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FAMILY FARMING MODEL IN BRACKISHWATER AQUACULTURE FOR LIVELIHOOD SUPPORT OF COMMUNITIES LIVING AROUND ADYAR CREEK AND ESTUARY

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भा.कृ.अनु.प.– केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान
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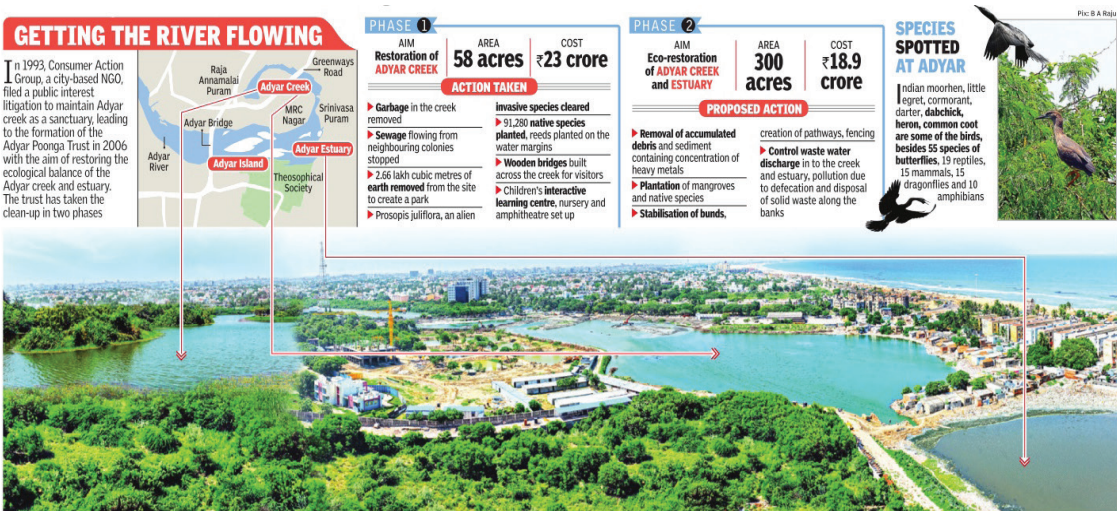
BACKGROUND

Estuarine and coastal areas are complex and dynamic aquatic environment. India has a long coastline of 8,129 km and 6,000 km of this is rich in estuaries, creeks, brackishwater, lagoons and lakes. The southeast coast of India is an important stretch of coastline, where many major rivers drain into the Bay of Bengal and they are rich in marine fauna and flora. Adyar creek is one of the primary and vibrant estuarine ecosystems of Chennai.

	History of Adyar
7th Century	Pallava port of mylapore is believed to have been on the northern bounds of adyar estuary.
1798	Adyar finds position in a British map as a suburb.
Late 18th & early 19th century	British garden houses were built on the northern bank of the river.
1840	Construction of Elphinstone bridge, giving access to the southern bank of adyar river.
1867	Madras Boat Club set up. Rowing continuous to be a popular sport on the river.
1882	Acquisition of 28 acre of estate on the southern bank of the river, an early step towards the formation of today's 270 acre Theosophical Society.
1950	Fisheries department of Govt. of Tamil Nadu controls the creek area and sets up fish farms and related institutions.
1993	Consumer Action Group, a city based NGO, filed a public interest petition to maintain adyar creek as a sanctuary.
Late 20th century	Waste water and sewage inflows, continual dumpling of debris and garbage along the river, estuary and creek. Heavy construction activity along the creek's edges.
2006	Following a court order, state government sets up Adyar Poonga Trust for restoration of the creek and estuary.

In 1950s Department of Fisheries, Govt. of Tamil Nadu was involved in the setting up fish and shrimp farms adjacent to the creek under the all India network project on fish farming. It was one among the first brackishwater shrimp farm in south India. But in later years with the urbanisation of Chennai, the Adyar estuary has lost its pristine condition along with the rich fauna, and was under great ecological stress due to progressive encroachment, discharge of untreated sewage, effluents, and solid waste disposal. As a result of degradation, many vital biological attributes of Adyar estuary such as clean brackishwater, faunal and floral diversity and its role as spawning and nursery ground of commercially important finfish and shellfish were lost.

In order to restore the ecology of Adyar estuary, Government of Tamil Nadu has taken up ambitious restoration measures. The eco-restoration activities of Adyar creek undertaken by Chennai Rivers Restoration Trust (CRRT) commenced in January 2008 and launched an ambitious project to clean the estuary (in two phases: 58 acres and 300 acres), with a budget of around Rs. 60 crores. It included excavation of accumulated sludge and debris in the water body which resulted in an increase of the water spread of the creek and has facilitated the ecological function of the creek. Before the implementation of eco-restoration activities, the stormwater drains were misused for sewage discharge.



(Source: Aug 26 2014, The Times of India, Chennai)

During the restoration, the sewage is diverted into the sewer pipeline to prevent the sewage inflow into the creek. Earthen mounds created around the water body, which supports coastal vegetation such as intertidal plants like mangroves, mangrove associates reeds and terrestrial plants. It serves as a niche for birds and other terrestrial animals of creek ecosystem. These mounds also serve as sound barriers against vehicular traffic. The plantation at Adyar creek comprised of six vegetative elements such as trees, shrubs, herbs, grasses, climbers and aquatic plants for planting in aquatic zone, core zone, peripheral zone, inland and littoral zone, along with water margins and hedges, grass cover, specimen tree, rockery etc. During the restoration process, the water bodies have been protected from any external source of pollution. Also, the site was protected from hunting and vandalism of the habitat of birds and reptiles.

At this point, in 2015, ICAR-CIBA, a national research institute, Govt of India has taken up the research cum demonstration work for the development of brackishwater aquaculture in the Adyar creek water bodies with the following objectives: (1) To evaluate and monitor soil and water parameters for the development of brackishwater aquaculture (2) To measure species diversity, density and abundance of available zooplankton and phytoplankton in the creek (3) To demonstrate brackishwater aquaculture technologies among coastal communities for their alternative livelihoods and as income generating activity

SOIL AND WATER QUALITY

To evaluate the potential of aquafarming in Adyar estuary, water and soil characteristics of the creek (from six sampling sites, Fig. 1) were evaluated for two years at monthly intervals. Maximum salinity was recorded in March (33 ppt) and the minimum was recorded in September (7 ppt). The pH of the water was almost stable throughout the year (7.9 to 8.6). Hardness and total alkalinity of the water varied according to the variations in salinity (Fig. 2a & b). Organic carbon and pH of the soil ranged between 0.23 and 2.8% and 7.5 and 8.9 respectively. It is also found that salinity, turbidity (Fig. 3), metabolites and nutrients varied significantly with the tidal pattern of the day (Table. 1). The two years study suggests that the physico-chemical characteristics of the estuary were within the desirable limits for brackishwater farming.

Fig. 1. Location map of Adyar creek sampling stations

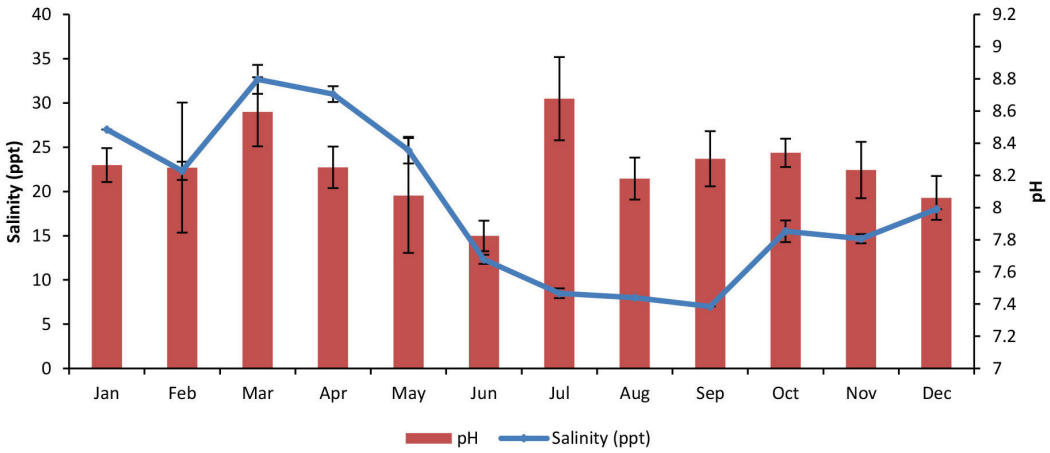


Fig. 2a. Changes in water quality parameters (Mean ±SD) of Adyar creek and estuary

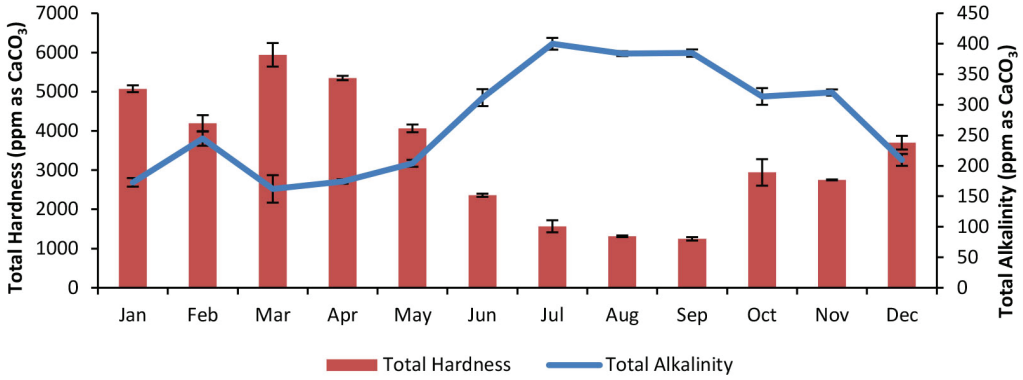


Fig. 2b. Changes in water quality parameters (Mean ±SD) of Adyar creek and estuary

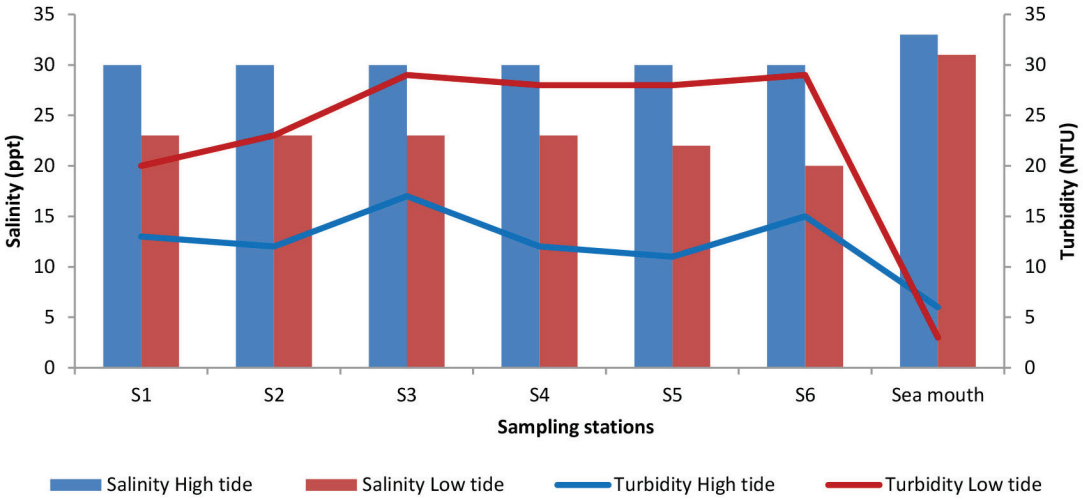


Fig. 3. Changes in salinity and turbidity level of Adyar creek water under low and high tide

Table 1. Influence of high and low tide on nutrients and metabolites concentration of Adyar creek water

Parameters	High tide		Low tide	
	Mean*±SD	Sea mouth	Mean*±SD	Sea mouth
pH	8.35±0.079	8.4	8.223±0.063	8.28
TAN (ppm)	2.036±0.221	0.309	2.346±0.031	0.8151
Nitrite-N (ppm)	0.045±0.033	0.017	0.05±0.047	0.001
Nitrate-N (ppm)	0.112±0.094	0.0556	0.101±0.141	0.0137
Phosphate (ppm)	0.556±0.041	0.088	1.176±0.086	0.2179

(* Mean value of six sampling stations)

PHYTO AND ZOOPLANKTON

The spatial and temporal pattern of distribution of phyto and zooplankton in the Adyar estuary were studied monthly from the samples collected in six sites. In phytoplankton, a total of 22 genera from different groups of Bacillariophyceae, Chlorophyceae, Cyanophycaeae, Euglenophyceae and Dinophyceae (Fig. 4) were identified, and its abundance and diversity were enumerated. Station 2 and 3 were found to be more diverse than other stations (Fig. 5). Among zooplankton, species of copepod, rotifers and cladocerans dominated (Fig. 6) whereas among phytoplankton *Chlorella sp*, *Chaetoceros sp*. and *Thalassiosira sp* dominated in all stations. The abundance of zoo and phytoplankton indicates the potential of this estuary for aquafarming.

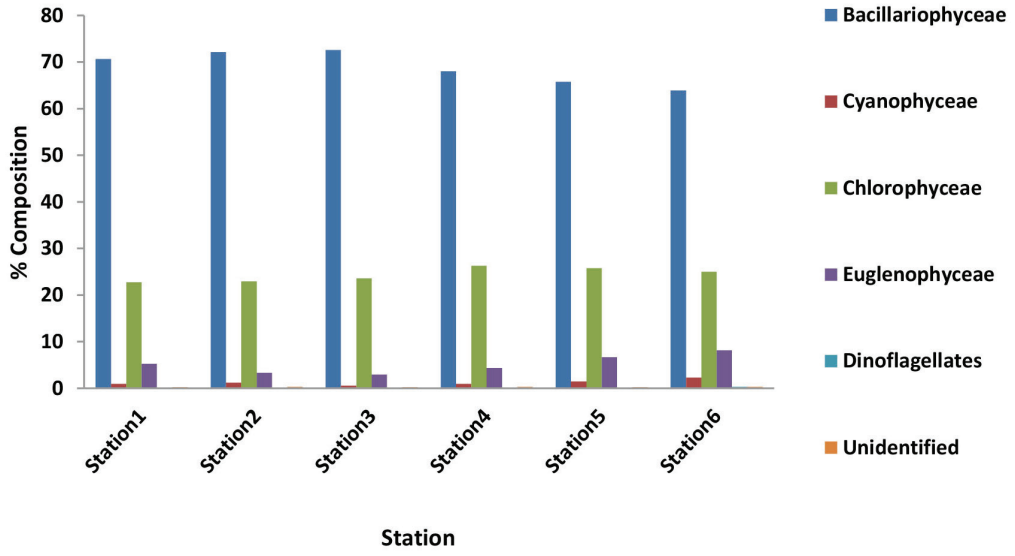


Fig . 4. Composition of phytoplankton (%) in each sampling station

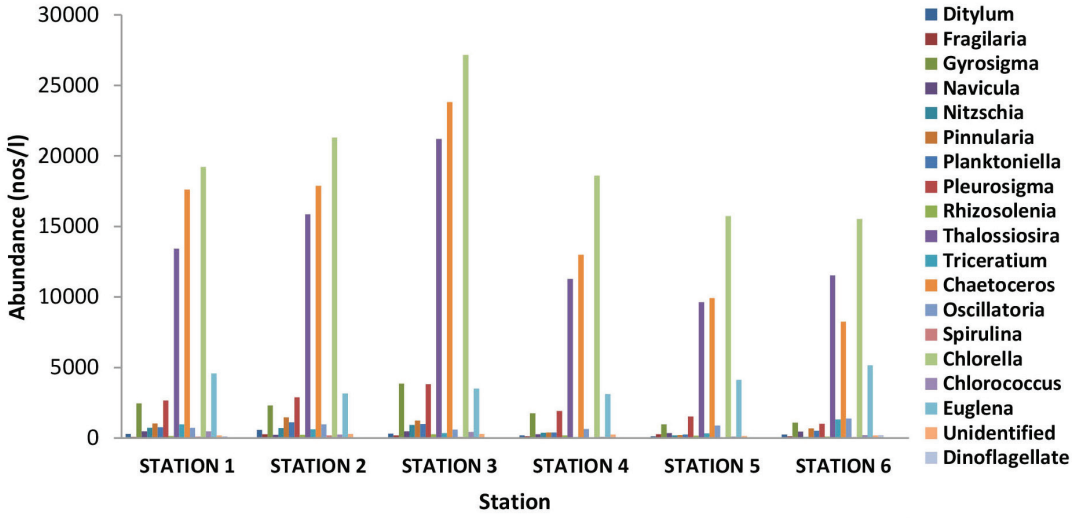


Fig. 5. Phytoplankton abundance in each sampling stations

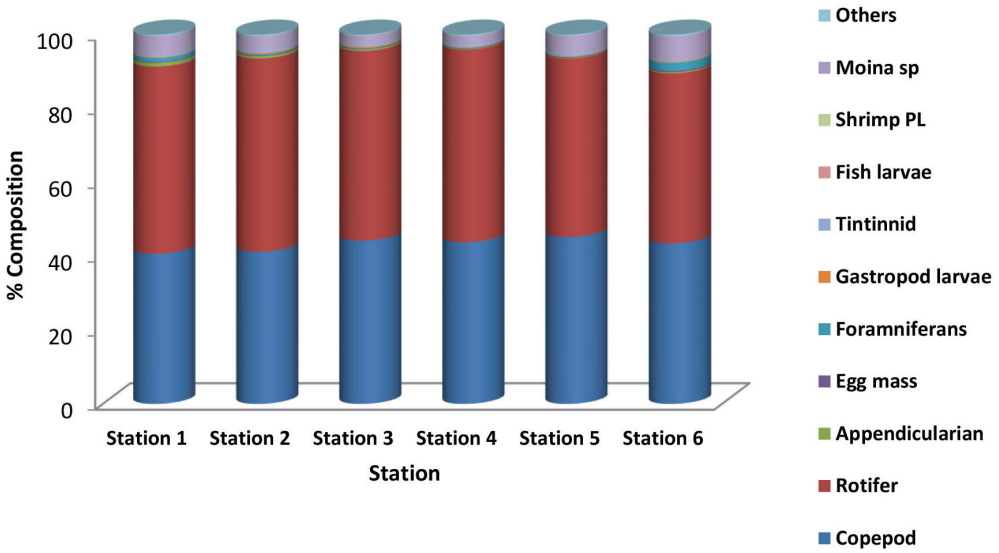
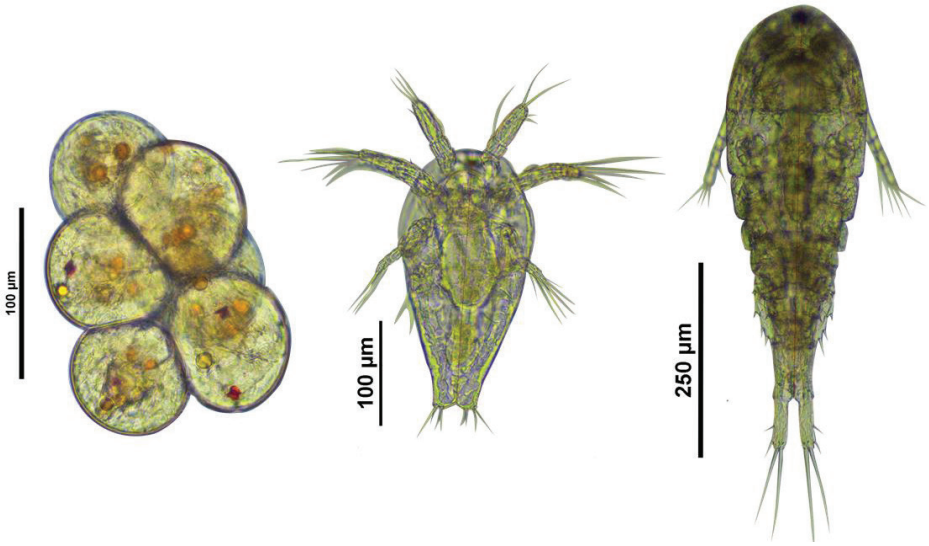
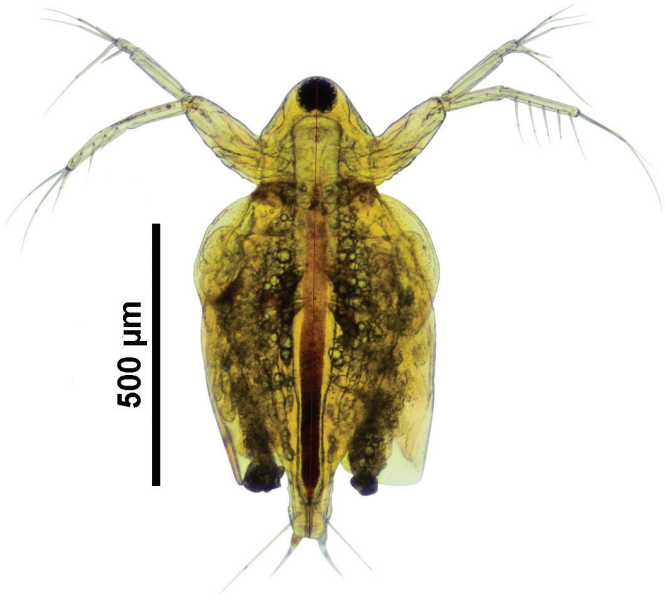


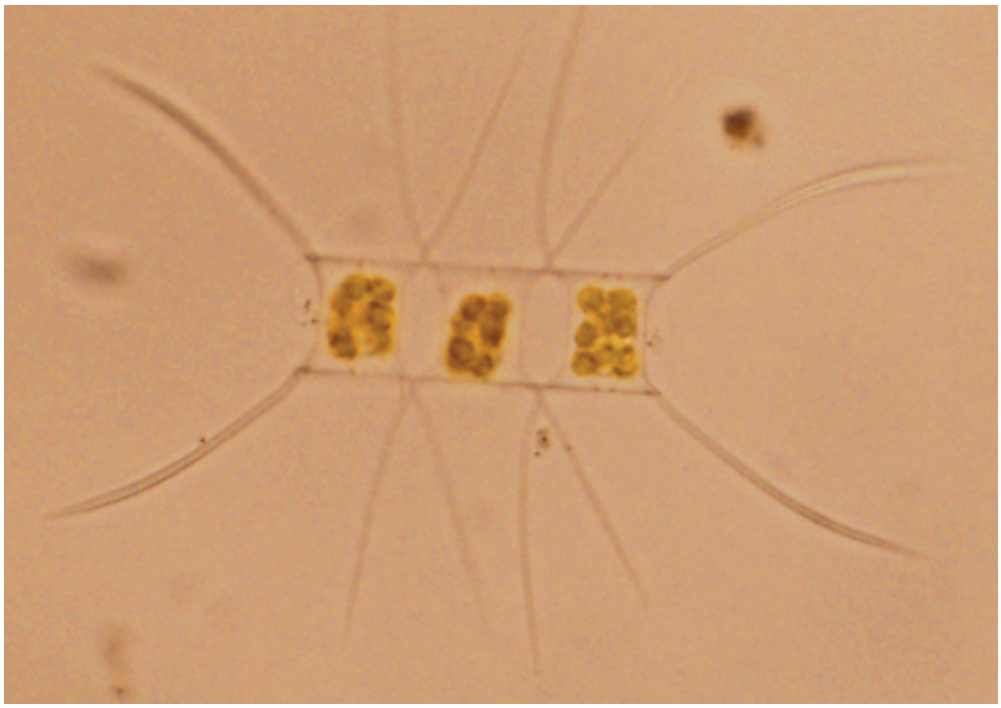
Fig. 6. Percentage composition of zooplankton in each sampling station



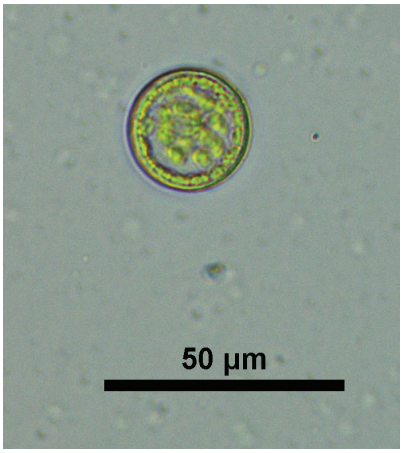
Life stages of *Cyclopoid copepod*



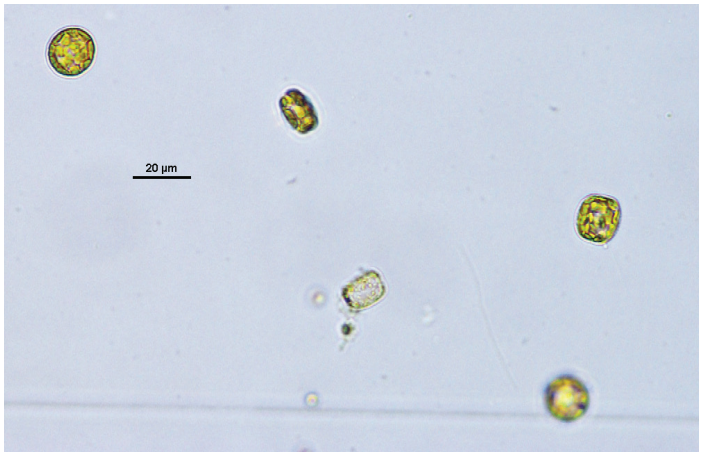
Cladocera sp



Chaetoceros sp



Thalassiosira sp

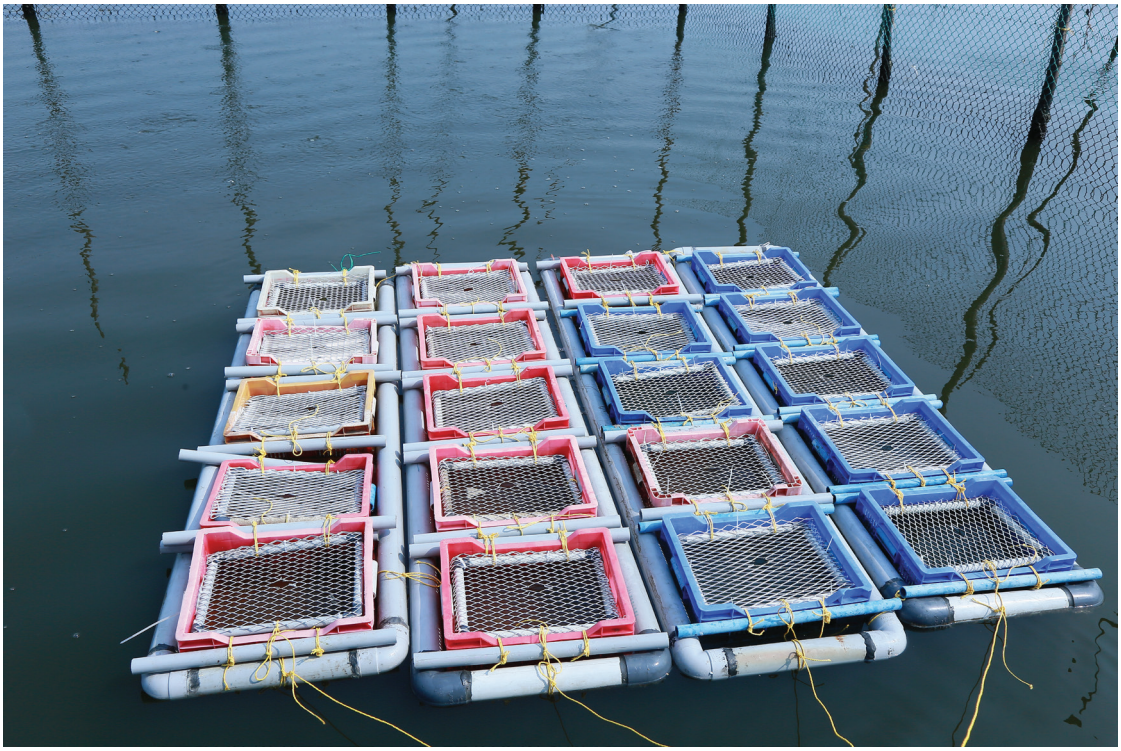


Chlorella sp

FAMILY FARMING MODEL

Soil water quality and natural productivity studies of estuary suggest the regaining of the health of the Adyar estuarine ecosystem. Thus, ICAR-CIBA initiated experimental demonstration trials of brackishwater finfish and shellfishes in pens and cages. In the pen and cage farming activities, we have involved families living in the fringes of the estuary, as a livelihood support model. For standardizing the suitable candidate species for farming in this water body, an experiment was initiated during 2016-17 with selected finfishes and shellfishes in cage and pen to understand the relative suitability of different species such as Milkfish, *Mystus gulio*, Seabass, Snapper, Pearlspot, and Mud crab. Based on the soil and water quality, social conditions and feasibility of suitable brackishwater species, two pen (100 sq m) structures 1500 meter away from the Adyar Creek mouth, besides Foreshore Estate signal, were installed and stocked Milkfish and Mud crab in December 2017.

A total of 50 mud crabs (body weight 95 - 250 g; total weight 9.6 kg) were stoked in pen and whereas 20 crabs were stocked individually in 20 floating boxes. Crabs were fed with trash fish (at the rate of 10% total biomass) daily twice and reared for 40 days. After 40 days of rearing the crabs in the boxes grew from an average weight of 109.9 g to 212.8 g and the crabs stocked in the pen reached a final weight of 168 to 627 g. A total of 230 milkfish fry (avg. wt - 4.8 g; avg length 6.7 cm) was stocked in 100 m^2 pen structure. Fish were allowed to feed naturally available feed and in addition to that, the fishes were fed with the formulated feed prepared by ICAR-CIBA @ 5% body weight daily in two times. After 55 DOC, the average weight and length of milkfish was 52.5g and 20.2 cm respectively. The adopted 10 nos. of fisher folks (5 families; 2 nos. from each family) who are all living around Adyar creek and estuary are trained with cage and pen installation, maintenance, feeding to animals, handling of crabs, and sampling etc. The feeding schedule with the behavior of fish and crab were monitored by the fisher folks every day.



After stocking of fish and crab, water quality parameters like pH, DO and salinity was monitored once in 15 days. During our regular monitoring, it has been observed that the water flows into the fish and crab culture demonstration areas were minimised due to less incoming water from the sea towards Adyar creek since January 2018, especially during summer and pre-monsoon seasons. It closed the Adyar mouth slowly, followed by formation of sand-bar towards the fish and crab culture demonstration cages. This sand-bar prevents the exchange of water between marine and freshwater ecotone. Ultimately the water quality of fish and crab culture demonstration areas were deteriorated followed by mortality was occurred after attaining an average weight of 52.5 g and 168-627 g of fish and crab respectively. However, the beneficiaries realized Rs, 18785/- worthy of fish and crab through harvest in February 2018.

Mud crab culture at Adyar creek

Milkfish culture at Adyar creek

ECONOMICS OF INTERVENTION

Poverty, disguised unemployment and engagement in unproductive activities due to surplus time at disposal are commonly reported among fishermen communities. At micro level the community has benefitted in terms of additional employment and income to a group of 10 fishermen. More than monetary gains, the community is made aware of productive capacity of the rejuvenated system due to the concerted efforts of Tamil Nadu State Government through CRRT. Fishermen could benefit economically and nutritionally, and the fishing and city community will also benefit by cleaner and better ecosystem.

SUMMARY AND LESSONS LEARNT

Brackishwater aquaculture Initiatives by CIBA in the Adyar estuary with the participation of self-help groups from nearby villages, revealed the potential of the estuary as a food production system, also with scope of generating employment and income generation. This initiative becomes a model for resource use plan for aquaculture development in adyar

creek areas, Tamil Nadu and other states. Therefore, the partnership of strong expert and technological support available with ICAR-CIBA and trained fishermen group at the grass root level will provide synergy and create a platform for the future sustainability of the farming system in adyar creek water bodies.

However, obstruction at the barmouth of the Adyar estuary especially during the summer months due to the sand bar formation is emerged as a constraint, in keeping the aquaculture activity and healthy biotic condition in the waterbody. In order to keep the living environment in the estuary, and promoting aquaculture which has the potential to provide food, employment and income to the nearby village folks, CRRT who has already spent more than 60 crores in cleaning and restoring life to the valuable estuary in the heart of Chennai city. Regular dredging to enhance and ensure the free flow of water to the estuary is a requirement, which could be coordinated by CRRT along with other related Government Department, to upkeep the life of Adyar estuary. The cleaning and restoration of dead Adyar estuary to life by sincere effort by a State Government body, and using the water body for production of food livelihood activities, can be a model, for other such estuarine water bodies in urban conditions.

PUBLICATIONS

4 TIMES CITY

* THE TIMES OF INDIA, CHENNAI
WEDNESDAY, JUNE 28, 2017

SEEDS OF FISH FARMING SOWN IN ADYAR CREEK

Five Families Chosen By CIBA To Rear Fish In Restored Water Body

OppiliP@timesgroup.com

Four decades ago the Adyar Creek teemed with fish, drawing birds from far off shores for food. Today, efforts are on to grow fish, albeit in cages, in the now-restored but ecologically fragile, water body.

Central Institute of Brackishwater Aquaculture (CIBA) has set up cages to help local fishermen harvest three species of fish. CIBA director K K Vijayan told TOI that after the creek was cleaned by Chennai River Restoration Trust, it was decided to help local fishermen by setting up cages in a portion of the water body. "Initially the species of sea bass, pearl spot and milkfish were released into the cages. We provided the feed for the fish. But only milkfish survived in the cages," said Vijayan. "Poor tidal movement could have affected the survival of the other two species we believe," he said.

For its pilot project, near Srinivasapuram after the creek was restored, CIBA has adopted the family farming mode. Since its launch in February, CIBA has trained 10 people from five families to feed the fish and monitor their growth.

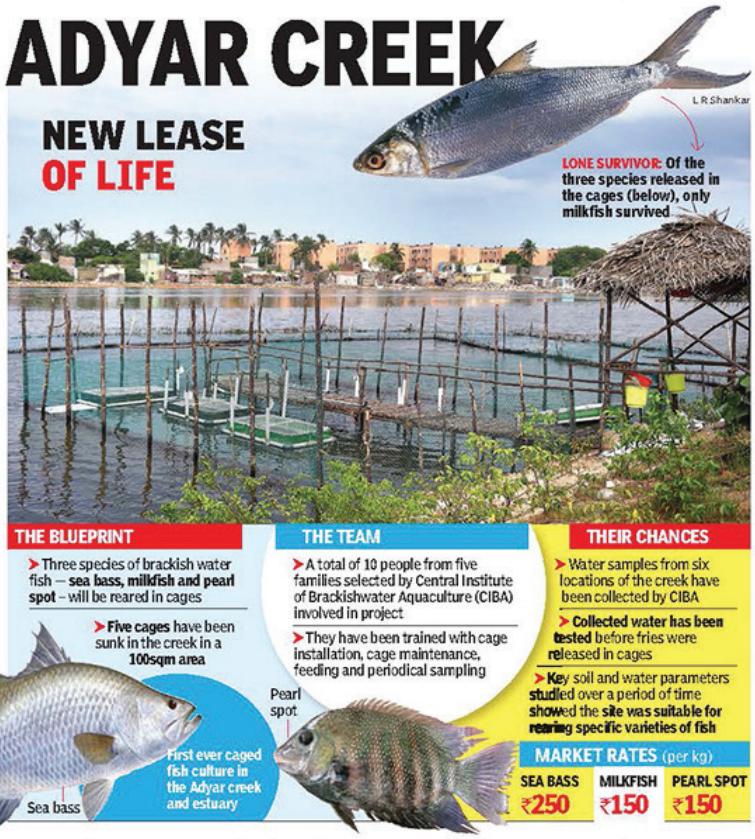
Srinivasapuram resident TSP Ravi, one of the beneficiaries of the project, said sand from the river had to be cleared regularly for the tidal movement to be favourable for fish culture. "A good tidal movement will help the fish grow," he said.

Since February, twice -- once in two months -- fish samples from the cages were collected and sent to Central Institute of Fisheries Technology for quality checks. This was necessary because the eastern side of the creek, a dumping ground for those living in the thatched houses, is highly polluted. The laboratory results have been positive so far.

Ravi said a milkfish could be harvested in six months and a fish weighing 1kg would fetch ₹150, which the beneficiaries can share among themselves. "CIBA has given us a good livelihood option which will provide an alternative income in the future," Ravi said.

Vijayan said fishermen involved in the project need not work full time. "This is an ancillary activity. They have to visit the cages twice a day for feeding. They can attend to their daily businesses after that," he said.

By August-end, CIBA is hoping for a rich harvest and the fishermen good earnings. Vijayan said if the breeding of milkfish in the creek is successful and sustainable, more such cage-culturing can be taken up.



Where old threats loom large

TIMES NEWS NETWORK

Close to ₹50 crore may have been spent to restore the Adyar creek and estuarine area in two phases by the Chennai River Restoration Trust (CRRT), but mounds of plastic and garbage are threatening the ecosystem again.

A state government official said the Tamil Nadu Slum Clearance Board had built tenements to house those living in the slums. More than 20 blocks were built but around these tenements encroachments have cropped up.

A Srinivasapuram resident said more than 3,000 unauthorised houses had come up in and around the tenements. Waste water from these illegal structures drains into the creek polluting it, he said.

Ravi, another resident, said sewage from the illegal settlements must be routed to the pumping station near Foreshore Estate bus terminus. "If this is done, pollution levels in the creek will come down and hasten its restoration," he said.

A senior official from the Slum Clearance Board said so far there was no plan to demolish the unauthorised buildings along the Adyar creek. When contacted, a CRRT source said the Slum Clearance Board was organising awareness programmes in the slums on their behalf, advising people against dumping waste in the creek. "But with regard to the encroachments near the slum tenements, the government has to take a decision. It is not our mandate," the source said.

inmathi
The online community hub for Tamils across the world

Bringing the Adyar Creek back to life can also mean restoring livelihoods of the local population

by Expert Contributors | Jul 16, 2018 | Environment | 0 comments

By Magentic Manifestations (Wikimedia Commons)

English, தமிழ்

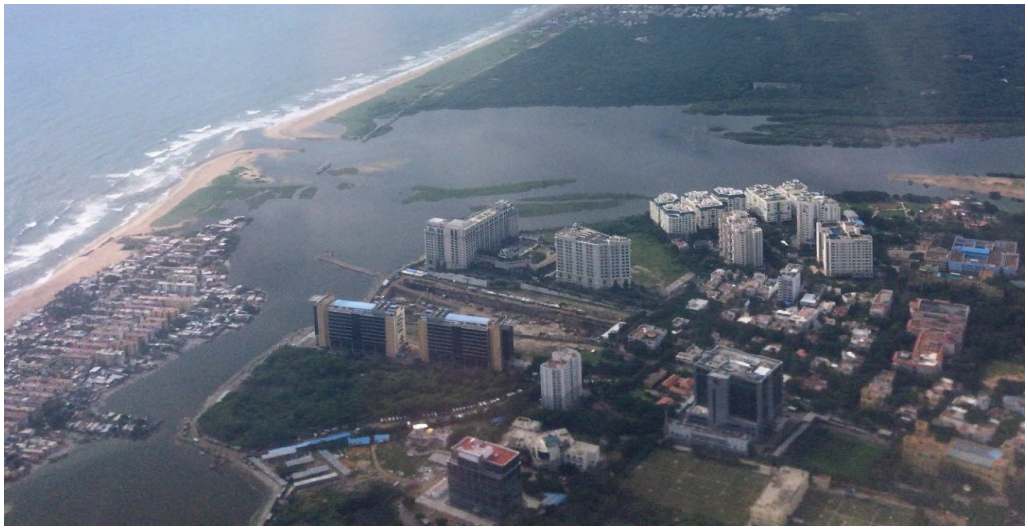
Adyar creek is one of the primary and vibrant estuarine ecosystems of Chennai. In the 1950s, the department of fisheries, government of Tamil Nadu, was involved in the setting up of fish and shrimp farms adjacent to the creek under the all-India network project on fish farming. It was one among the first brackishwater shrimp farms in south India. But in later years, with the urbanisation of Chennai, the Adyar estuary lost its pristine condition along with the rich fauna,and was under great ecological stress due to progressive encroachment, discharge of untreated sewage, effluents, and solid waste disposal.

As a result of degradation, many vital biological attributes of Adyar estuary such as clean brackishwater, faunal and floral diversity and its role as spawning and nursery ground of commercially important finfish and shellfish were lost. In order to restore the ecology of Adyar estuary, the government of Tamil Nadu has taken up ambitious restoration measures. The eco-restoration activities of Adyar creek under the Chennai Rivers Restoration Trust (CRRT)

இன்மதி

மீண்டும் உயிர் பெறுமா அடையாறு?

by Expert Contributors | ஜூலை 17, 2018 | சுற்றுச்சூழல் | 0 comments



By Magentic Manifestations (Wkimedia commons)

English, தமிழ்

சென்னையிலுள்ள ஆற்று முகத்துவார சூழல் அமைப்புகளில் மிக முதன்மையானது அடையாறு சிற்றோடை. மீன் பண்ணை தொழிலில், அனைந்திந்திய திட்ட அமைப்பின் கீழ், இந்த சிற்றோடைக்குப் பக்கத்தில் மீன் மற்றும் இறால் பண்ணைகள் அமைக்கும் வேலைகளில், 1950களில் ஈடுபட்டது தமிழக அரசின் மீன்வளத்துறை. தென் இந்தியாவில் இதுதான் முதல் உவர்நீர் இறால் பண்ணையாக இருந்தது. ஆனால், அதன் பிறகு சென்னையின் நகரமயமாக்கல் காரணமாக, அடையாற்று முகத்துவாரம், வளர்ச்சி ரீதியான ஆக்கிரமிப்பின் காரணமாகவும், சுத்திகரிக்கப்படாத கழிவுகளின் காரணமாகவும், சாயக் கழிவுகளின் காரணமாகவும், திடக் கழிவுகளின் காரணமாகவும் அதன் தேவை நல்நிலையை இழந்துவிட்டது.

இத்தகைய சூழல் அழிப்பின் காரணமாக, உவர்நீர், அதைச் சுற்றியிருந்த தாவர சூழல், செதில் மீன்கள், மட்டி மீன்கள் போன்ற வளங்களும் அழிந்திருக்கின்றன. அடையாற்று முகத்துவாரத்தின் சூழலை மறுபடி மீட்க, தமிழ்நாடு அரசு பல முக்கிய மீட்பு முயற்சிகளை எடுத்துவருகிறது. அடையாற்று சிற்றோடையின் சூழலை மீட்பதற்காக, ஜனவரி 2008ல், 58 ஏக்கர்