. Aadhavan K. Facility Manager
 88 Smt. Daly Cyriac Asst. Technical Manager
 89 Shri. Aswini Kumar Asst. Technical Manager
 90 Shri. Erra Suresh Babu Asst. Technical Manager

91 Shri. V. Ravi Kumar Asst. Technical Manager
 92 Shri. K. Sankar Purch./Stores Asst.
 93 Shri. P. KrishnaKanth Asst. Technical Manager
 Varadha Raju
 94 Ms. Sruthi Prem Asst. Technical Manager
 95 Shri. K. Ganesan Electrician-cum-Mechanic
 96 Shri. P. Thirunavukkarasu Technician
 97 Shri. G. Srinivasa Rao Technician
 98 Shri. Arun Babu Asst. Facility Manager (Elec)
 99 Shri. Sandeep K.S Accountant
 100 Shri. Amal Joseph Accountant

SEABASS/MUD CRAB HATCHERY, THODUVAI

SEABASS HATCHERY

101 Dr. K. Ganesh Project Manager
 102 Shri. R. Senthil Kumar Mech-cum-Elec Supervisor
 103 Shri. A.S Vasudevan Electrician-cum-Mechanic
 104 Shri. Sujith P.U Accountant
 105 Shri. D. Y. S. Krishna Murthy Asst. Project Manager
 106 Shri. K.V Gangadharan Asst. Technical Manager
 107 Shri. M. Saravanan Asst. Technical Manager
 108 Shri. R. Murugesan Asst. Technical Manager

MUD CRAB HATCHERY

109 Shri. S. Arulraj Asst. Project Manager
 110 Shri. K. Velmurugan Asst. Technical Manager
 111 Shri. S. Viswanathan Asst. Technical Manager

AQUACULTURE DEMO FARM, KARAİKAL/ MAHENDRAPALLI

112 Shri. S. Pandiarajan Project Manager
 113 Shri. B. Narasimha Rao Project Manager (Site-II)
 114 Shri. K. Satheesh Kumar Asst. Technical Manager
 115 Shri. Rajarajan S.V Accountant
 116 Dr. G.K Dinakaran Asst. Project Manager
 117 Shri. T. Sundaresan Asst. Technical Manager

SCAMPI / TILAPIA PROJECTS, VIJAYAWADA

SCAMPI PROJECT

118 Dr. Johny. T. Varghese Junior Project Manager
 119 Shri. B. Suresh Asst. Technical Manager



| | |
|---------------------------------|--------------------------|
| 120 Shri. K. Lakshmi Narayana | Asst. Technical Manager |
| 121 Shri. G. Ramu | Accountant |
| 122 Shri. K.K Chintaiyah | Asst. Technical Manager |
| 123 Shri. S. Kannan | Asst. Project Manager |
| 124 Shri. Hanok Kumar Indupalli | Technician |
| 125 Shri. Vikasri Godi | Technician |
| 126 Shri. G.P Subba Rao | Electrician-cum-Mechanic |

TILAPIA PROJECT

| | |
|--------------------------------|--------------------------|
| 127 Shri. B. Appala Naidu | Asst. Project Manager |
| 128 Shri. Mathews Varkey | Asst. Project Manager |
| 129 Shri. P. Srinivasa Rao | Asst. Project Manager |
| 130 Shri. U. Gunasekaran | Asst. Technical Manager |
| 131 Shri. V. Subash | Accountant |
| 132 Shri. M. Gnanavel | Asst. Technical Manager |
| 133 Shri. P. Srinu | Technician |
| 134 Shri. P.S Sivakumar | Asst. Technical Manager |
| 135 Shri. G. Senthil | Technician |
| 136 Shri. Kotharu Rohini Kumar | Electrician-cum-Mechanic |
| 137 Shri. Lakshmanarao Nayudu | Asst. Technical Manager |

MARINE FINFISH PROJECT, POZHIVUR, MUTTOM

| | |
|--------------------------|-------------------------|
| 138 Shri. Johnson D Cruz | Project Manager |
| 139 Shri. K. Dhandapani | Asst. Project Manager |
| 140 Shri. G. Karthik | Accountant |
| 141 Shri. V. S. Aravind | Asst. Technical Manager |
| 142 Shri. Damodar. P. N. | Asst. Project Manager |

| | |
|-----------------------------|--------------------------|
| 143 Shri. A. Packiaraj | Technician |
| 144 Shri. V. Pharthasarathy | Accountant |
| 145 Shri. M. Saravanan | Asst. Technical Manager |
| 146 Shri. E.S. Sajith | Electrician-cum-Mechanic |

RGCA L.VANNAMEI BROODSTOCK MULTIPLICATION CENTRE, VIZAG

| | |
|----------------------------------|-------------------------------|
| 147 Shri. H. Dinesh Kumar | Project Manager |
| 148 Shri. P. Michael Renold Bino | Accountant |
| 149 Shri. Ch. Santhosh Kumar | Asst. Technical Manager |
| 150 Ms. Varanasi Laxmi | Asst. Technical Manager |
| 151 Shri. A. Anand Kumar | Asst. Project Manager |
| 152 Shri. Ranjan Kumar Patra | Asst. Project Manager |
| 153 Shri. Ratikanta Mahapatra | Asst. Project Manager (P & A) |
| 154 Shri. Lanka Gurumurthy | Technician |
| 155 Shri. Anish. G | Purchase-cum-Store Assistant |
| 156 Shri. DV Ravi Kishore | Technician |
| 157 Shri. Raju Kari | Technician |
| 158 Shri. K. Simhachalam | Technician |
| 159 Shri. L. Sunil Kumar | Technician |
| 160 Shri. TA Nagaraju | Electrician-cum-Mechanic |
| 161 Shri. Feroze Rajan | AFM (Elec) |

Addresses of RGCA Projects

Administrative Complex (Registered office)

RAJIV GANDHI CENTRE FOR AQUACULTURE

(MPEDA, Ministry of Commerce & Industry,
Govt. of India)
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Website : www.rgca.org.in

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

Seabass Hatchery Project

Dr. K. Ganesh,
Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE

Seabass/Mud Crab Hatchery Project,
Koozhaiyar Road, Thoduvai, Thirumullaivasal,
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Mud Crab Hatchery Project

Shri. S. Arul Raj,
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Mud Crab Hatchery Project,
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RGCA Shrimp Breeding Projects

Dr. P. Jayagopal

Sr. Project Manager - Shrimp Breeding Projects

RAJIV GANDHI CENTRE FOR AQUACULTURE

Broodstock Multiplication Centre

Thekkuruchi Village, Ganapathipuram – 629 502,
Kanyakumari District, Tamil Nadu.

Tel : 0465-2208298
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Domestication of Tiger Shrimp Project (NBC)

Shri. D. Thinesh Santhar

Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE

Nucleus Breeding Centre

Kodiaghat Village, Burmanalla P.O
Gharacharama (via), Port Blair
South Andaman – 744 105
Andaman and Nicobar Islands, INDIA

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Email : rgcadtsps@gmail.com

Pilot Scale Broodstock Multiplication Centre

Shri. Boyina Srikanth

Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE

Pilot Scale BMC & High Health Seed

Production Unit

Orissa State Shrimp Production and Research
Centre (OSSPARC),
VIP Road, Gopalpur on Sea,
Ganjam District, Odisha – 761 002

Tel : 0680 2343065
Email : rgcadtspsbnp@gmail.com



**High Health Shrimp
Seed Production Unit - Chirala**

Shri. G. Ramar
Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE
High Health Seed Production Unit – II, Chirala
Vadarevu -523 157, Chirala Mandal,
Prakasam District, Andhra Pradesh

Tel : 08594-248224
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Email : rgcadtspnrc@gmail.com

Pre-Primary and Primary Quarantine Unit

Shri. M. Shailender
Asst. Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE
Pre-primary and Primary Quarantine Unit,
Amkunj, Near Rangat,
Middle Andaman – 744 205
Andaman and Nicobar Islands

Tel : 03192 215801
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L. vannamei Broodstock Multiplication Centre

Shri. H. Dinesh Kumar
Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE
The Andhra Pradesh Shrimp Production and
Research Centre (TASPARC),
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Bheemunipatnam Mandal,
Visakhapatnam District, Andhra Pradesh.

Tel : 08933 224104
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Email : rgcavannameibmc@gmail.com
Mobile : 09491910529

Grouper Project

Shri. D. Thinesh Santhar
Project Manager

RAJIV GANDHI CENTRE FOR AQUACULTURE
Grouper Project, Kodiaghat Village,

Burmanalla P.O
Gharacharama (via), Port Blair,
South Andaman – 744 105
Andaman and Nicobar Islands

Tel : 03192 281331
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Fax : +91 3192 281197
Email : rgcagp@gmail.com

Pilot Scale Artemia Project

Shri. M. Samaya Kannan, Asst. Project Manager
RAJIV GANDHI CENTRE FOR AQUACULTURE
Pilot Scale Artemia Project
2/340, Rajiv Gandhi Road, Tharuvaikulam – P.O,
Ottapidaram Taluk, Tuticorin – 628 105
Tamil Nadu

Tel : 0461 2277605
Mobile : +91 9965140759
Email : artemiargca@gmail.com

Aquaculture Demonstration farm

Shri. S. Pandiarajan - Project Manager
RAJIV GANDHI CENTRE FOR AQUACULTURE
Aquaculture Demonstration Farm,
No.102, 'GOWTHAM', North Street,
Karukkalacherry,
Akaraivattam Post, Neravy (Via),
Karaikal – 609 604
Union Territory of Pondicherry

Tel : 04368 222765
Email : rgcademofarm@gmail.com

Aquatic Quarantine Facility for L. vannamei

Dr. Amiya Kumar Panda, Project Manager
RAJIV GANDHI CENTRE FOR AQUACULTURE
Aquatic Quarantine Facility for L. vannamei
TNFDC Hatchery Complex, Beach Road,
Kapaleeswarar Nagar, Neelankarai,
Chennai – 600 041. Tamil Nadu

Tel : +91 44 24495070
Mobile : +91 9841023603
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Email : aqfacility@gmail.com

Scampi Broodstock Development Project

Shri. Jaideep Kumar – Technical Head
RAJIV GANDHI CENTRE FOR AQUACULTURE
 Scampi Broodstock Development &
 Tilapia Project

Konathanapadu Village, Kankipadu Mandal,
 Produtur Panchayat – 521 151.
 Vijayawada, Krishna District, Andhra Pradesh

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Tilapia Project

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L. vannamei broodstock and larvae rearing tanks at BMC, RGCA