BEFORE THE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

Original Application No. 152 of 2023 (SZ)

In the matter of:

Kumareson Sooluran,

Thiruvallur …Applicant(s)

Versus

The Tamil Nadu Coastal Zone Management Authority,

Rep by its Member Secretary,

Chennai and Others …Respondent(s)

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(**Note**: The page numbers are at the top centre of every page)

Through
Dr. D. Shanmuganathan
Standing Counsel for Govt. of Tamil Nadu
National Green Tribunal
Southern Zone, Chennai

DATE:09.07.2025

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MEMO FILED BY STANDING COUNSEL FOR GOVERNMENT OF TAMIL NADU AT NGT(SZ).

I, refer to the above matter, the Tamil Nadu State Wetland Authority has filed their report on 06.06.2025. The Following draft reports are filed for your pursual .

1. "Mapping of the invasive Charru Mussel (Mytella strigata) in Ennore Creek"(Overview of Field Surveys for the Project) by National Centre for Sustainable Coastal Management (NCSCM) (ANNEXURE 1)

2. "Value Addition of the Invasive Chaaru Mussel from Ennore Creek as Biofertilizer and Mineral Mix"(Progress Report on the Research Work) by Dr. M.G.R. Fisheries College, Ponneri. (ANNEXURE 2)

3. "Controlling the spread of Invasive Mussel, Mytella strigata, in dredged areas of Ennore Creek"(Progress Report on the Research Work) Dr. M.G.R. Fisheries College, Ponneri. (ANNEXURE 3)

Dr. D. Shanmuganathan
Standing Counsel for Govt. Tamil Nadu
National Green Tribunal
Southern Zone, Chennai
Date: 09.07.2025

ANNEXURE 1

Overview of Field Surveys for the Project "Mapping the Extent of Charru Mussel (*Mytella strigata*) in Ennore Creek" Conducted by NCSCM

The following is an overview of the field surveys conducted by NCSCM as part of the invasive Charru Mussel mapping project. TNSWA may refer to the relevant points, data, and findings presented here to support its response to queries raised by the Honorable Court particularly with regard to the progress of invasive Charru Mussel removal and associated scientific studies. This overview serves as a basis for substantiating actions taken and informing the final hearing proceedings.

1. Field sampling conducted to assess the presence and estimate the density of Charru Mussel using grab or quadrat sampling methods across two stretches:
    - *Ennore Creek Stretch (from Kannamangalam Bridge to Karungali)*
    - *Ennore Creek to Pulicat Lake Stretch (from Karungali to Pazhaverkadu)*
2. Sampling in the Ennore Creek Stretch was carried out on 16th and 17th May 2025, using grid-based random sampling points.
    - Grid size: 250 m × 250 m
    - Sampling points were adjusted to account for creek bed areas, fishing grounds, and known mussel-invaded locations.
    - Fishing ground details and previously reported mussel invasion sites were identified through a participatory mapping exercise with the local community conducted on 2nd May 2025.
3. Sampling in the Ennore Creek to Pulicat Lake Stretch was conducted on 29th May 2025, using grid-based random sampling points.
    - Grid size: 500 m × 500 m
4. Field Sampling Overview:

Survey Stretch	Sampling points surveyed	Charru mussel presence observed*
Ennore Creek Stretch (Kannamanagalam Bridge to Karungali stretch)§ Date: 16 to 17th May 2025	148 sampling points (Density Estimation: • Average: 26 mussels per m^2 • Range: 0 to 824 mussels per m^2)	35 sampling points (% of occurrence: 23.7%) (Density Estimation: • Average: 108 mussels per m^2 • Range: 4 to 824 mussels per m^2)
Ennore Creek to Pulicat Lake Stretch (from Karungali to Pazhaverkadu stretch)	49 sampling points (Density Estimation: • Average: 46 mussels per m^2	12 sampling points (% of occurrence: 24.5%) (Density Estimation: • Average: 186 mussels

Survey Stretch	Sampling points surveyed	Charru mussel presence observed*
Date: 29th May 2025	• Range: 0 to 500 mussels per m^2)	per m^2 • Range: 4 to 500 mussels per m^2)
Full Stretch (Ennore Creek + Pulicat Lake Stretch)	197 sampling points (Density Estimation: • Average: 31 mussels per m^2 • Range: 0 to 824 mussels per m^2)	47 sampling points (% of occurrence: 23.9%) (Density Estimation: • Average: 128 mussels per m^2 • Range: 4 to 824 mussels per m^2)

*Presence include live shells only, dead shells only as well as live & dead combination of clusters
§Invasive Charru Mussel were observed at various locations, predominantly under or near bridges, as well as near estuary mouth, mangroves, fishing zones, tower structures, and artisanal landing points.

*****

REPLY FROM NCSCM TO THE NGT ORDER

(Ref.: OA No. 152/2023(SZ) dated 25th June 2025 AD)

Order: Point No. 9 – The Member Secretary – Tamil Nadu State Wetland authority has to prioritize the removal of invasive species by dredging first and then go for the research studies and the value addition, etc.

Inputs from NCSCM:

- Dredging has already been carried out along the 0 to 1700-meter stretch, and related scientific studies are currently in progress.
- Additional areas where the invasive Charru Mussel is present have now been mapped, expanding the understanding of its spatial distribution.
- Mapping is a critical step for identifying potential future spread zones and for planning targeted management interventions.
- The value-addition study is underway; however, it will require additional time for completion. The Fisheries College is analyzing both dredged and freshly collected samples as part of this study to explore potential uses and processing methods.

Order: Point No. 10 – It is stated that the invasion of the alien species has spread across a stretch of 24 km, extending up to Pulicat Lake. However, the report addresses dredging activity over only 1,050 meters. According to the Water Resources Department's report, dredging 1,700 meters in Kathupalli and 500 meters in Puzhuthivakkam is estimated to cost Rs. 20.85 Crores. Regardless of the cost involved, it is the responsibility of the Government to undertake the dredging and removal of the invasive Charru mussels at the earliest, in order to prevent further financial burden—especially when it has been demonstrated that dredging results in

a marked reduction of the invasive species and facilitates the revival of native aquatic species.

Inputs from NCSCM on various aspects relevant to the point

A. Nature of extent of invasive Charru Mussel in the creek

- The observation of Charru mussel invasion is recorded only in certain pockets all along the entire stretch and not continuously.

B. Impacts of dredging on ecosystem:

Dredging is sometimes needed to remove invasive species like mussels from estuary beds, but it can also disrupt the natural balance of the ecosystem both immediately and over time.

B.1. Immediate (Direct) Impacts

- Dredging involves digging up sediment from the estuary floor, which can remove not only the invasive species but also eggs, larvae, and native animals living in the mud.
- It can destroy natural habitats where bottom-dwelling creatures live, causing some species to move away or struggle to survive.
- It also changes the shape and texture of the seabed, which can confuse fish, affect their feeding habits, and damage areas they use for shelter.
- Dredging can even alter underwater sound patterns, making it harder for marine animals that rely on sound to find food or navigate.

B.2. Water Quality and Long-Term (Indirect) Impacts

- Dredging stirs up fine sediment, making the water cloudy (turbid). This blocks sunlight, which harms tiny plants (like phytoplankton) that are the base of the food chain.
- The cloudy water can clog the feeding parts of filter feeders like mussels and barnacles, making it harder for them to breathe and eat.
- The settling of disturbed sediment can bury living organisms, change the type of sediment on the bottom, and even create space for new invasive species to move in.
- Some animals have to use extra energy to clean themselves or rebuild their burrows, which affects their growth and ability to reproduce.

B.3. Cumulative Effects Over Time

- Repeated dredging, like during regular maintenance, adds up over time, leading to fewer animals, different species, and even permanent changes to the ecosystem.
- The sediment stirred up can release harmful substances like heavy metals, plastics, or excess nutrients, which stress or kill aquatic life.
- Fish and other species may struggle with low visibility, making it harder to hunt or avoid predators. Young fish and larvae are especially at risk.

B.4. Why This Matters?

Even though dredging may be needed in some areas to manage invasive species, it can cause serious and lasting damage if not carefully planned. It can lead to:

- Loss of native species
- Reduced biodiversity
- Weakened ecosystem health

Hence it is essential to study each site carefully, use the least damaging methods, and allow time for nature to recover between dredging activities.

C. Impacts of nearshore disposal/dumping of dredged materials:

C.1. Changes to the Creek Bed and Water Quality

When dredged material is dumped nearshore, it temporarily disturbs the water and seabed. These disturbances make the water muddy (turbid), reduce light for underwater plants (seaweed and seagrass), and change the natural makeup of the sediment. Over time, this can turn soft, fine riverbed areas into coarser, sandier zones, altering the habitat for many aquatic species.

C.2. Pollution from Metals in the Sediment

Sediments from the estuary often carry heavy metals like copper, zinc, and lead, especially due to past pollution. When these are dumped, they can increase metal levels in the local area, sometimes for a year or more. These metals may harm small bottom-dwelling creatures, as seen in survival tests where fewer animals survived after the disposal took place.

C.3. Impact on Fish and Food Chains

Some of these metals build up in creatures living in or on the sediment, especially those that feed directly off the bottom. Over time, there's a chance these metals could move up the food chain, reaching fish and potentially humans. One example from the study showed that zinc levels increased in higher-level predators, suggesting a risk of contamination spreading through the ecosystem.

C.4. Long-Term Effects if Disposal Is Repeated Too Often

Although each disposal event might seem minor, doing it too frequently without giving the area time to recover can cause permanent damage. This includes lasting changes to the sediment, lower organic content, and loss of natural habitat. A scientific study[1] recommends spacing out disposal activities and closely monitoring the area to reduce harm to the environment.

[1] Donázar-Aramendía I, Sánchez-Moyano JE, García-Asencio I, Miró JM, Megina C, García-Gómez JC (2020). Environmental consequences of dredged-material disposal in a recurrent marine dumping area near to Guadalquivir estuary, Spain. *Marine Pollution Bulletin* 161: 111736.

ANNEXURE 2

Progress Report on the Research Work: "Valorization of *Mytella strigata* (Charru Mussel) as Bio-Fertilizer and Mineral Mix"

NGT Original Application No.152 of 2023(SZ): Sl. No: 5

1. Background

The TNSWA sanctioned an amount of ₹11.11 lakhs to Dr. M.G.R. Fisheries College and Research Institute, Ponneri, for carrying out research on the "Value Addition of the Invasive Charru Mussel (*Mytella strigata*) from Ennore Creek as Biofertilizer and Mineral Mix." The objective of this work is to utilize the invasive mussel species, for agricultural and aquacultural applications, thereby converting an ecological problem into an opportunity through a circular economy approach.

2. Work Progress and Activities Undertaken

a) Heavy metal analysis:

Charru mussel meat and shell samples, along with water and sediment samples, were collected from the Ennore Creek region. These samples were submitted to the Tamil Nadu Agricultural University (TNAU), Coimbatore, for heavy metal analysis such as Hg, Cd, Ni, and Pb content. The analytical results are being evaluated in reference to the permissible limits outlined under the Fertilizer Control Order (FCO), 1985 to ensure soil and crop safety.

b) Biofertilizer Formulation

- A preliminary formulation of a biofertilizer has been developed based on initial nutrient profiling. The mussel meat showed a high nitrogen content of 11% (dry weight basis) with a low carbon-to-nitrogen (C:N) ratio of 5.4:1. To balance this, external compost was incorporated to improve carbon content. Additionally, clay was added to improve soil-binding properties and granulation.
- Standardization trials are underway, experimenting with different shell-to-meat ratios (10–35%) to optimize the formulation for soil enrichment effectiveness.

c) Shell-Derived Mineral Mix for Aquaculture

Mineral profiling of Charru mussel shells revealed that, Calcium – 27%, Phosphorus – 3.68%, Magnesium – 0.8 % presence in the shell. The mineral mix is being developed specifically for aquaculture applications, especially for shrimp pond. As the shell powder lacks sufficient zinc, potassium, and copper, external supplementation is being included. Shrimp culture trials are planned to validate the bioavailability and level of the mineral formulation.

d) Technology Transfer Plan

After the completion of standardization and validation trials, the developed fertilizer and mineral mix technologies will be transferred to: Local Self-Help Groups (SHGs), Individual farmers in the Ennore region. The transfer will be facilitated through training, demonstrations, and technical support, contributing to sustainable livelihoods and invasive species management.

Dean
Dr MGR FC & RI, Ponneri

Progress Report on the Research Work: "A Pilot Study on Controlling the spread of Invasive Mussel, *Mytella strigata* (Hanley, 1843) in Dredged Areas of Ennore Creek, Chennai through Recurrence assessment, Eradication strategies and Ecosystem restoration"

NGT Original Appolication No. 152 of 2023 (SZ): S.No.: 6 & 7

1. Background

The TNSWA Sanctioned an amount of Rs. 22,63,000/- to Dr. M.G.R. Fisheries College and Research Institute, Ponneri for carrying out research on the "A Pilot Study on Controlling the spread of Invasive Mussel, *Mytella strigata* (Hanley, 1843) in Dredged Areas of Ennore Creek, Chennai through Recurrence assessment, Eradication strategies and Ecosystem restoration". The objective of this work are as follows

a. Monitoring the dredged area of Ennore creek for re-occurrence of Charru mussel through biodiversity studies in relation with environmental parameters
b. Suggesting ways for periodical eradication of Charru mussel beds from dredged areas
c. Restocking/ Translocation of native species in dredged area for restoration of estuarine ecosystem

2. Work Progress and Activities Undertaken

a. Site Selection for Monitoring

Three sampling plots (1- PuliyaMaram; 2- Samuthra Munai II; 3 – Lock Munai) and one control plot (Attipattu Puthunagar Bridge) were identified for long-term monitoring, covering dredged and non-dredged areas for comparative ecological assessment.

b. Dredging Impact and Spatial Variability

- Uneven dredging across the study area was noted, with sites like Jabarangal only partially dredged may be due to traditional fishing Paadu available.

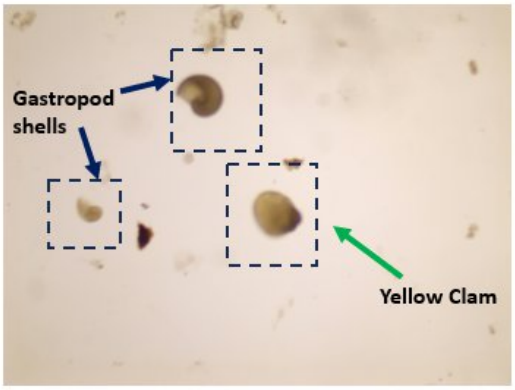
- Shell remnants at Samuthra Munai II indicate past colonization of *Mytella strigata* before dredging.

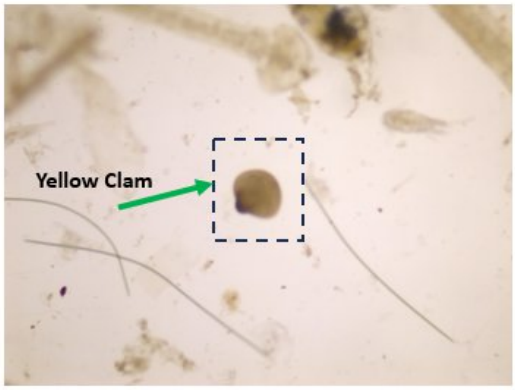
c. Presence and Distribution of *Mytella strigata*

- The invasive mussel *Mytella strigata* was predominantly found in non-dredged areas, especially in Kalmunai, where it coexisted with Manja Matti (Yellow Mussel).
- Dredged areas showed a notable absence or minimal presence of *Mytella strigata*, likely due to recent sediment removal.

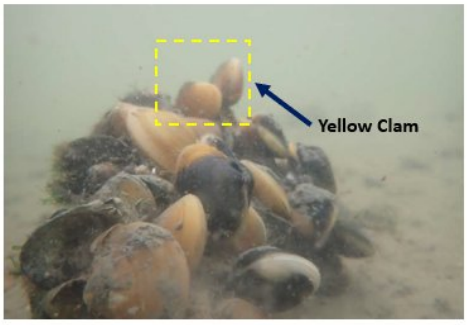
d. Larval and Associated Species Diversity

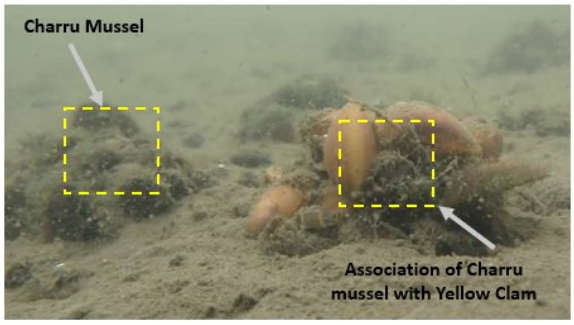
- Larval stages of yellow mussel and gastropods were found in dredged plots.



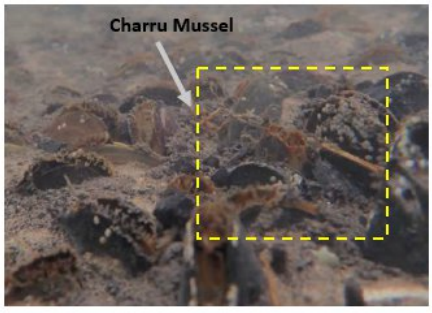


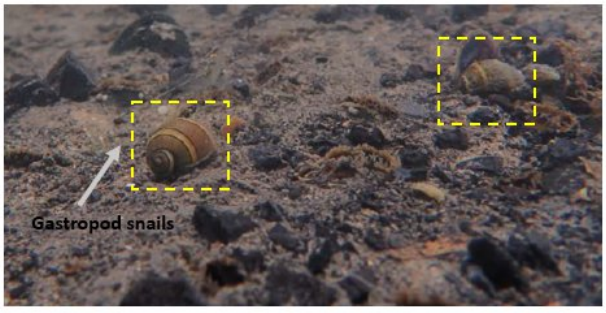
- Clusters of invasive mussels were found in association with yellow mussels in control plots.





- Bioindicator species such as *Nerita sp.* and fish larvae were observed across dredged plots.





e. Environmental Parameter Analysis

- No significant difference was detected in water and sediment quality parameters between dredged and control plots (refer Tables 1).
- Salinity ranged from 30 ppt to 36 ppt**,** with the highest salinity at Lock Munai and lower salinity in deeper zones, suggesting freshwater mixing.

Table 1: Water & Sediment quality parameters

S. No.	Parameters	Control Site	Plot 1	Plot 2	Plot 3
Water parameters					
1.	pH	7.82	7.85	7.93	7.96
2.	Calcium (mg/l)	360	360	360	360
3.	Hardness (mg/l)	6050	6150	6050	6100
4.	Carbonate (mg/l)	0	0	0	0
5.	Total Alkalinity	160	160	160	160
6.	Salinity (Ppt)	35	36	35	32
7.	Ammonia (mg/l)	0.868	0.815	0.758	0.567
8.	Nitrite (mg/l)	0.552	0.328	0.375	0.344
9.	Nitrate (mg/l)	0.716	0.691	0.777	0.796
10.	Magnesium (mg/l)	1236	1260	1236	1256
11.	TDS (g/l)	34.2	35.06	35.36	35.89
12.	TS (g/l)	39.12	40.26	40.12	42.89
13.	TSS (g/l)	4.92	5.2	4.76	4.78
Soil Parameters					
14.	pH	8.1	8.06	7.96	8.68
15.	EC (mS/cm)	0.474	0.636	0.499	0.534
16.	Organic carbon (%)	0.55	0.55	0.63	0.67

Work Plan for next 6 months

S. No.	Activities	1	2	3	4	5	6
1.	Bathymetry survey: Using echosounder to finalize four sampling plots based on depth and site suitability						
2.	Enclosure set up for sampling plots: Establish boundary fencing using wooden poles (10m x 10m x 4m) and polyethylene webbing in all four sampling plots						
3.	Install Internal fencing within the boundary to facilitate pen culture trials						
4.	Environmental parameters monitoring: Regular monitoring of hydrodynamic parameters viz. tidal flow, current velocity, water column depth across sampling plots						
5.	Environmental parameters monitoring: Periodical analysis of water and sediment quality parameters including salinity, pH, ammonia, hardness, organic carbon, etc.						
6.	Biodiversity and Biological Sampling: Routine sampling to assess plankton (including larvae) and species diversity (eg. mussels) in each sampling plot.						
7.	Biodiversity and Biological Sampling: Observation of mussel bed formation across various substrates, with documentation of reoccurrence and spread patterns						
8.	Species Translocation and Pen Culture Trials: Collection of native species such as green mussel, mud crab and white shrimp, followed by translocation into pen culture enclosures using different species combinations.						
9.	Protocol Development: Formulation of a standardized protocol for eradication strategies specific to *Mytella strigata*						
10.	Documentation: Preparation of a comprehensive Standard Operating Procedure (SOP). Compilation of finding and submission of technical reports to Wetland Authority.						

DEAN
Dr. MGR FC&RI,
Ponneri