Centurion University

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Sustainability Impact Ratings





SUSTAINABLE DEVELOPMENT GOAL 14 LIFE BELOW WATER

SUSTAINABLE DEVELOPMENT GOALS

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1. Executive Summary

Centurion University of Technology and Management (CUTM) advances **SDG 14: Life Below Water** through education, research, direct conservation action and community partnership. Led by the School of Fisheries, together with the M.S. Swaminathan School of Agriculture, the Department of Zoology and other schools, the University connects classroom learning with the management of ponds, reservoirs, wetlands and coastal waters, and extends this knowledge to farmers, fishers and Self-Help Groups (SHGs) across Odisha and neighbouring Andhra Pradesh.

Community capacity-building remained at the centre of this work. Five training programmes and one exposure visit reached **148 farmers and fishers**; a further **35 farmers** were trained in location-specific watershed management under a NABARD-sponsored project; and about 100 farmers and trainees received hands-on instruction at the University's Recirculating Aquaculture System (RAS) facility. Coastal programmes engaged **more than 95 fishermen and fisherfolk** on mesh-size regulation, responsible fishing gear and illegal, unreported and unregulated fishing, while the "Swachh Sagar, Surakshit Sagar" clean-up, held with the Indian National Centre for Ocean Information Services (INCOIS), removed **1,620 kg of marine debris**, including discarded fishing nets.

Across the University, about **9.45 lakh litres of wastewater** are treated each day in sewage treatment plants and reused, so that no effluent is released into natural water bodies. Fifty culture units across 25 sites were monitored through **about 250 water samples** for eight physical, chemical and biological indicators. A controlled biofloc trial recorded 36–42% higher dissolved oxygen, 30–50% lower total ammonia nitrogen and 28–40% better feed conversion than conventional culture, and the 2-lakh-litre RAS unit commissioned in January 2025 served as the reference model for a farmer-built RAS unit under the Mukhyamantri Krushi Udyog Yojana. Campus plastic waste fell from 32.50 to 28.65 tonnes, with all collected plastic recycled or diverted from landfill.

Direct conservation work continued at Jamakhala Pond, a threatened community freshwater ecosystem in Gopalpur that now supports **30 recorded indigenous aquatic species**, with more than 50 students taking part in water-quality testing, habitat restoration and wildlife monitoring. Research published with INCOIS explained a mass stranding of blue button jellies on the Odisha coast, two studies co-authored by the Department of Zoology mapped heavy-metal pollution risk in the State's wetlands, and University researchers were named on three patents for plastic-waste recycling and the removal of heavy metals from water.

SDG 14 IMPACT AT A GLANCE 2025		
148 FARMERS AND FISHERS TRAINED	**1,620 kg** MARINE DEBRIS REMOVED	**9.45 lakh L** WASTEWATER TREATED AND REUSED DAILY
~250 WATER SAMPLES ANALYSED	**30** INDIGENOUS SPECIES AT JAMAKHALA POND	**11.8%** REDUCTION IN CAMPUS PLASTIC WASTE

Key 2025 Achievements:

Metric	2025 Value	Linkage
Farmers and fishers trained (five programmes, one exposure visit)	148	SDG 14.b
Farmers trained in watershed management (NABARD-sponsored)	35	SDG 14.2
Fishermen and fisherfolk reached on overfishing and IUU fishing	95+	SDG 14.4
Marine debris removed, including discarded fishing nets	1,620 kg	SDG 14.1
Wastewater treated and reused daily (zero effluent)	9.45 lakh litres	SDG 6.3
Water samples analysed across 50 monitored units	~250	SDG 14.2
Reduction in campus plastic waste (32.50 t to 28.65 t)	3.85 t (11.8%)	SDG 14.1
Indigenous aquatic species recorded at Jamakhala Pond	30	SDG 14.2
Native fish species bred for watershed stocking	4	SDG 14.4
Ornamental aquaria / farmers and SHG members / students trained	30 / ~70 / 41	SDG 14.7
Patents on plastic recycling and heavy-metal removal	3	SDG 14.a
Peer-reviewed papers and books on aquatic ecosystems	4 papers, 1 book	SDG 14.a

2. Summary – Our Impact on SDG 14: Life Below Water

Summary – Our Impact on SDG 14 – Life Below Water						
Dimension	**Impact Area / Target**	**Initiatives**	**2025 Data**	**Output**	**Impact**	**2030 Target**
Innovation and Integration	Access for small-scale artisanal fishers to marine resources and markets – SDG 14.b	Community Aquaculture and Livelihood Training	148 farmers and fishers in five trainings and one exposure visit; ~100 farmers and trainees in five RAS batches	Hands-on training in biofloc, RAS, carp breeding and pond management	Stronger skills in water-efficient, low-discharge aquaculture among small-scale producers	**300 farmers and fishers trained each year**
	Increase economic benefits from the sustainable use of aquatic resources – SDG 14.7	Sustainable Aquaculture Value Chains	Pacu RAS model: projected net profit of Rs 9.44 lakh a year and Rs 1.27 return per rupee; 4% of Totagomuda trainees adopted carp breeding	Bankable RAS business model and farm-level adoption of hatchery techniques	Viable aquaculture livelihoods with lower water use and less reliance on wild-caught fish meal	**10% adoption among trainees; 10 farmer-owned RAS or biofloc units**
	Integrate ecosystem-based management of watersheds – SDG 14.2	Watershed Management Strategy	3 watershed ponds managed by species and use; 4 native species bred; 35 farmers trained	Location-specific stocking and supply of locally adapted native seed	Watershed management grounded in local aquatic biodiversity	**6 native species bred; 100 farmers trained each year**
Management and Monitoring	Sustainably manage and protect aquatic ecosystems – SDG 14.2	Aquatic Ecosystem Health Monitoring	25 sites, 50 units, ~250 samples, 8 indicators; DO 6.8 mg/L; ammonia <0.05 ppm	Two-weekly sampling of biofloc and RAS, monthly sampling of ponds, with corrective action on elevated BOD	Early detection of ecosystem stress and evidence-based management	**400 samples a year across 60 units; BOD within the optimum range in all units**
	Prevent and significantly reduce pollution of water bodies – SDG 14.1	Wastewater Treatment and Reuse	9.45 lakh litres a day treated and reused; zero effluent; external environmental audit on 17–18 June 2025	Treated water reused for gardens, playgrounds, landscaping and farms	No untreated discharge into natural water bodies	**10 lakh litres a day treated and reused; zero effluent maintained**
	Minimise alteration of aquatic ecosystems by aquaculture – SDG 14.2	Biofloc and RAS Low-Discharge Culture	DO +36–42%, TAN −30–50%, FCR 28–40% better than control; 100% survival	Zero-exchange culture demonstrated to farmers on campus units	Less nutrient-rich effluent reaching rivers, lakes and coastal waters	**Biofloc or RAS practices adopted by 50 farmers**
Participation and Partnerships	Conserve coastal and marine areas – SDG 14.5	"Swachh Sagar, Surakshit Sagar" with INCOIS and NGO SPANDAN	80+ fisherfolk at Konark and 40+ volunteers at Astaranga; 1,620 kg of debris removed	Removal of ghost gear and plastic litter with awareness sessions	Cleaner coastline and stronger community stewardship of marine resources	**3,000 kg of debris removed each year through 5 coastal drives**
	Collaborative management of shared water bodies – SDG 14.2	Jamakhala Pond, Ramsagar Reservoir and Kailash Hatchery	30 indigenous species at Jamakhala Pond; ~40 students at Ramsagar; 44 students trained at Kailash Hatchery	Community awareness, weed management and hatchery training	Restored ecological, economic and cultural links between communities and water bodies	**32 species at Jamakhala Pond; 2 more water bodies under joint restoration**
	Increase scientific knowledge and research capacity – SDG 14.a	National Research and Industry Partnerships	MoUs with ICAR-CIWA, ICAR-CIFA and ICAR-IISWC (signed 29 June 2025); INCOIS, NABARD and MPEDA engagement	Joint training, internships, research and industry exposure	Students and staff linked to national expertise in aquaculture and ocean science	**6 active national research partnerships**
	Women in aquaculture – SDG 14.b	SHG Engagement and Ornamental Fish Programme	~70 farmers and SHG members; 40–45 SHG women in monitoring training; 2 women's SHGs taking up floating cage aquaponics	Livelihood-oriented training in breeding, fish health and water quality	Greater participation of women in aquaculture enterprises	**150 farmers and SHG members; 100 SHG women trained**

Summary – Our Impact on SDG 14 – Life Below Water						
Dimension	**Impact Area / Target**	**Initiatives**	**2025 Data**	**Output**	**Impact**	**2030 Target**
Advancement and Awareness	Ecosystem-based community awareness – SDG 14.2	Community Awareness and Education Events	200 at the 3rd Utkal Krishi Mela; 118 on National Remote Sensing Day; 44 on World Ocean Day; 45 on World Fisheries Day	Talks, exhibitions, quizzes and technology demonstrations	Wider public understanding of aquatic conservation and sustainable fisheries	**750 participants in awareness events each year**
	End overfishing and illegal, unreported and unregulated fishing – SDG 14.4	Responsible Fishing Outreach	95+ fishermen and fisherfolk; 24 B.F.Sc. students at the Visakhapatnam landing centre	Awareness on mesh size, fishing gear, IUU fishing and ghost gear	Fishing communities informed about practices that protect breeding stocks	**250 fisherfolk reached each year**
	Education for sustainable fisheries – SDG 14.a	ICAR-Accredited Fisheries Education, RAWEP and FELP	44 final-year students in 14 villages with 200 fish farmers; 41 students trained in ornamental fish; 40+ students in monitoring	Experiential learning in culture, monitoring and village water-resource surveys	Graduates equipped to practise and promote aquatic stewardship	**RAWEP surveys extended to 25 villages; 100 students in FELP units**
Conservation and Circularity	Prevent and significantly reduce marine pollution of all kinds – SDG 14.1	Plastic Waste Action Plan	28.65 t collected, 100% recycled or diverted; 3.85 t (11.8%) reduction; 165+ students in four drives	Plastic recycled into paver blocks; paper into handmade paper	Less plastic reaching drains, water bodies and the sea	**Campus plastic waste below 20 t a year; 100% diversion maintained**
	Reduce pressure on wild fish stocks – SDG 14.4	Black Soldier Fly (BSF) and RAS Waste-to-Feed Programme	BSF larvae with 56.9% crude protein; 100% survival in the RAS feeding trial; 25 farmers of Buguda block trained	Partial replacement of fish meal with larvae reared on organic waste	Organic waste kept out of water bodies and less demand for wild-caught fish meal	**BSF feed used in all campus RAS units; 100 farmers trained**
Technology and Transfer	Transfer aquatic technology to improve ecosystem health – SDG 14.a	RAS Technology Transfer	2-lakh-litre RAS commissioned in January 2025; reference unit for an MKUY farmer RAS in Rayagada district	Farmer-built closed-loop unit based on the University model	Low-discharge production adopted beyond the campus with Fisheries Department support	**10 farmer RAS units established on the University model**
	Enhance scientific knowledge for aquatic ecosystem protection – SDG 14.a	Research, Patents and Publications	3 patents; 4 peer-reviewed papers; 1 book on IoT-based microalgae management	New materials and methods for removing pollutants and monitoring water quality	Scientific evidence that supports coastal and wetland management	**6 patents and 10 publications a year**

3. Supporting Aquatic Ecosystems through Education (14.2)

Community outreach on freshwater ecosystems, sustainable fisheries and overfishing, delivered to farmers, fishers, Self-Help Groups and students through training, demonstration units, field surveys and coastal awareness programmes.

3.1 Freshwater Ecosystems – Community Outreach (14.2.1)

Overview

Centurion University of Technology and Management (CUTM), through its School of Fisheries, delivers ongoing community outreach through educational and practical training programmes on freshwater ecosystems for farmers, fishers, Self-Help Groups (SHGs) and students from neighbouring villages and districts of Odisha. The programmes cover irrigation-water use, water-body management, water conservation and water-efficient aquaculture techniques, including cage culture, biofloc, Recirculating Aquaculture Systems (RAS), aquaponics, breeding and larval rearing. A significant institutional achievement is the in-house construction of Recirculating Aquaculture System (RAS) units by the University School of Fisheries, demonstrating its capacity to develop and establish advanced aquaculture infrastructure through its own technical expertise. These units function as living laboratories, providing year-round, hands-on opportunities for learning, experimentation and the demonstration of water-efficient aquaculture practices. Complemented by field surveys and practical training, the programmes equip participants with skills applicable to their own farming and aquaculture activities. Follow-up assessments document outcomes, including the adoption of demonstrated practices by participants on their farms.

Community Outreach in 2025

During 2025, CUTM conducted three documented community-based programmes on freshwater ecosystems including water irrigation practices, water management and water conservation, engaging a total of participants, supported by year-round demonstration units:

- **200 participants —** 3rd Utkal Krishi Mela, organised by the M.S. Swaminathan School of Agriculture, featuring discussions on aquaculture, livestock, farm mechanisation and crop protection.
- **44 participants —** RAWEP Field Survey of Water Bodies and Irrigation Infrastructure: final-year B.F.Sc. students working with farmers and SHG members in 14 villages of Gajapati district.
- **25 participants —**25 participants selected by district Gajapati district visited Biofloc aquaculture set up at the school of fisheries. The faculty gave training and demonstration about fish farming in the biofloc system.
- **20 participants —** Training on Intensive, Water-Saving Aquaculture (Biofloc, Shrimp Culture and RAS) for farmers from Rasoor and the surrounding area
- 118 participants — National Remote Sensing Day 2025, engaging students and local farming communities through expert talks and a student quiz on remote sensing applications in freshwater resource assessment, water management and sustainable ecosystem planning.
- **Demonstration units —** ornamental fish breeding, freshwater pearl culture and aquaponics units and value addition maintained under the Fisheries Experiential Learning Programme (FELP) and used for farmer and student training.

Rainwater Harvesting and Community Water Infrastructure

CUTM's collaboration with the LTIMindtree Foundation through the **Shelter to Habitat project** integrates sustainable housing and community infrastructure in rural tribal communities of Odisha. The

LTIMindtree Foundation Shelter to Habitation project commenced in **2024**, with the partnership formalised through an MoU announced on 27 November 2024 and implementation extending through 2025. The initiative covers villages including Alajhola and Gayaljuba in Rayagada Block and Rashika Rajpur in Gumma Block, with project documentation identifying an expected outreach of approximately **3,000 beneficiaries** across the three villages.

3.1 Rainwater Harvesting in Rural Housing

CUTM's project reporting documents **82 climate-resilient homes incorporating rainwater-harvesting systems** alongside other sustainable infrastructure. A separate CUTM public profile similarly describes 82 sustainable homes for tribal communities incorporating solar energy and rainwater harvesting.

Integrating rainwater harvesting into rural housing provides infrastructure for the **capture and beneficial use of rainfall**, supporting local water management and resource conservation beyond the University campus. In this way, the project connects climate-resilient housing with practical community-level water conservation.

3.2 Solar-Powered Community Water Infrastructure

The Shelter to Habitat project also incorporates **solar-powered borewell systems to support community access to safe drinking water**. These systems complement the rainwater-harvesting infrastructure by providing decentralised community water access within the wider sustainable-habitat initiative.

The water-conservation contribution of the project is therefore centred on **rainwater harvesting integrated into rural housing and supporting community water infrastructure**. CUTM's available records document these interventions but do not quantify the volume of rainwater harvested or the resulting reduction in freshwater extraction. The project is therefore presented as practical support for **rainwater capture and community water management**, without attributing an unverified quantity of water conserved.

CUTM's Smart Agriculture domain includes smart irrigation systems, sensor-based irrigation scheduling, automated fertigation, IoT/sensor systems and hydroponics, with sensor-enabled irrigation infrastructure

Case Study: RAWEP Field Survey of Water Bodies and Irrigation Infrastructure — Gajapati District

As part of the Rural Agricultural Work Experience (RAWE) internship, 44 final-year B.F.Sc. students conducted a household- and community-level assessment of water bodies and irrigation infrastructure across 14 villages in Gajapati district, Odisha, engaging with farmers and Self-Help Group (SHG) members. The survey generated village-level information on the availability, condition, use and management of local water resources, providing a baseline for identifying gaps in water management and opportunities for sustainable aquaculture and irrigation practices.

14 villages covered: Gosani, B. Sitapur, R. Sitapur, Totagumuda, Rayada, R. Udaygiri, Burkhhat, Mahendragiri, Kashinagar, Seranga, Gumma, Palasa, Tikili and Barua.

Outcome: The survey identified community-level water-resource management needs and potential sites and practices for improved aquatic-resource use across the 14 villages. It produced a village-level baseline on the condition of irrigation water bodies and community water-management practices, which supported follow-up interventions with farmers and SHGs.



Figure 1. *Student surveying irrigation infrastructure use with a farmer — Serango,*



Figure 2. *Students recording water-resource data with farmers and SHG Odisha (14 July 2025) members — Brahmana Sitapur, Odisha (13 July 2025)*

Case Study: Farmer Training on Intensive, Water-Saving Aquaculture — Biofloc, Shrimp Culture and RAS (Rasoor Village)

A hands-on training programme on intensive aquaculture practices was conducted in July 2025 at the School of Fisheries, Centurion University campus. It covered three emerging technologies — biofloc systems, shrimp culture and Recirculating Aquaculture Systems (RAS) and was attended by 20 farmers from Rasoor and the surrounding area.

Participants received hands-on exposure to biofloc-based culture, shrimp culture practices, and RAS operation and management, using the School of Fisheries' on-campus demonstration units. RAS cleans and reuses the same water within the system, reducing the need for a continuous freshwater supply; biofloc technology uses beneficial micro-organisms to maintain water quality, reducing the need for frequent water replacement. Compared with conventional flow-through ponds, both require less freshwater per unit of fish produced, so the training covered their role in reducing freshwater use as well as their production benefits.

Outcome: 20 farmers acquired practical skills in operating biofloc and RAS units, water-conserving technologies that were not previously part of their production systems, and in managing water quality with minimal water exchange.



Figure 3. *Farmers from Rasoor at the School of Fisheries' RAS and biofloc demonstration units, July 2025*

Freshwater Management and Sustainable Aquaculture

In 2025, the School of Fisheries trained 50 fish farmers in freshwater aquaculture and resource management, with ten progressive farmers and two women's Self-Help Groups expressing interest in demonstrating the floating cage aquaponics system under IFCASRIPF. The School assured continued handholding support to participating communities. Additionally, 44 fourth-year B.F.Sc. students engaged with a group of 200 fish farmers through the Rural Fisheries Work Experience Programme (RAWEP), supporting the exchange of knowledge on freshwater fisheries and sustainable aquaculture practices.

Case study: National Remote Sensing Day

Centurion University of Technology and Management (CUTM), Paralakhemundi Campus, observed National Remote Sensing Day on 12 August 2025, engaging 118 students and members of local farming communities in learning about remote sensing applications in natural resource management, including freshwater resources.

The programme featured two expert talks highlighting the relevance of Earth observation and geospatial technologies to water resource management and environmental monitoring. Dr. Panda discussed ISRO's Earth observation missions and their applications in agriculture, fisheries, water resource management and disaster mitigation. Dr. Farooq explained how remote sensing supports data-driven natural resource monitoring and planning, including environmental and climate studies. A student quiz competition further encouraged scientific learning and engagement with remote sensing concepts. Through expert-led sessions, interactive learning and community participation, the programme promoted awareness of technologies that can support freshwater resource assessment, water management planning and sustainable ecosystem management.



Figure 4. *National Remote Sensing Day*

Case Study: Ornamental Fisheries, Pearl Culture and Aquaponics Units — Freshwater Ecosystem Demonstration and Community Outreach

During 2025, Centurion University of Technology and Management (CUTM), through its Fisheries Experiential Learning Programme (FELP), promoted freshwater resource management through practical learning, technology demonstrations and community outreach. The campus ornamental fisheries, freshwater pearl culture and aquaponics units demonstrated how freshwater resources can be utilised efficiently for aquaculture while supporting student training, farmer knowledge transfer and sustainable livelihoods.

Four final-year B.F.Sc. female students were assigned to manage ornamental fish breeding and culture and maintain the aquaponics system within the intensive fish-rearing unit. These activities provided practical exposure to freshwater quality management, fish breeding, larval rearing and aquaculture systems that support more efficient water use. Species bred and reared included fighter fish, angelfish, polar blue parrot fish, gourami, cichlids, goldfish, guppy and molly. Fighter fish (Betta splendens) breeding recorded approximately 93% fertilisation, 100% hatching and 72% larval survival.

Table 1. Fighter fish (Betta splendens) breeding performance, FELP 2025

Parameter	Result (%)
Fertilisation rate	~93
Hatching rate	100
Larval survival rate	~72
Mortality rate	~28

The programme connected freshwater ecosystem education with practical approaches to responsible water-resource use in aquaculture. Demonstrations of recirculating aquaculture systems (RAS), biofloc and aquaponics exposed students and visiting farmers to alternative production methods that can help reduce freshwater demand and improve water-use efficiency when appropriately managed. The units also provided opportunities to share knowledge on freshwater aquaculture practices and explore their application in household-scale production and livelihood development.

Outcome: The units served as practical demonstration and learning facilities for freshwater management, documenting fish-breeding performance while showcasing aquaculture approaches designed to use water more efficiently and support sustainable freshwater-based livelihoods.

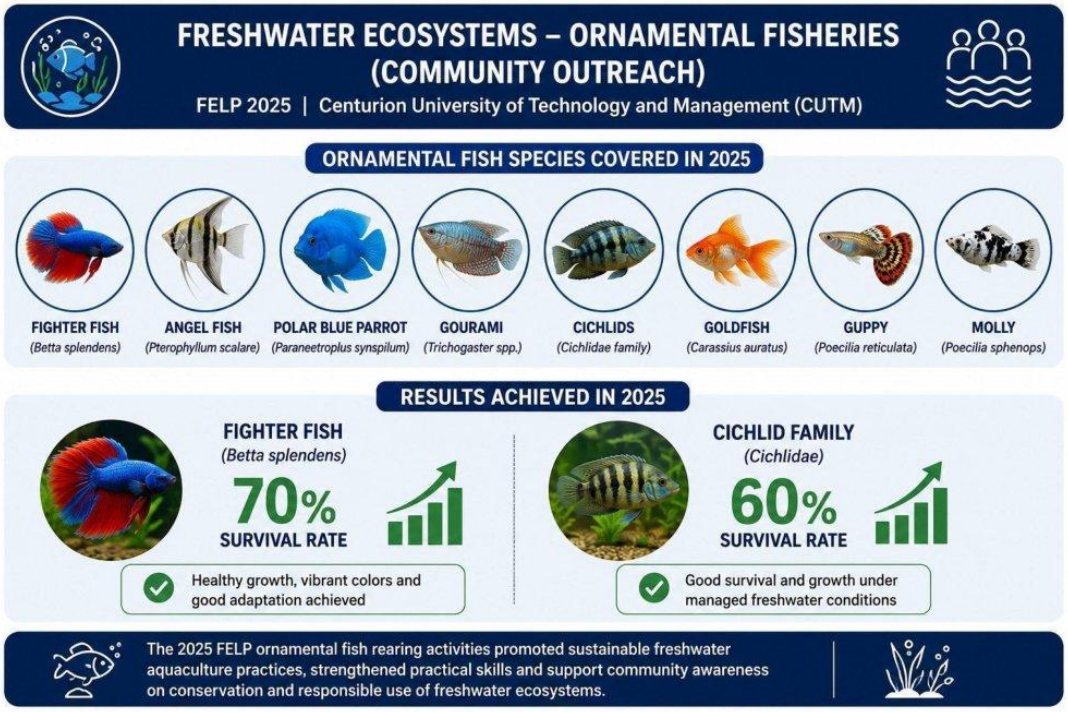


Figure 5. *Freshwater ecosystems — ornamental fisheries community outreach, FELP 2025*

3rd Utkal Krishi Mela (Farmers' Fair)

3rd Utkal Krishi Mela, Paralakhemundi (7–8 April 2025): Organised by the M.S. Swaminathan School of Agriculture, Centurion University of Technology and Management (CUTM), the two-day farmers' fair

brought together farmers, students, researchers, agricultural experts, entrepreneurs and representatives of government departments. The event recorded 200 participants, as per the available reporting.

Focused on:

- **Aquaculture awareness:** A panel discussion addressed aquaculture alongside livestock management, farm mechanisation and crop protection.
- **Technology demonstrations:** The fair showcased agricultural innovations and technologies relevant to improving farm productivity and resource use.
- **Farmer–expert interaction:** Technical discussio**ns enabled knowledge exchange on scientific farming practices and challenges faced by farmers.**
- **Sustainable livelihoods:** The programme promoted awareness of improved agricultural practices and technology-based solutions for rural development.



Figure 6. *3rd Utkal Krishi Mela*

Participatory Freshwater Resource Mapping — Hatibadigopinathpur

Date: 2 July 2025

Location: Hatibadigopinathpur, Gajapati district, Odisha (18.763162° N, 84.13694° E)

Participants: 22 B.F.Sc. students and 1 faculty member under the Rural Agricultural Work Experience Programme (RAWEP)

As part of RAWEP, students conducted a participatory resource-mapping exercise in Hatibadigopinathpur, documenting the village's natural resources, with particular emphasis on freshwater resources, their availability and their utilisation by the community. The exercise helped students understand the community's dependence on local water resources and the importance of their conservation and sustainable management.

Link to freshwater conservation and sustainable utilisation: The mapping exercise supported the documentation of local freshwater resources and community water-use patterns, providing a basis for understanding resource availability and identifying considerations for their sustainable utilisation. It aligns with the conservation and sustainable management of freshwater ecosystems, including rivers, lakes and other inland water resources.



Figure 7. *Students preparing a participatory resource map of village water resources, Hatibadigopinathpur, 2 July 2025*

3.2 Sustainable Fisheries – Community Outreach (14.2.2)

Overview

Centurion University, the School of Fisheries provides educational outreach on sustainable management of fisheries and aquaculture through hands-on training and demonstration facilities. The evidence documented in this report includes three community activities: a training programme on pond management and carp breeding at Totagomuda for 25 local fishermen; a four-day capacity enhancement workshop on fisheries governance and blue economy practices for 25 farmers and 20 students; and an exposure visit by 28 farmers of the Centre for Community Development (CCD), Gajapati, which included the university's Recirculating Aquaculture System (RAS) unit. The School also hosted a 15-day internship on advanced fisheries practices for zoology students from Gargaon College, Assam.

Eco-tourism Demonstration Models

The School of Fisheries' aquaponics, biofloc and RAS units and the Aquaculture Research Farm serve as eco-tourism and educational demonstration models for visiting farmers, fishermen and students. In 2025, through the 3rd Utkal Krishi, these facilities received 200 participants, including farmers, students, researchers, agricultural experts, entrepreneurs and government representatives, providing a platform for agricultural knowledge exchange, technology demonstrations and awareness of farming and allied livelihood practices, including aquaculture.

25 fishermen for hands-on training at the Aquaculture Research Farm, Totagomuda. 28 farmers from the Centre for Community Development (CCD), Gajapati, who were shown the RAS unit during an exposure visit on 2 December 2025 and four students from Gargaon College, Assam, who were trained on the RAS and biofloc units during a 15-day internship.

National Sustainable Fisheries Education and Capacity Building — Gargaon College, Assam

The School of Fisheries hosted four students from the Department of Zoology, Gargaon College, Simaluguri, Assam, for a 15-day Internship Programme on Advanced Fisheries Practices, held from 30 June to 14 July 2025 at the Paralakhemundi Campus. The internship combined theory and hands-on practical sessions covering nursery management, water-quality assessment, Recirculating Aquaculture Systems (RAS), biofloc technology, ornamental fish farming, fish nutrition and feed technology, live fish-feed culture, fish-disease diagnostics and post-harvest handling. Students also undertook field visits to the Fish Landing Centre at Gopalpur and the regulated fish market at Berhampur.



Figure 8. *Internship Programme on Advanced Fisheries Practices — Gargaon College students at the School of Fisheries fish-rearing unit*

Local Training on Sustainable Pond Management and Carp Breeding Practices — Totagomuda

A 4-day hands-on training programme on pond management and carp breeding practices was conducted from 2 to 5 August 2025 at the Aquaculture Research Farm, Totagomuda, with participation from 25 fishermen. Participants received practical exposure to pond management and induced breeding of Rohu using the ICAR-CIFA model.

Table 2. Programme details

Item	Details
Programme	Training on Pond Management and Carp Breeding Practices
Dates	2–5 August 2025
Duration	4 days
Venue	Aquaculture Research Farm, Totagomuda (School of Fisheries, CUTM)
Participants	25 fishermen from the local community
Student involvement	7 FELP students (hands-on training)
Resource persons	Dr. Sambid Swain, Dr. Iffat Jahan and Dr. Pritam Tripathy (Aquaculture faculty)
Technique demonstrated	Complete induced-breeding procedure of Rohu using WOVA-FH and the ICAR-CIFA carp model hatchery



Figure 9. *Case study summary — Training on Pond Management and Carp Breeding Practices, Totagomuda (2025)*



Figure 10. *Hands-on demonstration of induced spawning (hormone injection) in Rohu broodstock*

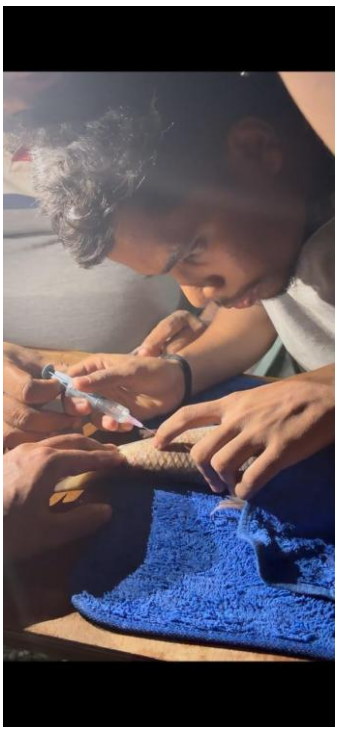


Figure 11. *ICAR-CIFA model carp hatchery — hatching pool, School of Fisheries, Aquaculture Research Farm, Totagomuda*

3.1 Practical Training Process

1. **Brood stock:** selection of healthy Rohu brooders.
2. **Hormone administration:** use of WOVA-FH for induced breeding.
3. **Induced breeding:** breeding carried out in the ICAR-CIFA carp model hatchery.
4. **Egg incubation:** controlled incubation for healthy hatching.
5. **Hatching and larval rearing:** hatching to fry under optimal conditions.

3.2 Training and Participant Outcomes

- **Participant outcome:** 4% of the participating farmers subsequently adopted the demonstrated carp-breeding technique on their own pond.
- **Survival during training:** approximately 70% survival from egg to spawn and approximately 50% survival from spawn to fry. Considering the relatively high water hardness in the region, the survival rates achieved are encouraging in the context of prevailing aquaculture conditions across Gajapati district.
- **Capacity building:** farmers gained direct exposure to carp breeding and pond-management practices, strengthening local capacity for sustainable freshwater aquaculture and seed availability.

Case Study: Farmers' Exposure Visit to the RAS Unit — CCD Gajapati

A one-day Farmers' Exposure Visit was held on 2 December 2025 for 28 farmers associated with the Centre for Community Development (CCD), Gajapati, together with CCD staff members. The visit was organised by the Department of Agricultural Extension Education, M.S. Swaminathan School of Agriculture, and sponsored by CCD Gajapati. Farmers were taken through the university's demonstration units, including the Recirculating Aquaculture System (RAS) unit, where students, staff and resource persons explained the technology and answered farmers' questions.

- **Date and duration:** 2 December 2025
- **Participants:** 28 farmers associated with CCD Gajapati, with CCD staff members; signed registration forms on record

- **Aquaculture content:** exposure to the RAS unit, a closed-loop, water-efficient fish-culture system, as one of the demonstration stops, with explanation and question-and-answer session
- **Coordinators:** Mr. Biswajit Sahoo (Assistant Professor) and Mrs. Oggu Kirti Priya (Project Executive), MSSSoA
- **Outcome:** participants' feedback forms record positive remarks; farmers expressed interest in adopting several of the technologies observed. The visit was covered by The Yugabdha (Odia news daily) on 3 December 2025.



Figure 12. *CCD Gajapati farmers at the Recirculating Aquaculture System (RAS) unit, CUTM*



Figure 13. *The Yugabdha, 3 December 2025*

Urban Waterbody Conservation and Sustainable Aquatic Ecosystem Awareness

Bhubaneswar's ponds and urban waterbodies are important freshwater ecosystems that support aquatic biodiversity and provide opportunities for environmental education and community engagement. CUTM's campus-level water-management initiatives provide a relevant institutional example of responsible waterbody management. The Bhubaneswar Water Audit documents the treatment and reuse of wastewater for gardening and irrigation, with surplus treated water directed towards a campus pond for groundwater recharge. The Environmental Audit 2024–25 also identifies the campus lake as an important aquatic resource and highlights sediment accumulation as an issue requiring attention. These observations reinforce the importance of water-quality monitoring, responsible wastewater management and the protection of freshwater habitats.

Local Four-Day Capacity Enhancement Workshop on Fisheries Governance and Blue Economy Practices

The School of Fisheries conducted a four-day capacity enhancement workshop from 16 to 19 July 2025, bringing local fish farmers and students together in a structured, day-wise extension programme on fisheries governance, sustainable aquaculture technologies, blue economy livelihoods and community action planning.

Table 3. Workshop details

Item	Details
Dates	16–19 July 2025 (4 days)
Organised by	School of Fisheries, CUTM Paralakhemundi
Overall coordinator	Mr. Chinmaya Nanda
Resource faculty	Dr. Iffat Jahan, Dr. Aurobindo
Participants	25 farmers and 20 students (45 in total)

Item	Details
Day 1	Fisheries governance and sustainable resource management: responsible fishing practices and fisheries regulations; community participation and co-management of aquatic resources; aquatic biodiversity conservation
Day 2	Sustainable aquaculture technologies: biofloc, Recirculating Aquaculture Systems (RAS) and water reuse, aquaponics, integrated aquaculture
Day 3	Blue economy and diversified aquatic livelihoods: ornamental fish culture, fish seed production and nursery management, small-scale aquaculture, value addition and post-harvest management
Day 4	Entrepreneurship, livelihoods and community action: fisheries-based enterprises, women and youth participation, market linkages and value chains, community-level action planning

Field component: participants and faculty visited a community pond and reservoir site to observe cage culture infrastructure and to discuss water resource management and community co-management practices directly with local stakeholders.

Outcome: the workshop built capacity among 25 farmers and 20 students across the governance, technology and livelihood dimensions of sustainable fisheries and aquaculture, ending with a community-level action-planning session on Day 4 to carry the training into farmer-led sustainable practice.



Figure 14. *Faculty, students and farmer participants at a community pond field site during the workshop (July 2025)*

2025 Measurement Evidence — Supporting Technical Data

The following 2025 results from the School of Fisheries biofloc trial for Amur carp, comparing a control with jaggery-based (T1) and millet-based (T2) biofloc, provide current-year technical evidence on water quality and production efficiency, supporting the sustainable aquaculture practices demonstrated through the outreach activities above.

Table 4. 2025 biofloc trial performance relative to control (Amur carp)

Measure	Control	T1 (Jaggery)	Change vs control	T2 (Millet)	Change vs control
Dissolved oxygen (mg L^{-1})	5.30	7.23	+36%	7.50	+42%
Total Ammonia Nitrogen (mg L^{-1})	0.50	0.25	−50%	0.35	−30%
Final weight (g)	124.00	215.00	+73%	171.67	+38%
Feed Conversion Ratio	2.05	1.23	−40% (better)	1.47	−28% (better)
Survival (%)	100	100	No loss	100	No loss

Both biofloc treatments outperformed the control on every growth metric, with the jaggery-based biofloc (T1) performing best overall: 73% higher final body weight, more than double the weight-gain percentage

and a markedly better feed conversion ratio (1.23 vs 2.05), with **100% survival maintained across all three groups.**

Ornamental Fish Culture and Health Programme

The Ornamental Fish Culture and Health Programme continued in 2025 as a hands-on and livelihood-oriented activity that applies water-quality and fish-health management at the level of individual systems. Aquaria serves as live demonstration units for students, farmers and Self-Help Group (SHG) members, and in 2025 day-to-day management of the units was led by four final-year FELP students.

Table 5. Ornamental fish programme: 2025

Measure	2025
Aquaria maintained as demonstration units	30
Farmers and SHG members engaged	~70
Students trained in breeding, rearing and fish-health management	41

Species bred in 2025 included Betta (fighter fish), Polar Blue Parrot, goldfish (Carassius auratus), guppy (Poecilia reticulata), molly (Poecilia sphenops) and platy (Xiphophorus maculatus). Each breeding line involved species-specific management of temperature, pH and tank set-up, spawning observation and fry care. Breeding performance was recorded for each line; fighter fish achieved about 98% fertilisation, 90% hatching and 71% larval survival.

7.1 Ornamental Fish Laboratory, Department of Zoology

The Department of Zoology, School of Applied Sciences, CUTM, maintains an ornamental fish laboratory with a documented reference collection of 14 species — pleco, tetra, blood parrot cichlid, molly, cherry shrimp, three-spot gourami, tiger barb, zebrafish, guppy, electric yellow cichlid, swordtail, koi, betta and goldfish — recording the breeding biology, feeding behaviour and colour pigmentation of each species.

A two-day workshop, “Exploring Ornamental Fishes: Sexual Dimorphism, Breeding Biology and Aquascaping”, was held in the laboratory from 25 November 2025. Students practised sex identification, breeding set-ups, courtship and spawning observation, larval management, aquarium set-up, water-quality management, fish handling and aquascaping with mollies, guppies and bettas, and swordtail juveniles and betta hatchlings were raised in the laboratory.



Figure 15. *Students in the ornamental fish breeding and aquascaping workshop, Department of Zoology, CUTM Bhubaneswar (November 2025)*

3rd Utkal Krishi Mela (Farmers' Fair)

The 3rd Utkal Krishi Mela, held in Paralakhemundi on 7–8 April 2025, was organised by the M.S. Swaminathan School of Agriculture, Centurion University of Technology and Management (CUTM). The two-day event brought together 200 participants, including farmers, students, researchers, agricultural experts, entrepreneurs and government department representatives. The fair provided a platform for agricultural knowledge exchange, technology demonstrations and awareness of farming and allied livelihood practices.

Key activities and their relevance to sustainable management included:

- Aquaculture Awareness and Sustainable Fisheries: A panel discussion addressed aquaculture alongside livestock management, farm mechanisation and crop protection. The event provided an opportunity to discuss aquaculture as an allied livelihood activity and its relevance to rural communities. This aligns with outreach on sustainable fisheries and aquaculture management, particularly when supported by evidence of practices such as responsible fish farming, efficient water use and aquatic resource conservation.
- CUTM Campus as a Learning Site for Aquaculture and Tourism: CUTM's campus can also serve as a site for educational outreach on sustainable aquaculture and the relationship between aquatic ecosystems and tourism, where relevant facilities and activities are documented. Campus-based demonstrations and learning activities can help students and community visitors understand responsible aquaculture practices, freshwater resource management and the importance of conserving aquatic environments that support recreational and nature-based tourism.
- Technology Demonstrations: Agricultural innovations and technologies showcased at the fair familiarised participants with approaches relevant to farm productivity and resource use, supporting awareness of technology-based solutions for rural livelihoods.
- Farmer–Expert Knowledge Exchange: Technical discussions enabled participants to exchange knowledge on scientific farming practices and challenges faced by farmers, strengthening opportunities for community learning on agriculture and allied activities.

The farmers' fair provides evidence of community outreach on agriculture and aquaculture awareness. CUTM's campus may provide a complementary learning site for sustainable aquaculture, fisheries and tourism, provided that the relevant facilities, educational activities and community engagement are documented.

3.3 Overfishing – Community Outreach (14.2.3)

95+ fishermen and fisherfolk engaged in field-based awareness programs	**1,620 kg** marine debris removed, incl. discarded fishing nets	**80+** fisherfolk at Chandrabhaga Beach	**8 June** World Ocean Day 2025 observed

1. Overview

Centurion University of Technology and Management (CUTM) carries out educational outreach with fishing communities to raise awareness of overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices. In 2025 this reached 95+ fishermen and fisherfolk through two coastal programmes: a field-based awareness programme with 15 local fishermen at a working fish landing centre in Visakhapatnam, Andhra Pradesh, delivered by the School of Fisheries with 24 B.F.Sc. students; and a coastal clean-up and sustainable-fishing awareness programme with 80+ fisherfolk at Chandrabhaga

Beach, Konark, held with the Indian National Centre for Ocean Information Services (INCOIS), which removed discarded fishing nets and other marine debris. The School of Fisheries also continued its annual observance of World Ocean Day (8 June) with an awareness programme on ocean conservation and sustainable marine resource management.

2. Case Study 1: Fish Landing Centre Awareness Programme, Visakhapatnam

During an educational exposure tour to Visakhapatnam (Vizag), Andhra Pradesh, on 20–21 August 2025, the School of Fisheries, CUTM Paralakhemundi, conducted an awareness programme at a working fish landing centre. A group of 24 B.F.Sc. 5th-semester students, accompanied by faculty, delivered the programme.

At the beach and fish landing centre, the students and faculty engaged 15 local fishermen in discussions on **mesh-size regulations, appropriate fishing gear, fish handling practices, and illegal and unregulated fishing**. The interaction focused on promoting responsible fishing practices and reducing activities that contribute to overfishing and the depletion of marine fish stocks.

A beach and harbour cleaning drive was also conducted at the landing site to raise awareness about marine litter and abandoned, lost or discarded fishing gear (ALDFG, or "ghost gear"), which continues to trap and harm aquatic organisms and damage marine ecosystems.

Table 6. Programme details

Item	Details
Dates	20–21 August 2025
Location	Fish landing centre and harbour, Visakhapatnam, Andhra Pradesh
Community participants	15 local fishermen
University participants	24 B.F.Sc. 5th-semester students with accompanying faculty, School of Fisheries
Activities	Awareness discussions with fishermen; beach and harbour cleaning drive

Table 7. Awareness topics covered with fishermen and their link to the indicator

Topic discussed	Indicator area addressed
Mesh-size regulations	Overfishing: legal mesh sizes let juvenile fish escape and so protect breeding stocks
Appropriate fishing gear	Destructive fishing practices: choosing gear that limits bycatch and habitat damage
Illegal and unregulated fishing	Illegal, unreported and unregulated (IUU) fishing
Abandoned, lost or discarded fishing gear (cleaning drive)	Destructive fishing practices: ghost gear that keeps catching fish and harming marine life



Figure 16. *B.F.Sc. 5th-semester students and faculty at the fish landing harbour, Visakhapatnam, during the educational exposure tour and awareness programme (20–21 August 2025)*

3. World Ocean Day 2025: Awareness Programme on Ocean Conservation and Sustainable Marine Resource Management

Continuing its annual observance of World Ocean Day, which in 2024 featured the Tableau exhibition "Saving Turtles – Sustainable Education for a Thriving Marine Future" on overfishing, bycatch reduction and Turtle Excluder Devices, the School of Fisheries observed World Ocean Day 2025 on 8 June 2025 at the Fish Resource Management (FRM) Laboratory, School of Fisheries, CUTM.

The programme promoted awareness about ocean conservation and the sustainable use of marine resources. It included a painting competition on ocean conservation themes, encouraging students to creatively express the importance of protecting marine ecosystems, and an awareness talk by a faculty member (Dr. Iffat Jahan) on ocean health, conservation and the responsible use of aquatic resources. A total of 44 Participants gained an understanding of the importance of marine biodiversity conservation, sustainable fisheries and the protection of ocean ecosystems.



Figure 17. *Painting competition on ocean conservation themes, World Ocean Day 2025, FRM Laboratory, School of Fisheries (8 June 2025)*

4. Case Study 2: "Swachh Sagar, Surakshit Sagar" Coastal Clean-Up and Sustainable Fishing Awareness with Fisherfolk — Konark and Astaranga

On International Coastal Cleanup Day, 20 September 2025, CUTM joined the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, and the NGO SPANDAN to hold a beach clean-up and community awareness programme under the national "Swachh Sagar, Surakshit Sagar" (Clean Ocean, Safe Ocean) campaign. The programme was coordinated by Dr. Kamal Kumar Barik (Department of Civil Engineering) and Dr. Pratap Kumar Chhotaray (Department of Chemistry), CUTM, with funding from INCOIS.

At Chandrabhaga Beach, Konark, more than 80 fisherfolk worked alongside INCOIS scientists, CUTM officials, students and local community members. Together they collected 1,400 kg of waste, including plastic litter, discarded fishing nets and other non-biodegradable material. INCOIS scientists Dr. Sanjiba Baliarsingh and Dr. Alakes Samanta interacted with the participants on the growing problem of marine plastic pollution and its adverse impact on fisheries and coastal livelihoods. At Tandahar Beach, Astaranga, more than 40 volunteers, including government officials, students and members of the fishing community, removed a further 220 kg of marine debris.

Awareness sessions held with the participants covered sustainable fishing practices, the harmful effects of single-use plastics, and community stewardship of the coast, and the programme closed with a collective pledge to promote eco-friendly practices and protect the ocean. All collected waste was segregated and handed over for safe disposal. CUTM Pro-Vice Chancellor Dr. Biswajit Mishra emphasised the importance of engaging youth and coastal communities in this work.



Figure 18. *Coastal Clean-Up and Sustainable Fishing Awareness with Fisherfolk — Konark and Astaranga*

Table 8. Programme details and results

Item	Details
Date	20 September 2025 (International Coastal Cleanup Day)
Locations	Chandrabhaga Beach, Konark; Tandahar Beach, Astaranga, Odisha
Partners	INCOIS, Hyderabad (Ministry of Earth Sciences); NGO SPANDAN
Community participants	80+ fisherfolk with local community members at Konark; 40+ volunteers including fishing-community members at Astaranga

Item	Details
Awareness topics	Sustainable fishing practices; harm from single-use plastics; community stewardship of the coast
Debris removed	1,400 kg at Konark (including discarded fishing nets) + 220 kg at Astaranga = 1,620 kg
Media coverage	12 outlets, including Kanak News and KNews (video), Orissa Diary, Odisha Khabar, The Businessbytes, Pragativadi, Samaja, Prameya, Samaya and Nitidina
Message to participants from INCOIS scientists *"Beaches are not only hubs of ecological significance but also crucial for tourism and the fishing economy. Collective action is essential to safeguard them."* Dr. Sanjiba Baliarsingh and Dr. Alakes Samanta, INCOIS	



Figure 19. *Fisherfolk, volunteers and the INCOIS–CUTM team with collected waste beside fishing boats and nets, Chandrabhaga Beach, Konark (20 September 2025; image as published by Orissa Diary)*



Figure 20. *Volunteers and women from the fishing community clearing the shoreline (20 September 2025; image from KNews video coverage)*

Discarded fishing nets are a form of abandoned, lost or discarded fishing gear ("ghost gear") that continues to catch fish and harm marine life. Removing them with fisherfolk, alongside sessions on sustainable fishing practices, directly addresses the destructive-fishing element of this indicator.

Source: event report published on the CUTM website: https://cutm.ac.in/wp-content/uploads/event/2025/Beach%20Clean-Up%20at%20Konark%20and%20Astaranga%202025.pdf

Table 9. Beach clean-up awareness programme, 2025

Sl. No.	Place	Date	No. of participants
1	Palasa Gopalpur Beach (Andhra Pradesh)	12 July 2025	12
2	Konark and Astaranga	20 September 2025	40
3	Berhampur Beach	23 October 2025	12
	Total		**64**

4. Supporting Aquatic Ecosystems through Action (14.3)

Events promoting the conservation and sustainable use of oceans, rivers and lakes, direct work to maintain threatened aquatic ecosystems and their biodiversity, and technologies that prevent damage to aquatic ecosystems.

4.1 Conservation and Sustainable Utilisation of the Oceans – Events (14.3.1)

6	~100	2	2
conservation and sustainable-use events in 2025	farmers and trainees trained at the RAS facility (5 batches)	coastal clean-up drive, Gopalpur beach	national fisheries research institutes visited

Overview

Centurion University's School of Fisheries organises and supports ongoing events promoting the conservation and sustainable utilisation of oceans, rivers, lakes and aquatic resources. In 2025 these comprised a recurring farmers' training programme on water-recirculating aquaculture, a coastal clean-up drive at Gopalpur beach, Odisha (12 July, 2025), the School's annual fisheries event "Blue-Fiesta", a participatory mapping of village freshwater resources, and two student exposure events at national fisheries research institutes, ICAR-CMFRI (Visakhapatnam) and ICAR-CIFE (Mumbai), focused on marine resource conservation and aquatic biodiversity.

Table 10. 2025 Conservation and Sustainable Utilisation of the Oceans Events at a Glance

Date	Event	Location	Participants	Conservation focus
Across 2025 (5 batches)	RAS Farmers' Training and Demonstration Programme	RAS facility, School of Fisheries, CUTM Paralakhemundi	~100 farmers, trainers and visitors; 20–24 B.F.Sc. students	Water-recirculating fish production that reduces withdrawal from and discharge into rivers and lakes
2 Jul 2025	Participatory freshwater resource mapping (RAWEP)	Hatibadigopinathpur, Gajapati, Odisha	22 students, 1 faculty member	Documenting village freshwater resources and their sustainable use
20 Aug 2025	Exposure visit to ICAR-CMFRI	Visakhapatnam, Andhra Pradesh	24 B.F.Sc. students with faculty	Marine biodiversity conservation and fishery resource assessment
22 Aug 2025	Field visit to ICAR-CIFE	Mumbai, Maharashtra	B.F.Sc. 4th-year students with faculty	Aquatic biodiversity documentation and water-efficient aquaculture
12 July 2025	Beach clean-up drive	Gopalpur beach, Andhra Pradesh	12students, 2 faculty members	Removal of plastic and marine litter from the shoreline
20 Sep 2025	"Swachh Sagar, Surakshit Sagar" Coastal Clean-Up and Sustainable Fishing Awareness with Fisherfolk	Chandrabhaga Beach, Konark, and Tandahar Beach, Astaranga, Odisha	More than 80 fisherfolk at Chandrabhaga Beach and more than 40 volunteers at Tandahar Beach, alongside scientists, university representatives, students and community members	Coastal and marine pollution prevention through the removal of 1,620 kg of waste, including plastic litter, discarded fishing nets and other marine debris, combined with awareness-raising on plastic pollution, its impacts on fisheries and coastal livelihoods, and sustainable fishing practices.
1 Nov 2025	"Blue-Fiesta" annual fisheries event	Auditorium, School of Fisheries, CUTM Paralakhemundi	Students, faculty and invited experts from industry, fisheries administration and NABARD	Student exhibits on aquaculture, fish processing and sustainable fisheries practices; expert talks on the future of aquaculture

1. Swachh Sagar, Surakshit Sagar" Coastal Clean-Up and Sustainable Fishing Awareness with Fisherfolk — Konark and Astaranga

On International Coastal Cleanup Day, 20 September 2025, CUTM joined the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, and the NGO SPANDAN to hold a beach clean-up and community awareness programme under the national "Swachh Sagar, Surakshit Sagar" (Clean Ocean, Safe Ocean) campaign. The programme was coordinated by Dr. Kamal Kumar Barik (Department of Civil Engineering) and Dr. Pratap Kumar Chhotaray (Department of Chemistry), CUTM, with funding from INCOIS.

At Chandrabhaga Beach, Konark, more than 80 fisherfolk worked alongside INCOIS scientists, CUTM officials, students and local community members. Together they collected 1,400 kg of waste, including plastic litter, discarded fishing nets and other non-biodegradable material. INCOIS scientists Dr. Sanjiba Baliarsingh and Dr. Alakes Samanta interacted with the participants on the growing problem of marine plastic pollution and its adverse impact on fisheries and coastal livelihoods. At Tandahar Beach, Astaranga, more than 40 volunteers, including government officials, students and members of the fishing community, removed a further 220 kg of marine debris.

2. RAS Farmers' Training and Demonstration Programme

The School of Fisheries at Centurion University of Technology and Management (CUTM) has **constructed its Recirculating Aquaculture System (RAS) units in-house**, demonstrating the University's technical expertise in developing advanced, water-efficient aquaculture infrastructure. Functioning as a living laboratory, the RAS facility served as a regular demonstration and training hub throughout 2025 for local fish farmers, trainers and visiting delegates, providing hands-on exposure to sustainable aquaculture practices and water-efficient production technologies.

Reach in 2025: five batches of farmers and trainees, with about 18–22 participants per batch, giving a cumulative total of about 100 participants trained during the year (5 batches × 18–22 = 90–110).

Training content: RAS operation, feed management, disease prevention, water-quality monitoring, culture of high-value fish and sustainable harvesting practices.

Student involvement: about 20–24 B.F.Sc. 4th-year students operated and managed the RAS system through the year, gaining hands-on experience in system operation, feeding, water-quality monitoring, fish health management and maintenance.

Link to conservation and sustainable use: RAS filters and reuses the same water in a closed loop, so fish can be produced with a small fraction of the fresh water used by conventional ponds and without releasing nutrient-rich effluent into nearby rivers, lakes or coastal waters. Training farmers in RAS, water-quality monitoring and sustainable harvesting therefore promotes the sustainable use of freshwater resources and reduces pressure on natural water bodies.



Figure 21. Farmers and trainees at the RAS demonstration facility, School of Fisheries, CUTM



Figure 22. Visiting farmers receiving a demonstration of the RAS unit

3. Beach Clean-Up Drive — Gopalpur Beach

Date: 23 Oct 2025

Location: Berhampur beach, Odisha

Participants: 12 students and 2 faculty members, School of Fisheries

Students manually collected plastic bottles, cans and other marine litter from the shoreline, removing waste before it could be washed into the sea.

Link to conservation and sustainable use: marine litter, especially plastic, harms seabirds, turtles and fish that ingest or become entangled in it; clearing it from the shoreline directly supports the conservation of coastal and marine ecosystems and raises awareness of marine pollution.



Figure 23. Students collecting marine litter along the shoreline, Berhampur beach (23 October 2025)

Table 11. Beach clean-up awareness programme, 2025

Sl. No.	Place	Date	No. of participants
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3	Berhampur Beach	23 October 2025	12
	Total		**64**

4. Student Exposure Visit — ICAR-CMFRI, Visakhapatnam

Date: 20 August 2025, as part of a two-day educational exposure tour to Visakhapatnam, Andhra Pradesh

Participants: 24 B.F.Sc. 5th-semester students with faculty (Dr. Iffat Jahan), School of Fisheries, CUTM

Resource persons: Dr. Joe K. Kizhakudan (Principal Scientist) and Dr. Pralay Ranjan Behera (Senior Scientist), ICAR-Central Marine Fisheries Research Institute

Activities: briefing on marine fish breeding techniques and controlled-environment fish care; overview of ongoing aquaculture and mariculture research; discussion on marine biodiversity, conservation strategies and fishery resource assessment; laboratory and research-unit tour; discussion on potential academic collaboration with CMFRI.

Link to conservation and sustainable use: the briefing covered fishery resource assessment, marine biodiversity conservation strategies, and marine fish breeding and mariculture, which can supply fish without further depleting wild stocks, giving students a direct understanding of the science behind conserving and sustainably using marine resources.

5. Student Field Visit — ICAR-CIFE, Mumbai

Date: 22 August 2025

Participants: B.F.Sc. 4th-year students (44) of CUTM Paralakhemundi with accompanying faculty

Activities: guided tour of aquaponics, biofloc and RAS installations; visits to the fish genetics and biotechnology laboratories (genome editing, DNA barcoding), aquatic animal health management (PCR diagnostics), feed technology and soil, water and proximate-analysis facilities; visit to the ornamental fish breeding unit, display aquarium and the Aquatic Biodiversity Museum and Repository; expert interaction and hands-on demonstrations with CIFE scientists.

Link to conservation and sustainable use: the Aquatic Biodiversity Museum and Repository documents aquatic species diversity through preserved reference specimens, and DNA barcoding provides reliable species identification, both of which underpin the monitoring and conservation of fish biodiversity. Together with water-efficient RAS and biofloc systems that reduce demand on rivers and lakes, the visit showed students how research institutions support the conservation and sustainable use of aquatic species and ecosystems.



Figure 24. *B.F.Sc. 4th-year students with faculty at the ICAR-CIFE Aquatic Biodiversity Museum and Repository, Mumbai (22 August 2025)*

6. Participatory Freshwater Resource Mapping — Hatibadigopinathpur

Date: 2 July 2025

Location: Hatibadigopinathpur, Gajapati district, Odisha (18.763162° N, 84.13694° E)

Participants: 22 B.F.Sc. students and 1 faculty member, under the Rural Agricultural Work Experience Programme (RAWEP)

The participatory resource-mapping exercise documented the village's natural resources, with emphasis on freshwater resources and their utilisation by the community. It gave students a practical understanding of the community's dependence on these water resources and of the importance of their conservation and sustainable management.

Link to conservation and sustainable use: Mapping a village's water resources and how they are used is the first step in planning their conservation; the exercise directly addresses the sustainable utilisation of rivers, lakes and other freshwater resources named in this indicator.



Figure 25. *Students preparing a participatory resource map of village water resources, Hatibadigopinathpur, 2 July 2025*

7. "Blue-Fiesta" 2025 — Annual Event of the School of Fisheries

Date: 1 November 2025

Venue: Auditorium, School of Fisheries, CUTM Paralakhemundi

Chief Guest: Dr. Manoj M. Sharma, CEO, Mayank Aquaculture Limited, Gujarat

Guests of Honour: Dr. Supratim Chowdhary, Comptroller of Examination, West Bengal University of Fisheries and Animal Sciences; Mr. Nirod Chandra Nayak, District Fisheries Officer, Gajapati; Mr. Pratik Panda, District Development Manager, NABARD, Gajapati

The School of Fisheries organised its annual techno-cultural event "Blue-Fiesta" on 1 November 2025. The Chief Guest spoke on innovations and future opportunities in aquaculture, and the Guests of Honour emphasised the role of skilled fisheries professionals in regional development. Students presented technical exhibits showing their practical knowledge of aquaculture, fish processing and sustainable fisheries practices, and conducted skill-based demonstrations in aquaculture and fish processing. Technical competitions included drawing, elocution, photography and a quiz on fisheries science, and interactive sessions allowed students to engage directly with the invited experts. The School's Annual Report and the annual students' magazine "Aquazone" were released during the event.

Link to conservation and sustainable use: The event brought together students, the District Fisheries Officer, NABARD and the aquaculture industry around sustainable fisheries practices and the responsible development of aquaculture, promoting the sustainable utilisation of aquatic resources.



Figure 26. Release of the School's Annual Report and students' magazine "Aquazone", Blue-Fiesta (1 November 2025)



Figure 27. Felicitation of the Chief Guest and Guests of Honour, Blue-Fiesta (1 November 2025)

4.2 Maintain Ecosystems and Their Biodiversity – Direct Work (14.3.3)

Overview

CUTM researchers and students work directly through research and engagement to maintain and extend aquatic ecosystems and their biodiversity especially those under threat. Since 2023 CUTM researchers and students have been directly involved in restoring and conserving Jamakhala Pond - a threatened ecosystem in Gopalpur, Odisha.

In 2025, CUTM faculty, working with the Indian National Centre for Ocean Information Services (INCOIS), published research explaining a mass stranding of blue button jellies on the Odisha coast using satellite and model data. Two 2025 studies co-authored by CUTM's Department of Zoology assessed heavy-metal pollution in the wetland ecosystems of Odisha using birds as bioindicators, and a doctoral thesis on the fish diversity of Pradhanpat Waterfall, Deogarh, was awarded. School of Fisheries students also carried out a coastal plastic clean-up and awareness activity with fishermen at Palasa beach.

Table 12. 2025 direct work at a glance

Type	Work	Ecosystem	CUTM role
Direct Field action	Beachside plastic awareness and clean-up, 12 July 2025	Coastal (Gopalpur beach, Andhra Pradesh)	12 School of Fisheries students with local fishermen and residents
Direct Field action	Beachside plastic clean up awareness-23 oct	Berhampur beach	12 students
Direct Restoration	Reviving Jamakhala Pond: Restoring a Threatened Freshwater Ecosystem and Its Native Biodiversity	Freshwater pond (Gopalpur, Odisha)	Direct restoration in collaboration with the government, including wastewater diversion, water lilies for water-quality improvement, native fish reintroduction and breeding programmes, and student participation in water-quality testing, habitat restoration and wildlife monitoring
Research	Probing a blue button jellies beach stranding event on the east coast of India	Coastal and marine (Astaranga, Odisha)	CUTM authors with INCOIS scientists
Research	Bioaccumulation of copper and zinc in birds as bioindicators in wetland ecosystems of Odisha	Wetlands of Odisha	Co-authored by Prof. Siba Prasad Parida, Zoology, CUTM

Type	Work	Ecosystem	CUTM role
Research	Identifying ecological risk zones through spatial prioritisation of heavy-metal pollution and bioaccumulation in birds	Wetlands and associated habitats	Co-authored by Prof. Siba Prasad Parida, Zoology, CUTM
Research (PhD)	Studies on fish diversity and haematology of fishes, Pradhanpat Waterfall, Deogarh, Odisha	Freshwater stream and waterfall	PhD awarded, Department of Zoology, CUTM

Direct Restoration: Reviving Jamakhala Pond: Restoring a Threatened Freshwater Ecosystem and Its Native Biodiversity

Centurion University of Technology and Management (CUTM) is working directly to restore and conserve Jamakhala Pond in Gopalpur, Odisha. The pond is a freshwater ecosystem that dates back to before 1950 and had become degraded by urbanisation and pollution.

In October 2023, Centurion University in collaboration with the government, executed a multifaceted strategy focused on the ecosystem's biodiversity. Wastewater that had been flowing into the pond was diverted to stop ongoing pollution. These included steps like introducing water lilies as a natural method of improving water quality. Indigenous and endangered fish species were reintroduced and supported through breeding programmes.

The pond now supports a recorded population of 30 indigenous aquatic species, including fish and prawns. Among them are the Great Snakehead (Channa micropeltes), the Bronze Featherback (Notopterus notopterus), the Clown Featherback (Chitala chitala), the Freshwater Shark (Wallago attu) and the Asian Stinging Catfish (Heteropneustes fossilis). Plant and animal life are being restored together.

The pond also serves as a field site where the University's students learn conservation by doing it. In 2025, over 50 students from different programmes and Schools e.g. Agriculture, Fisheries, took part in hands-on work at the pond, including water quality testing, habitat restoration and wildlife monitoring. This fieldwork is built into their coursework and supports the University's ongoing research and monitoring of the pond. The findings are used to adjust conservation strategies based on evidence.

The initiative is intended as a model for restoring other threatened freshwater ecosystems in the region.



Figure 28. *Jamakhala Pond - Restored a Threatened Freshwater Ecosystem and Its Native Biodiversity*

5. Field Action: Beachside Plastic Awareness and Clean-Up, Palasa (Gopalpur)

Date: 12 July 2025

Location: Palasa gopalpur beach, Andhra Pradesh coast

Participants: 12 School of Fisheries students, with local fishermen and coastal residents

Students surveyed and collected plastic waste along the shoreline and segregated it. They interacted with local fishermen and coastal residents on the impacts of plastic pollution on marine ecosystems and fisheries, and promoted paper bags and reusable alternatives among local vendors.

Link to maintaining ecosystems and biodiversity: Removing plastic from the shoreline prevents it from entering the sea, where it harms marine animals through ingestion and entanglement, while engaging the fishing community in keeping the coastal ecosystem clean.



Figure 29. *School of Fisheries students collecting plastic waste along the shoreline, Palasa Gopalpur beach (12 July 2025)*

Table 13. Beach clean-up awareness programme, 2025

Sl. No.	Place	Date	No. of participants
1	Palasa Gopalpur Beach (Andhra Pradesh)	12 July 2025	12

Sl. No.	Place	Date	No. of participants
2	Konark and Astaranga	20 September 2025	40
3	Berhampur Beach	23 October 2025	12
	Total		**64**

Action Research: Blue Button Jellies Stranding on the Odisha Coast

In September 2024 a mass stranding of blue button jellies (Porpita porpita) occurred at Astaranga, an ecologically and socio-economically important stretch of the Odisha coast. The stranding polluted the beach, hindered fishing operations and affected tourism, and local fishermen and visitors offered differing explanations. The 2025 study traced the event using satellite and model data. It found a rise in sea-surface temperature from 28.8 °C to 30.5 °C (about 1.7 °C) that favoured the proliferation of the jellies, phytoplankton concentrations of 0.73–5.76 mg m^{-3} (average 3 mg m^{-3}), and coast-ward ocean currents that carried them onto the beach.

Link to maintaining ecosystems and biodiversity: the research identifies ocean warming as a driver of gelatinous blooms that disrupt coastal ecosystems and fisheries, giving coastal managers and fishing communities a scientific basis for monitoring and responding to such threats.

Publication: Barik, K.K., Jena, A.K., Mohanty, S.K., Srichandan, S., Baliarsingh, S.K., Samanta, A., Chhotaray, P.K., Joseph, S. and Nair, T.M.B. (2025). Probing a Blue Button Jellies Beach Stranding Event on the East Coast of India. Journal of the Indian Society of Remote Sensing, 53, 3369–3379. Published 16 May 2025.

CUTM authors: Kamal Kumar Barik, Sumit Kumar Mohanty and Pratap K. Chhotaray, Centurion University of Technology and Management, with scientists from INCOIS

Research: Heavy-Metal Pollution in Wetland Ecosystems of Odisha

Two 2025 studies co-authored by Prof. Siba Prasad Parida, Department of Zoology, CUTM, with researchers from partner institutions, use birds as bioindicators to assess pollution threats to wetland ecosystems in Odisha:

- Panda, B.P., Kumari, R., Pradhan, A., Majhi, B.K., Acharya, P. and Parida, S.P. (2025). *Assessing the bioaccumulation of copper and zinc using birds as bioindicators in different wetland ecosystems of Odisha, India.* Environmental Systems Research, 14, 10.
- Panda, B.P., Parida, S.P., Pradhan, A., Mohanta, Y.K., Parthipan, P., Narayan, M. and Sarma, H. (2025). *Identifying ecological risk zones using spatial prioritization of heavy metal pollution and bioaccumulation in birds.* Environmental Science and Pollution Research, 32(18), 11727–11748.

Link to maintaining ecosystems and biodiversity: wetlands are among the most threatened ecosystems; measuring metal accumulation in the birds that depend on them and mapping ecological risk zones identifies where wetland habitats and their wildlife are most at risk, so that protection can be prioritised.

Research: Fish Diversity of Pradhanpat Waterfall, Deogarh (PhD awarded)

A doctoral thesis titled “Studies on Fish Diversity and Haematology of Fishes, Pradhanpat Waterfall, Deogarh, Odisha” by Sagarika Mishra (Department of Zoology) was among the PhDs awarded by CUTM in 2025–26. The thesis studied the diversity of fish species at this freshwater stream and waterfall habitat and the haematology (blood health) of the fishes.

Link to maintaining ecosystems and biodiversity: baseline records of the fish species in a stream habitat and of their health are essential for detecting future losses and for planning the conservation of freshwater fish biodiversity.

Source: CUTM Annual Report 2025–26, Section 10.1 (Ph.D. Awarded)

4.3 Technologies Towards Aquatic Ecosystem Damage Prevention – Direct Work (14.3.4)

1. Overview

Centurion University advanced technologies to reduce the negative and enhance the positive impacts of aquaculture and fisheries on aquatic ecosystems. A School of Fisheries trial of biofloc technology showed 30–50% lower toxic ammonia and 28–40% better feed conversion than the control, meaning cleaner water and less waste. The University's Recirculating Aquaculture System (RAS), which treats and reuses water in a closed loop, was studied as the reference for a new RAS unit to be built in Rayagada district for a fish-farming beneficiary of the MKUY scheme (Mukhyamantri Krushi Udyog Yojana - a scheme to promote commercial agri-enterprises, boost capital investment in agriculture and allied sectors and provide financial subsidies through the nodal agency APICOL) at the request of the District Fisheries Officer, Rayagada.The University's Black Soldier Fly (BSF) larvae unit, run jointly by the School of Fisheries and the M.S. Swaminathan School of Agriculture, turns organic waste into fish feed; in a RAS feeding trial, fish fed BSF larvae showed optimum growth with 100% survival at lower feed cost than formulated feed, and the larvae can replace part of the fish meal made from wild-caught fish. In 2025, CUTM researchers contributed to aquatic pollution management and sustainable aquaculture through a patent for a heavy-metal ion removal material, a research paper on dye-pollutant removal from pond water, and a book on IoT-based precision management of microalgae in aquaculture.

2. Research: Biofloc Technology Trial — Cleaner Water, Less Waste (2025)

In 2025 the School of Fisheries ran a controlled trial of biofloc technology for Amur carp, comparing a control tank with two biofloc treatments: jaggery-based (T1) and millet-based (T2). In biofloc systems, beneficial microbes convert fish waste into microbial protein that the fish eat, so water quality is maintained with little or no water exchange. The trial recorded water quality and fish growth in each treatment.

Table 14. Water quality in the 2025 biofloc trial

Parameter	Control	Jaggery-based Biofloc (T1)	Millet-based Biofloc (T2)
Temperature (°C)	21.66 ± 1.2	21.66 ± 1.2	21.66 ± 1.2
pH	7.60 ± 0.01	7.06 ± 0.37	6.91 ± 0.39
Dissolved Oxygen (mg L^{-1})	5.30 ± 0.15	7.23 ± 0.14	7.50 ± 0.37
Alkalinity (mg L^{-1})	44.00 ± 0.18	38.66 ± 1.00	35.00 ± 2.40
Hardness (mg L^{-1})	90.0 ± 2.88	116.66 ± 0.33	106.33 ± 2.02
Free carbon dioxide (mg L^{-1})	Nil	Nil	Nil
Total ammonium nitrogen (mg L^{-1})	0.50 ± 0.01	0.25 ± 0.02	0.35 ± 0.01
Total dissolve soilds(mg L^{-1})	132.33 ± 1.45	272.76 ± 2.72	231.33 ± 5.78
Total suspended solids (mg L^{-1})	11.43 ± 0.81	164.66 ± 11.79	154.66 ± 4.84
Total solids mg L^{-1})	143.76 ± 1.13	437.33 ± 9.84	386.34 ± 4.73
Floc Volume (mL L^{-1})	0.10 ± 0.01	28.00 ± 1.15	17.66 ± 1.45

Table 15. Growth performance of Amur carp in the 2025 biofloc trial

Treatment	Survival (%)	Final Wt. (g)	WG (%)	SGR	FCR	FER	PER
C (Control)	100 ± 0.00	124.00 ± 2.31	140.73 ± 11.51	0.42 ± 0.02	2.05 ± 0.09	0.49 ± 0.02	1.86 ± 0.21
T1 (Jaggery)	100 ± 0.00	215.00 ± 2.89	296.90 ± 14.3	0.66 ± 0.02	1.23 ± 0.03	0.81 ± 0.01	3.10 ± 0.19
T2 (Millet)	100 ± 0.00	171.67 ± 3.28	197.90 ± 6.41	0.52 ± 0.01	1.47 ± 0.11	0.69 ± 0.06	2.63 ± 0.02

WG = weight gain; SGR = specific growth rate; FCR = feed conversion ratio; FER = feed efficiency ratio; PER = protein efficiency ratio.

Table 16. 2025 biofloc performance relative to control (calculated from Tables 14 and 15)

Measure	Control	T1 (Jaggery)	Change vs control	T2 (Millet)	Change vs control
Dissolved oxygen (mg L^{-1})	5.30	7.23	+36%	7.50	+42%
Total ammonium nitrogen (mg L^{-1})	0.50	0.25	−50%	0.35	−30%
Final weight (g)	124.00	215.00	+73%	171.67	+38%
Feed conversion ratio	2.05	1.23	−40% (better)	1.47	−28% (better)
Survival (%)	100	100	No loss	100	No loss

Both biofloc treatments outperformed the control on every growth metric, with the jaggery-based biofloc (T1) performing best overall: 73% higher final body weight, more than double the weight-gain percentage and a markedly better feed conversion ratio (1.23 vs 2.05), with 100% survival maintained across all three groups.

Relevance to the marine aquaculture industry: biofloc technology is widely used in commercial shrimp farming, the main form of coastal and brackish-water aquaculture in India. CUTM's Center for Aquaculture and Fish Processing Technology lists biofloc aquaculture as a research priority, including research on Pacific white shrimp (Litopenaeus vannamei), the principal species of India's coastal shrimp-farming industry, under biofloc conditions. The same principles of waste recycling and reduced water exchange tested in the 2025 carp trial underpin biofloc shrimp farming, which reduces the discharge of farm effluent into coastal waters.

How this prevents damage to aquatic ecosystems: Toxic ammonium nitrogen (TAN) in the biofloc tanks was 30–50% lower than in the control and dissolved oxygen 36–42% higher, and feed was converted 28–40% more efficiently, so less uneaten feed and waste is produced. Because biofloc systems recycle waste inside the tank and need little water exchange. Farms that adopt them release far less nutrient-rich effluent into rivers, lakes and coastal waters, preventing pollution and eutrophication of aquatic ecosystems.



Figure 30. *Farmers at the School of Fisheries' biofloc and RAS demonstration units during hands-on training,*

3. Recirculating Aquaculture System (RAS) — Technology Transfer to Fish Farming

The School of Fisheries operates a fully automated Recirculating Aquaculture System of 2 lakh litre capacity at its Paralakhemundi campus, commissioned in January 2025. RAS treats and reuses culture water within a closed loop instead of discharging it into natural water bodies, as conventional flow-through aquaculture does.

2025 Engagement: Through Letter No. 313 dated 21 February 2025, the District Fisheries Officer, Rayagada, informed the Dean of the School of Fisheries, CUTM, of a proposed RAS unit in Rayagada district under the MKUY scheme and requested a visit to CUTM's RAS facility on 25 February 2025 for the beneficiary to observe its installation and functioning.

The beneficiary is the fish farmer for whom the new RAS unit is being constructed. By studying the installation and functioning of the CUTM unit before building their own, the farmer draws directly on the university's working technology, so a low-discharge production system passes from the university into fish farming, with the Fisheries Department supporting the transfer.

How this prevents damage to aquatic ecosystems: fish farms built on the RAS model reuse their water and do not release nutrient-rich effluent into rivers, lakes or coastal waters, and they need far less fresh water than open ponds, reducing pressure on natural water bodies.

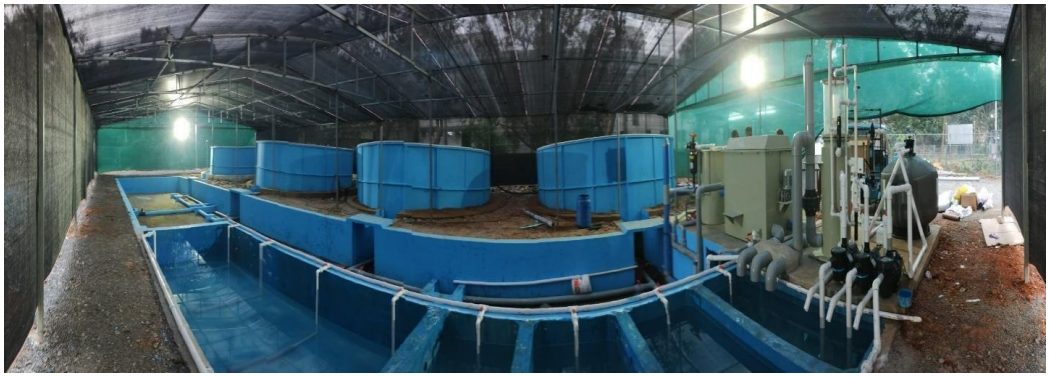
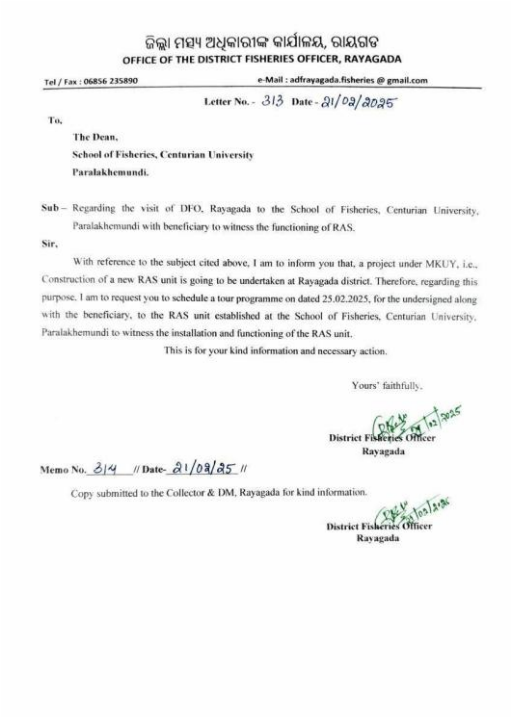


Figure 31. *RAS facility at the School of Fisheries, CUTM Paralakhemundi, with closed-loop water treatment and reuse*



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OFFICE OF THE DISTRICT FISHERIES OFFICER, RAYAGADA

Tel / Fax : 06856 235890 e-Mail : adfrayagada.fisheries @ gmail.com

Letter No. - 313 Date - 21/02/2025

To,
The Dean,
School of Fisheries, Centurian University
Paralakhemundi.

Sub – Regarding the visit of DFO, Rayagada to the School of Fisheries, Centurian University, Paralakhemundi with beneficiary to witness the functioning of RAS.

Sir,

With reference to the subject cited above, I am to inform you that, a project under MKUY, i.e., Construction of a new RAS unit is going to be undertaken at Rayagada district. Therefore, regarding this purpose. I am to request you to schedule a tour programme on dated 25.02.2025, for the undersigned along with the beneficiary, to the RAS unit established at the School of Fisheries, Centurian University, Paralakhemundi to witness the installation and functioning of the RAS unit.

This is for your kind information and necessary action.

Yours' faithfully,

District Fisheries Officer
Rayagada

Memo No. 314 // Date- 21/02/25 //

Copy submitted to the Collector & DM, Rayagada for kind information.

District Fisheries Officer
Rayagada

Figure 32. *Visit to the CUTM RAS unit under the MKUY scheme*

4. Waste-to-Feed and Water-Reuse Technologies: Black Soldier Fly (BSF) and Recirculatory aquaculture system (RAS)

- **Direct work:** BSF larvae are reared on organic waste. The larvae are fed to fish in the RAS, and the frass is used as manure in the Organic Research Farm and for lettuce in a hi-tech growth chamber.
- **Result:** in the feeding trial, fish fed BSF larvae showed optimum growth with 100% survival, comparable to formulated feed, at lower feed cost. The larvae contain 56.9% crude protein (fish meal 70.6%, soya meal 51.8%).
- **Damage prevented:** larvae can replace part of the fish meal, which is made largely from wild-caught fish, easing pressure on wild stocks. Organic waste is kept out of landfills and water bodies, and the RAS reuses its water instead of discharging it.



Figure 33. *Farmers of Buguda block, Ganjam, on the NMAET-ATMA training visit at the BSF Larvae Production Unit,*

5. Other 2025 CUTM Research on Preventing Water Pollution

- **Patent:** Panda, R., Biswal, S.K. and Panda, S. (2025). A magnetically separable nanocomposite material for the removal of heavy metal ions. India Patent. The material removes heavy-metal ions from water and can be recovered magnetically after use.
- **Paper:** Das, K., Mohanty, S. and Maji, S.K. (2025). Removal of Methylene Blue (Basic Dye) from Spiked Pond Water through Adsorption and Photodegradation Using TNTs. Indian Chemical Engineer. The study tested nanotube materials for removing a common industrial dye from pond water.
- **Book:** Suman, P., Sahoo, C. and Rabi Prasad, B. (2025). Beyond the Blue: Smart IoT Solutions for Precision Microalgae Cultivation in Aquaculture. Nova Science Publishers. It covers sensor-based monitoring and control of water quality in aquaculture.

How this prevents damage to aquatic ecosystems: heavy metals and dyes are toxic to fish and other aquatic life, and poor water-quality control in fish farms leads to polluted discharge; technologies that remove these pollutants from water and allow precise monitoring of aquaculture systems help prevent such damage to aquatic ecosystems.

5. Water-Sensitive Waste Disposal (14.4)

The University's action plan to reduce plastic waste through a ban on single-use plastics, alternatives, recycling, research, awareness and regular monitoring.

5.1 Action Plan to Reduce Plastic Waste (14.4.2)

1. Overview

Centurion University of Technology and Management (CUTM) has a plastic waste reduction action plan across all campuses. Plastic Waste Reduction of its Sustainability Policy and is aligned with India's Plastic Waste Management Rules, under which its campuses operate with a plastic-free commitment. The plan combines a ban on single-use plastics on campus, provision of alternatives, recycling of residual plastic waste, awareness and education, and regular monitoring. Under the plan, plastic waste generated on campus fell from 32.50 tonnes to 28.65 tonnes year on year, a reduction of 3.85 tonnes (11.8%), diverting most paper and plastic waste from landfill. The most recent external environmental audit of both campuses, carried out on 17–18 June 2025, reviewed plastic waste handling and recommended further improvements. In 2025 the plan was also carried forward through recycling of campus plastic waste into paver blocks, two patents on plastic-waste recycling, and student-led plastic awareness and cleaning drives on and around the campuses.Awareness campaigns promoted the responsible use and collection of PET (polyethylene terephthalate) beverage bottles for appropriate recycling, while encouraging the campus community to avoid unnecessary single-use plastic bottles. Awareness campaigns promoted the responsible use and collection of PET (polyethylene terephthalate) beverage bottles for appropriate recycling, while encouraging the campus community to avoid unnecessary single-use plastic bottles.

2. Campus Plastic Waste Action Plan

Governance, Management and Accountability

Centurion University of Technology and Management (CUTM) implements its campus plastic waste reduction measures under its Sustainability Policy 2024, which commits the University to compliance with India's Plastic Waste Management Rules, reducing plastic waste, encouraging alternatives to single-use plastics, and improving recycling through the principles of Reduce, Reuse and Recycle (3R). Implementation is supported by the Institutional Sustainability Committee, campus administration, estate

and facilities teams, housekeeping staff, procurement units, canteen operators, faculty and student groups. Campus teams and service providers support waste segregation, reduced plastic consumption, appropriate collection and storage, and the transfer of recyclable plastic to suitable recycling or recovery channels. The policy also encourages alternatives such as paper and cloth bags, water facilities that reduce reliance on plastic bottles, staff training, curriculum integration, student projects and awareness activities.

Link to the University's Sustainability Policy:

https://cutm.ac.in/wp-content/uploads/2024/11/Sustainability-Policy-3.pdf

Monitoring and review: The Institutional Sustainability Committee reviews implementation, identifies gaps and recommends corrective measures. Annual waste audits and documented waste reports will support monitoring of plastic waste generation, year-on-year changes, quantities reused or recycled, waste disposed, and compliance across campus facilities and commercial vendors. Findings will inform subsequent action plans, procurement practices, awareness initiatives and corrective measures. CUTM's Sustainability Policy provides for monitoring plastic waste management systems and reviewing environmental audit findings annually. The external environmental audit conducted on 17–18 June 2025 provides a reference point for assessing existing practices and identifying areas for improvement.

These measures support CUTM's long-term objective of developing a plastic-free campus environment by discouraging avoidable plastic use, encouraging reusable and recyclable alternatives, and strengthening responsible plastic waste management in line with the University's sustainability commitments.

Table 17. Components of the action plan

Component	Measures
Ban on single-use plastics	Zero single-use plastic mandate across all campus blocks, commercial kiosks and dining facilities, banning thin carry bags, straws, stirrers and disposable plastic cutlery; campus vendors are contractually required to use durable alternatives. "Say No to Plastic" stickers are displayed across the campuses.
Alternatives to plastic	Water purification and refill units in academic and residential buildings with a bring-your-own-bottle culture; use of stainless steel / glass bottles on campus; stainless steel plates in mess and canteens; cloth and paper bags promoted; wood and metal furniture instead of plastic; procurement guidelines favouring reusable serveware and eco-friendly packaging.
Recycling of residual plastic	Plastic waste generated on campus is recycled into paver blocks; fabric and paper waste are recycled through the University's handmade paper unit.
Research and innovation	Student and faculty projects applying reduce, reuse and recycle principles to waste plastics, including a solar-powered plastic shredder for on-campus processing (peer-reviewed Springer publication) and patented technologies for recycling plastic waste (Section 3).
Awareness and education	Plastic waste management integrated into the curriculum; training for staff on the Plastic Waste Management Rules; student-led awareness campaigns on campus and in surrounding communities.
Monitoring and review	Annual environmental audits, overseen by the Institutional Green Audit Committee, review waste segregation, plastic reduction and recycling practices. The most recent external audit of both campuses was conducted on 17–18 June 2025 (Section 5), and its recommendations feed into the action plan.

2.1 Measured Reduction in Plastic and Paper Waste

Table 18. Paper and plastic waste generated (tonnes)

Type of waste	2024	2025	Reduction
Plastic	32.50	28.65	3.85 (11.8%)

Type of waste	2024	2025	Reduction
Paper	1.65	1.60	0.05 (3.0%)
Total	34.15	30.25	3.90 (11.4%)

Plastic waste, mainly clean packaging, PET bottles and delivery wrappers, is collected through colour-coded recycling bins, shredded in the University's engineering workshops and made into interlocking paver blocks used for campus footpaths and walkways. Paper waste is processed in the handmade paper unit into recycled paper for institutional stationery.

2.2 Key Quantitative Results: 2025

Table 19. Plastic waste results

Measure	2025
Plastic waste collected and recycled	28.65 tonnes of campus plastic waste collected through colour-coded recycling bins, with 100% recycled or diverted from landfill
Reduction in plastic waste generated	3.85 tonnes less than the previous year (32.50 t to 28.65 t; 11.8%)
Recycled-plastic products	Plastic waste processed into interlocking paver blocks for campus footpaths; 2 patents in 2025, including a construction block made from recycled plastic
People engaged in plastic drives	165+ students and volunteers across four drives (51 + 47 + 45 + 22), plus NSS waste-segregation volunteers

3. Recycling and Innovation in 2025

Plastic waste to paver blocks: the CUTM Annual Report 2025–26 records that the University's plastic waste is recycled into paver blocks, while fabric and paper waste are recycled through its handmade paper unit and food waste is composted.

Patents on plastic-waste recycling (2025):

- Panda, P.K., Majhi, R.K., Narayan, B.B., Dandapat, A.K. and Jothimani, M. (2025). Composite construction block from recycled plastic with protective shell. India Patent.
- Panda, R., Das, N. and Panda, S. (2025). Adaptive multiphase catalyst system for plastic waste recycling. India Patent.

These patents extend the plan's recycling component by developing ways to turn waste plastic into construction material and to break plastic waste down for recycling.

4. Plastic Awareness and Cleaning Drives in 2025

Table 20. Student-led plastic reduction activities, 2025

Date	Activity	Participants	Focus
2–4 Jul 2025	Plastic-awareness poster and rangoli activity, Hatibadigopinathpur, Gajapati	22 students and 1 faculty member	Plastic waste reduction and responsible waste management with villagers
24 Sep 2025	Campus cleaning drive on NSS Day	47 student volunteers	Cleanliness and waste collection across the whole campus
25 Oct 2025	Awareness rally to restrict single-use plastic	51 students	Avoiding single-use plastic; rally from the main gate to the Madhusudan building
21 Jul 2025	Plastic Awareness Drive at B.N. Palace, Paralakhemundi (NSS)	45 student volunteers	Waste segregation and plastic reduction
08 Feb 2025	Waste Segregation Awareness Drive, CUTM Paralakhemundi (NSS)	NSS student volunteers	Waste segregation and plastic reduction

4.1 Village Plastic-Awareness Activity — Hatibadigopinathpur

From 2 to 4 July 2025, 22 students and 1 faculty member conducted a plastic-awareness poster and rangoli activity at Hatibadigopinathpur, Gajapati district, Odisha, engaging villagers on plastic waste reduction and responsible waste-management practices. The activity is documented through geo-tagged photographs.



Figure 34. *Students creating plastic-awareness rangoli, Hatibadigopinathpur (geo-tagged, 2 July 2025)*



Figure 35. *Students at the plastic-awareness poster-making activity, Hatibadigopinathpur (geo-tagged, 4 July 2025)*

5. Most Recent Environmental Audit (June 2025)

Audit: Environmental Audit Report 2024–25 (valid until 2027-28), Paralakhemundi and Bhubaneswar campuses

Conducted by: Centre for Envotech and Management Consultancy Pvt. Ltd., Bhubaneswar, an ISO 14001-certified firm accredited by National Accreditation Board for Education and Training (NABET), a constituent board of the Quality Council of India and empanelled as a Category "A" consultant with the Odisha State Pollution Control Board.

Audit dates: 17–18 June 2025

Scope: water, solid waste generation, segregation and disposal, liquid, hazardous, biomedical and e-waste, environmental quality, energy, biodiversity and carbon footprint

Table 21. Audit findings on plastic waste

Finding	Detail
Handling of plastic waste	Non-biodegradable waste, consisting of plastics, tins and glass bottles, is managed through recycling and reuse.
Segregation at source	Colour-coded bins are placed at major waste-generation points, and separate bins are placed in different areas of the campus; hostel and canteen staff are trained to separate waste.
Recycling	Plastic waste is converted into paver blocks; fabric, paper and plastic waste are sent to the University's Waste to Wealth recycling unit to make useful products (Bhubaneswar campus).
Area for improvement	The audit listed plastic waste reduction among the areas for continued improvement.
Recommendations	Training sessions for stakeholders on segregation; separate dry- and wet-waste bins in all departments and hostels; on-campus recycling units for non-biodegradable waste; partnerships with local organisations for recycling.

The audit recommendations are taken forward through the action plan: segregation and plastic-reduction awareness drives were held on campus in 2025 and plastic waste continues to be recycled into pavements.

6. Maintaining a Local Ecosystem (14.5)

The plan to minimise alteration of aquatic ecosystems, monitoring of ecosystem health, stewardship programmes, collaboration for shared water bodies and a watershed management strategy based on location-specific aquatic biodiversity.

6.1 Minimising Alteration of Aquatic Ecosystems (14.5.1)

945 m³/day (9.45 lakh litres/day) Wastewater treated and reused every day; no effluent released	**30–50%** Lower ammonia in biofloc tanks than control (2025 trial)	**17–18 Jun 2025** External environmental audit	**45** Students at the World Fisheries Day seminar (21 Nov 2025)

1. Overview

CUTM's plan to minimise alteration of the aquatic ecosystems focuses on three elements: the water-management objectives of the University's Sustainability Policy; a set of operating measures that keep wastewater and aquaculture effluent out of natural water bodies, managed largely through the School of Fisheries' aquaculture facilities; and annual external environmental audits that monitor the results and set follow-up actions. The plan continued in force through 2025. The campus ponds, biofloc, RAS, aquaponics and hatchery units remained in operation, all campus wastewater continued to be treated and reused with no effluent released, and the most recent external audit was carried out on 17–18 June 2025.

2. Policy

The implementation is anchored in the CUTM Sustainability Policy (Version 2, 2024, issued by the Registrar), whose objectives include:

- **Water management:** the University should recycle at least 90% of its wastewater; rainwater harvesting should be integrated with campus architecture; the green landscape must include water bodies for biodiversity; and water management should be integrated into higher education through research, practice and skill training.
- **Recycling and waste management:** diverting 90% of waste from landfill.
- **Plastic waste reduction:** a campus-wide ban on single-use plastics, which keeps plastic out of campus water bodies.

3. Plan Measures by Type of Alteration

Table 22. How the plan minimises physical, chemical and biological alteration

Type of alteration	Measures in place in 2025
Chemical (pollutants, nutrients, effluent)	All campus wastewater, about 9,45,000 litres a day, is treated in four sewage treatment plants and reused for gardening, playgrounds, landscaping and farms, so the campus releases no effluent. Aquaculture uses closed-loop Recirculating Aquaculture Systems (RAS) and zero-water-exchange biofloc tanks that retain nutrient-rich water instead of discharging it, and aquaponics units that recycle fish-culture water to grow vegetables without chemical fertiliser. Single-use plastics are banned on campus.

Type of alteration	Measures in place in 2025
Physical (habitat, sediment, water flow)	Campus ponds and water bodies are retained as part of the green landscape; rainwater harvesting is built into campus architecture; and water use and overflow are reviewed through the annual audit, which in 2025 flagged sediment accumulation in the campus lake as a risk to its water quality and recommended enhanced rainwater harvesting, automated overflow prevention and water-conservation drives.
Biological (species, disease, nutrient balance)	Fish are cultured in contained systems (ponds, tanks, RAS and biofloc units) rather than released into natural waters; water quality in culture systems is monitored to keep ammonia low and oxygen high; and the School's farmer training covers disease prevention and water-quality monitoring so that the same practices are adopted on surrounding farms.

Source: Environmental Audit Report 2024–25, CUTM (audit of 17–18 June 2025); CUTM Sustainability Policy; School of Fisheries

4. Aquaculture Facilities in Operation in 2025

The School of Fisheries operates an Aquaculture Research Farm with culture ponds, biofloc units, ornamental fish systems, aquaponics, Recirculatory Aquaculture Systems (RAS), hatchery systems, a feed mill and a fish processing and value-addition unit. The June 2025 environmental audit mapped these facilities on the campus land-use plan. In 2025 they comprised 41 culture units across 25 monitored sites (5 biofloc tanks, 3 RAS tanks, 3 aquaponics systems, 10 cemented tanks and 20 ponds); species cultured included the Indian major carps (rohu, catla and mrigal), singhi, Amur carp, pacu (under containment only) and ornamental fish; and the units were used to train 148 farmers and fishers in water-saving, low-discharge practices.

Table 23. Aquatic and water-treatment facilities recorded in the June 2025 audit

Facility	Area (acres)
Ponds 1–6	3.00
Other campus ponds (three)	2.20
Recirculatory Aquaculture System (RAS)	0.85
Sewage treatment plants (four)	0.30

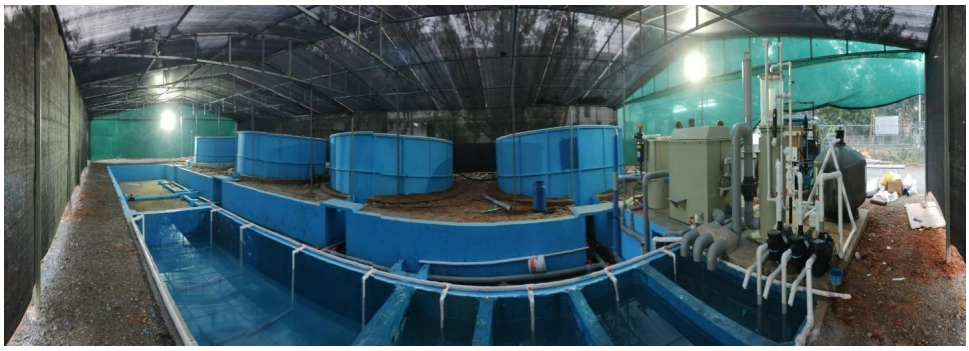


Figure 36. *Recirculating Aquaculture System at the School of Fisheries, CUTM*

Source: CUTM Annual Report 2025–26, Section 2.7; Environmental Audit Report 2024–25, CUTM, land-use table

5. Water-Quality Results

The School of Fisheries monitored water quality in a controlled biofloc trial for Amur carp, comparing a conventional control with two biofloc treatments over eleven parameters. The key results show how zero-exchange biofloc culture keeps water quality stable without discharging effluent:

Table 24. Selected water-quality results, 2025 biofloc trial

Parameter	Control	Biofloc (T1, jaggery)	Biofloc (T2, millet)	Change vs control
Dissolved oxygen (mg L^{-1})	5.30	7.23	7.50	+36% to +42%
Total ammonia nitrogen (mg L^{-1})	0.50	0.25	0.35	−30% to −50%
Feed conversion ratio	2.05	1.23	1.47	28–40% better (less waste feed)

Source: School of Fisheries, CUTM, 2025 biofloc trial

6. Monitoring and Review: June 2025 Environmental Audit

Auditor: Centre for Envotech and Management Consultancy Pvt. Ltd., Bhubaneswar (ISO 14001-certified; NABET-accredited; Category "A" consultant with the Odisha State Pollution Control Board)

Dates: 17–18 June 2025

Key findings on aquatic ecosystems: about 9,45,000 litres of wastewater treated daily in the University's STPs and reused, with no effluent produced; treated water released to campus ponds in an environmentally compliant manner; sediment accumulation in the campus lake identified as a threat to its water quality and ecological balance; aquatic life supported through ornamental fish ponds and an aquarium, with the School of Fisheries promoting recirculatory aquaculture.

Follow-up actions recommended: enhanced rainwater harvesting, campus-wide water-conservation drives, automated overflow prevention in water tanks, and sensor-operated taps.

Source: Environmental Audit Report 2024–25, CUTM

7. Institutional Collaboration

The plan is supported by formal collaborations with national research institutes that were in force during 2025:

Table 25. Research collaborations (MoUs) in force during 2025

Partner	Purpose	Period
ICAR-Central Institute for Women in Agriculture (ICAR-CIWA)	Student training and collaborative research	May 2021 – May 2026
ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar	Student training and internships, postgraduate research, and exposure to and involvement of scientists	July 2022 – July 2025
ICAR-Indian Institute of Soil and Water Conservation (ICAR-IISWC), Dehradun	Student exchange, joint research, and sharing of academic and research resources	Signed 29 June 2025

Soil and water conservation work under the ICAR-IISWC agreement reduces erosion and sediment inflow to water bodies, supporting the physical-alteration component of the plan, while the ICAR-CIFA and ICAR-CIWA collaborations support research and training in sustainable freshwater aquaculture.

Source: CUTM list of MoUs 2025–26; CUTM list of active MoUs (as on 23 June 2026)

8. Education Supporting the Plan: World Fisheries Day Seminar

On 21 November 2025 the School of Fisheries observed World Fisheries Day at the Fisheries Resource Management Laboratory, Paralakhemundi, with a seminar on "Blue Growth and Sustainable Fisheries: Challenges and Opportunities", attended by 45 students. The programme was led by Dr. Sambid Swain (Associate Dean, Programme In-charge), with Dr. Suman Nama (Assistant Professor) as coordinator and speaker. It covered the physical, chemical and biological pressures on aquatic ecosystems and was

followed by a structured SWOT analysis of world and Indian fisheries focused on sustainability, governance and technology.



Figure 37. *Seminar on "Blue Growth and Sustainable Fisheries", World Fisheries Day (21 November 2025)*



Figure 38. *Students at the World Fisheries Day seminar, Fisheries Resource Management Laboratory (21 November 2025)*

6.2 Monitoring the Health of Aquatic Ecosystems (14.5.2)

50 units water samples analysed in 2025 dissolved oxygen, ornamental aquaria maintained monitored in 2025	**~250**	**6.8 mg/L** (~200 in 2024) representative 2025 reading	**30** (15 in 2024)

1. Overview

The School of Fisheries at Centurion University runs a structured programme to monitor the health of the ponds, tanks and other water bodies on its campuses. In 2025 the programme covered 25 monitoring sites comprising **50 units, including 26 ponds (22 at the Aquaculture Research Farm and 4 on the Paralakhemundi campus), 12 cemented tanks, 5 biofloc tanks, 3 RAS culture tanks, 3 aquaponics units and 1 FRP Chinese circular hatchery.** About 250 water samples were analysed for physical, chemical and biological indicators. Dissolved oxygen and ammonia readings were within levels that support fish health, while biochemical oxygen demand (BOD) was elevated and has been taken up for corrective action. Monitoring is supported by the ornamental fish culture and health programme and by the external environmental audit of the campus carried out on 17–18 June.

Centurion University's School of Fisheries operates a structured programme to monitor the health of aquatic ecosystems associated with the Paralakhemundi campus. In 2025, monitoring covered campus ponds and the campus lake, supported by monitoring of managed aquaculture systems including biofloc, recirculating aquaculture and aquaponics facilities. Approximately 250 water samples were analysed using physical, chemical and biological indicators of aquatic ecosystem condition, including dissolved oxygen, pH, nutrients, biochemical oxygen demand, turbidity and plankton diversity. Monitoring results are used to identify changes in ecosystem condition and inform corrective management actions. The programme is complemented by an external environmental audit of campus water bodies, wastewater treatment and water management conducted in June 2025.

2. Monitoring Sites and Coverage

Table 26. Monitoring sites and units, 2025

Facility type	Sites /ponds/ tanks
Ponds	26
Biofloc tanks	5
Recirculating Aquaculture System (RAS) tanks	3
Aquaponics systems	3
Cemented tanks	12
FRP portable circular hatchery	1
Total	50 units

Monitoring coverage was maintained at the 2024 level across all sites, and the number of water samples analysed rose by about a quarter:

Table 27. Monitoring programme coverage, 2024 and 2025

Measure	2024	2025
Culture sites monitored	41	41
Water samples analysed	~200	~250
Water-quality indicators tracked	8	8
B.F.Sc. students collecting data	40+	40+

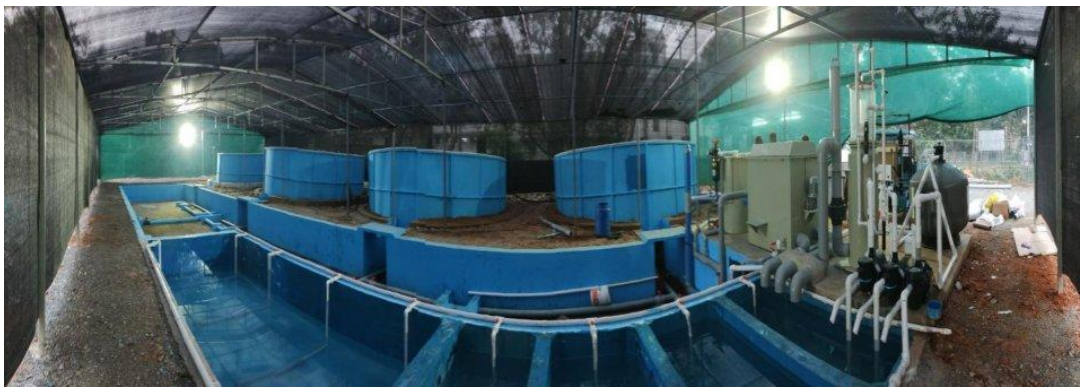


Figure 39. *Recirculating Aquaculture System (RAS) tanks, one of the monitored culture systems, School of Fisheries, CUTM*



Figure 40. *Monitored campus pond with fish and aquatic plants (date-stamped 16 September 2025)*

3. Sampling Method and Frequency

About 250 water samples were collected across all sites in 2025, up from about 200 in 2024. General physicochemical parameters were analysed using standard laboratory methods, and ammonia was measured on site with a field test kit. Sampling frequency is matched to how quickly each system changes:

- **Biofloc and RAS systems:** every two weeks, to capture rapid changes in water quality.
- **Ponds and aquaponics:** monthly, to track seasonal and biological trends.



Figure 41. *B.F.Sc. student carrying out water-quality analysis (titration), School of Fisheries laboratory*

4. Indicators Monitored

Table 28. Indicators and what they show

Indicator	Type	What it shows about ecosystem health
Dissolved oxygen (DO)	Chemical	Oxygen available for fish and other aquatic life
pH	Chemical	Acidity and alkalinity balance
Ammonia	Chemical	Toxic waste build-up affecting fish health
Nitrate	Chemical	Nutrient loading and risk of eutrophication
Biochemical oxygen demand (BOD)	Chemical	Organic pollution load
Chemical oxygen demand (COD)	Chemical	Total organic matter
Turbidity	Physical	Light penetration and sediment load
Plankton diversity	Biological	Balance of the living community at the base of the food web

5. Results, 2025

Table 29. Representative water-quality readings, 2025

Indicator	2025 reading	Assessment
Dissolved oxygen	6.8 mg/L	Adequate oxygen for fish and other aquatic life
Nitrate	0.08-1 ppm	Low; limited build-up of toxic waste
Biochemical Oxygen Demand	30–40 ppm	Elevated organic load; taken up for corrective action

Indicator	2025 reading	Assessment
Alkalinity	70-135 ppm	Optimum range
Hardness	160-250 ppm	Comparatively high hardness
pH	6.9-7.8	For maintaining acidity and basicity of water quality
Ammonia	<0.05 ppm	Optimum, easy to maintain water quality

The dissolved oxygen and ammonia readings show that aeration and waste management in the monitored biofloc, RAS and pond systems kept water quality within levels that support fish health. The BOD readings indicate organic loading in the ponds and cemented tanks.

5.1 Corrective Action Arising from Monitoring

Findings from monitoring in 2025 were used to direct management action on the monitored systems:

Table 30. Monitoring findings and management response, 2025

Finding	Basis	Management response
Elevated BOD (30–40 ppm), indicating organic loading	2025 water-quality monitoring of ponds and cemented tanks	Review of organic loading and water-exchange protocols; BOD tracked explicitly in the next monitoring cycle
Sediment accumulation in the campus lake	External environmental audit, 17–18 June 2025	Enhanced rainwater harvesting, automated overflow prevention and campus-wide water-conservation drives recommended
Ammonia build-up and lower dissolved oxygen under conventional culture	2025 biofloc trial, control compared with two biofloc treatments	Zero-exchange biofloc culture used in the demonstration units (TAN 30–50% lower, DO 36–42% higher than control) and demonstrated to farmers in the July 2025 training

6. Supporting Monitoring in 2025

External environmental audit (17–18 June 2025): the campus environmental audit by Centre for Envotech and Management Consultancy Pvt. Ltd., a NABET-accredited firm, reviewed water use, wastewater treatment and water bodies on the Paralakhemundi campus. It recorded that all wastewater (about 3,75,000 litres a day) is treated in four sewage treatment plants and reused with no effluent released, that treated water reaching campus ponds is discharged in an environmentally compliant manner, and that sediment accumulation in the campus lake is a risk to its water quality and ecological balance.

Controlled water-quality trial: in a 2025 biofloc trial the School monitored eleven water-quality parameters, including dissolved oxygen, ammonia, alkalinity, hardness and suspended solids, across a control and two treatments, recording 36–42% higher dissolved oxygen and 30–50% lower ammonia in the biofloc tanks than in the control.

Source: Environmental Audit Report 2024–25, CUTM Paralakhemundi; School of Fisheries 2025 biofloc trial

7. Ornamental Fish Culture and Health Programme

The Ornamental Fish Culture and Health Programme continued in 2025 as a hands-on and livelihood-oriented activity that applies water-quality and fish-health management at the level of individual systems. Aquaria serves as live demonstration units for students, farmers and Self-Help Group (SHG) members, and in 2025 day-to-day management of the units was led by four final-year FELP students.

Table 31. Ornamental fish programme: 2025

Measure	2025
Aquaria maintained as demonstration units	30
Farmers and SHG members engaged	~70
Students trained in breeding, rearing and fish-health management	41

Species bred in 2025 included Betta (fighter fish), Polar Blue Parrot, goldfish (Carassius auratus), guppy (Poecilia reticulata), molly (Poecilia sphenops) and platy (Xiphophorus maculatus). Each breeding line involved species-specific management of temperature, pH and tank set-up, spawning observation and fry care. Breeding performance was recorded for each line; fighter fish achieved about 98% fertilisation, 90% hatching and 71% larval survival.

7.1 Ornamental Fish Laboratory, Department of Zoology

The Department of Zoology, School of Applied Sciences, CUTM, maintains an ornamental fish laboratory with a documented reference collection of 14 species — pleco, tetra, blood parrot cichlid, molly, cherry shrimp, three-spot gourami, tiger barb, zebrafish, guppy, electric yellow cichlid, swordtail, koi, betta and goldfish — recording the breeding biology, feeding behaviour and colour pigmentation of each species.

A two-day workshop, “Exploring Ornamental Fishes: Sexual Dimorphism, Breeding Biology and Aquascaping”, was held in the laboratory from 25 November 2025. Students practised sex identification, breeding set-ups, courtship and spawning observation, larval management, aquarium set-up, water-quality management, fish handling and aquascaping with mollies, guppies and bettas, and swordtail juveniles and betta hatchlings were raised in the laboratory.



Figure 42. *Students in the ornamental fish breeding and aquascaping workshop, Department of Zoology, CUTM Bhubaneswar (November 2025)*



Figure 43. *Ornamental Fish Laboratory, Department of Zoology*



Figure 44. *Planted aquascape*

8. People Involved in Aquatic Monitoring

- **Students:** 40+ B.F.Sc. students collect water samples and record data across the monitoring sites.
- **Farmers:** Around 20 farmers take part in training-linked monitoring exercises that build skills in water-quality management.
- **SHG women: SHG group approximately every year 40-45 women** take part in community-based monitoring training, extending ecosystem-health awareness to local communities.

6.3 Programmes Towards Good Aquatic Stewardship Practices (14.5.3)

Overview

The School of Fisheries at CUTM runs ongoing programmes that build and sustain good aquatic stewardship practices among students, fish farmers, fishers and Self-Help Group (SHG) members. In 2025, these included ICAR-accredited fisheries education; five training programmes and one exposure visit involving 148 farmers and fishers; demonstration units promoting water-saving and waste-reducing aquaculture practices; a joint waste-to-feed programme using Black Soldier Fly (BSF) larvae and Recirculating Aquaculture Systems (RAS) with the M.S. Swaminathan School of Agriculture; the Ornamental Fish Culture and Health Programme; and industry-linked practical training for students. Together, these activities combine education, demonstration and community capacity-building to encourage responsible management of aquatic resources and sustainable aquaculture practices. There are three strands that support this:

1. **Community Training and Capacity-Building:** farmer/fisher training, SHG training and exposure visits
2. **Demonstration and Applied Aquatic Stewardship:** Ornamental Fish Culture and Health Programme, RAS, BSF waste-to-feed and water-saving/waste-reducing aquaculture demonstrations
3. **Embedding Aquatic Stewardship in Fisheries Education:** formal fisheries programmes, student practical training and industry-linked learning

Community Training and Capacity Building Programmes

In 2025 the School of Fisheries trained a further 50 fish farmers. The farmers and women SHG groups showed interest in demonstrating the floating cage aqua geoponics system (IFCASRIPF- integrated fish cum aqua system rural infrastructure promotion fund). The school assured hand holding support to the farmer communities.

Beyond these training, 4th year 44 B.F.Sc. students worked directly with the forming group 200 fish farmers as a part of their rural fisheries work experience programme (RAWEP).

Applied Aquatic Stewardship: Ornamental Fish Culture and Health Programme

The Ornamental Fish Culture and Health Programme continued in 2025 as a hands-on and livelihood-oriented activity that applies water-quality and fish-health management at the level of individual systems. Aquaria serves as live demonstration units for students, farmers and Self-Help Group (SHG) members, and in 2025 day-to-day management of the units was led by four final-year FELP students.

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A two-day workshop, “Exploring Ornamental Fishes: Sexual Dimorphism, Breeding Biology and Aquascaping”, was held in the laboratory from 25 November 2025. Participants practised sex identification, breeding set-ups, courtship and spawning observation, larval management, aquarium set-up, water-quality management, fish handling and aquascaping with mollies, guppies and bettas, and swordtail juveniles and betta hatchlings were raised in the laboratory.



Figure 45. *Ornamental Fish Culture Laboratory*

BSF–RAS Collaborative Programme: Agriculture and Fisheries

In 2025 the School of Fisheries and the M.S. Swaminathan School of Agriculture continued to operate the Black Soldier Fly (BSF) Larvae Production Unit and the Recirculating Aquaculture System (RAS) unit as a joint programme that links organic-waste recycling with sustainable fish feed. On the agriculture side, BSF larvae are reared on organic waste, and the residual frass is used as organic manure in the Organic Research Farm and in a hi-tech growth chamber for lettuce. On the fisheries side, the larvae are fed to fish cultured in the RAS. Both units were used for student experiential learning and for demonstrations to farmers and visitors.

Feeding trial — Black Soldier Fly Larvae as a Sustainable, Cost-Effective Feed in Recirculating Aquaculture

Systems: freshwater fish cultured in the RAS and fed BSF larvae showed optimum growth with 100% survival, and growth shows as optimum.

Table 33. Nutrient content of BSF larvae compared with conventional feed ingredients (% dry matter)

Feed ingredient	Crude protein	Lipid
BSF larvae	56.9	26.0
Fish meal	70.6	9.9
Soya meal	51.8	2.0

Student training: B.Sc. (Hons.) Agriculture students run the BSF unit under the Agricultural Experiential Learning Programme (AELP) of the ICAR Student READY programme (Rural fisheries work experience programme), covering the full BSF life cycle, larval rearing on organic waste, harvesting, and the preparation of live larvae, dried larvae powder, pelleted feed and frass.

Farmers' training visit, 3–4 September 2025: a two-day Within-State Residential Training Programme under NMAET-ATMA (Agricultural Technology Management Agency, Department of Agriculture and Farmers' Empowerment, Government of Odisha) brought 25 farmers of Buguda block, Ganjam district, to CUTM Paralakhemundi. The farmers trained hands-on at the BSF Larvae Production Unit and the RAS unit, among other farm units, and saw how organic waste is converted into larval protein for fish feed and into organic manure.

Link to aquatic stewardship: BSF larvae can replace part of the fish meal in aquaculture feeds. Fish meal is produced largely from wild-caught marine fish, so substituting it reduces pressure on wild fish stocks, while converting organic waste into feed and manure keeps it out of landfills and water bodies. Rearing the fish in a RAS also reuses culture water instead of discharging it.



Figure 46. *Farmers of Buguda block, Ganjam, on the NMAET-ATMA training visit at the BSF Larvae Production Unit*



Figure 47. *Visitors at the campus Recirculating Aquaculture System (RAS) unit, School of Fisheries, CUTM*



Figure 48. *A visiting participant handling BSF larvae reared on organic waste at the BSF unit*

Table 34. Farmer benefit from a Pacu RAS unit (projected)

What the farmer gets	Figure
One-time set-up cost (tanks, filters, aeration and controls)	Rs 28.62 lakh
Harvests per year	2 (40,000 Pacu stocked per crop)
Income per harvest	Rs 22.50 lakh
Running cost per harvest (seed, feed, power, labour)	Rs 13.13 lakh
Surplus per harvest	Rs 9.37 lakh
Estimate net profit per year, after interest and depreciation	Rs 9.44 lakh
Return on every Rs 1 spent	Rs 1.27
Set-up cost recovered in	About 2 years

Note: CUTM estimate based on the School of Fisheries' projected costs and income for a Pacu RAS unit, at two harvests a year. Interest is taken at 12% a year on the full project cost of Rs 41.75 lakh, and depreciation at 15% of the set-up cost.

A Pacu RAS unit gives a farmer two harvests a year from a small land area, with each harvest earning about Rs 9.4 lakh more than it costs to run. After interest and depreciation, the unit is projected to earn a net profit of about Rs 9.4 lakh a year, returning Rs 1.27 for every rupee spent, and to recover its set-up cost in about two years. The same unit also serves the environment: the system recirculates its water instead of discharging it, and feed, which is about two-thirds of the running cost, can be partly replaced with BSF larvae reared on organic waste. This lowers water use and reduces dependence on fish meal made from wild-caught fish.

Embedding Aquatic Stewardship in Fisheries Education

The School of Fisheries, established in 2017, was the first private institution in Odisha to offer the Bachelor of Fisheries Science (Hons.). The programme is accredited by the Indian Council of Agricultural Research (ICAR) (F.No.1/27/2023-EQR/Edu./Accre., dated 27 February 2024) and follows the ICAR curriculum, with structured Experiential Learning, Rural Agricultural Work Experience (RAWE) and in-plant training delivered under the ICAR Student READY programme. The School also offers the M.F.Sc.

(Aquaculture). In the 2025–26 admission cycle, 52 students (30 male, 22 female) were admitted to the fisheries degree programme.

Table 35. Stewardship content of the degree programmes

Programme	Stewardship practices taught	How they are practised
B.F.Sc. (Hons.)	Sustainable aquaculture, biodiversity conservation, responsible fishing, water- quality and fish-health management	Experiential Learning and in-plant training in the School's culture ponds, biofloc, RAS, aquaponics, hatchery and processing units
M.F.Sc. (Aquaculture)	Advanced aquaculture and ecosystem management	Postgraduate research on aquaculture systems

Industry-Linked Training: Seafood Value Addition with MPEDA

Nine second-year B.F.Sc. students took part in one-day hands-on training in seafood value addition organised by the Marine Products Export Development Authority (MPEDA) in two export processing units. The training covered responsible handling, hygienic processing, quality assurance and export compliance, which reduced spoilage and waste of harvested fish and shellfish.

Table 36. MPEDA seafood value-addition training, November 2025

Item	Details
Organising body	Marine Products Export Development Authority (MPEDA)
Dates	24 November 2025 and 28 November 2025
Venues	Falcon Marine Exports, Bhubaneswar; Alashore Marine Exports Pvt. Ltd., Balasore
Participants	9 second-year B.F.Sc. students (4 at Bhubaneswar, 5 at Balasore)
Shrimp	Ice-water storage, deveining, peeling, butterfly cutting, skewer preparation, Nobashi technique, breading
Squid	Ice-water storage, deheading, gutting, gladius removal, skin removal, ring cutting, breading
Tilapia (finfish)	Deheading, gutting, filleting, trimming, skinning, breading



Figure 49. *B.F.Sc. students at the MPEDA seafood value-addition training in export processing units*

6.4 Collaboration for Shared Aquatic Ecosystems (14.5.4)

A Pond for the People: Centurion University Restores Community (Jamakhala) Pond

Jamakhala Pond in Gopalpur, Odisha, is a shared community resource. It has existed since before 1950 and served as a source of drinking water for around 100 village families. It also supports local fishermen and plays a part in the regional festival of Dola Purnima. Over time, urbanisation and pollution left the pond degraded, which threatened both the ecosystem and the community's connection to it.

In October 2023, Centurion University of Technology and Management (CUTM) secured custodianship of the pond and began restoring it in collaboration with the Government, local residents, students and volunteers. Together, the partners diverted wastewater away from the pond, introduced water lilies for natural cleansing, and reintroduced indigenous fish species.

In 2025, CUTM held community awareness activities at and around the pond. The sessions explained why the pond matters for clean water, local fish stocks and the village's cultural heritage and how residents can help keep it healthy. Centurion University's students helped lead these activities, sharing what they had learned through their fieldwork with the community.

The University's Cultural, Sports and Responsibility Cell lead this ongoing engagement, advocacy and long-term stewardship. This keeps local people involved in caring for the pond rather than leaving them as passive beneficiaries.

The restored pond is now a thriving ecosystem, home to 30 recorded indigenous aquatic species. It has re-established the economic and cultural links between the pond and the village.

The Jamakhala pond is adorned with a diverse array of indigenous fish varieties, flourishing through careful conservation efforts and successful breeding programs. Below is the list of the fishes in it:

Table 37. Scientific Name of the Fishes at Jamakhala Pond

Sl. No	Scientific Name of the Fishes at Jamakhala Pond
1	Anguilla Bengalensis
2	Trichogaster Fasciata
3	Rasbora Borapetensis
4	Pethia Ticto
5	Puntius Chola
6	Eleotris Fusca
7	Glossogobius Giuris
8	Labeo Calbasu
9	Acetes Indicus
10	Penaeus monodon
11	Metapenaeus Affinis
12	Channa Micropeltes
13	Climbing Perch
14	Heteropneustes Fossilis
15	Heteropneustes Microps
16	Wallago Attu
17	Ceylon Snakehead
18	Channa Punctata
19	Nandus Nandus
20	Belonidae
21	Trichiurus lepturus
22	Anguillifrmes
23	Ompok
24	Notopterus Notopterus
25	Stolephorus Indicus

Sl. No	Scientific Name of the Fishes at Jamakhala Pond
26	Clown Featherback
27	Puntius Sophore
28	Mystus Cavasius
29	Parambassis Ranga
30	Pangasius Pangasius

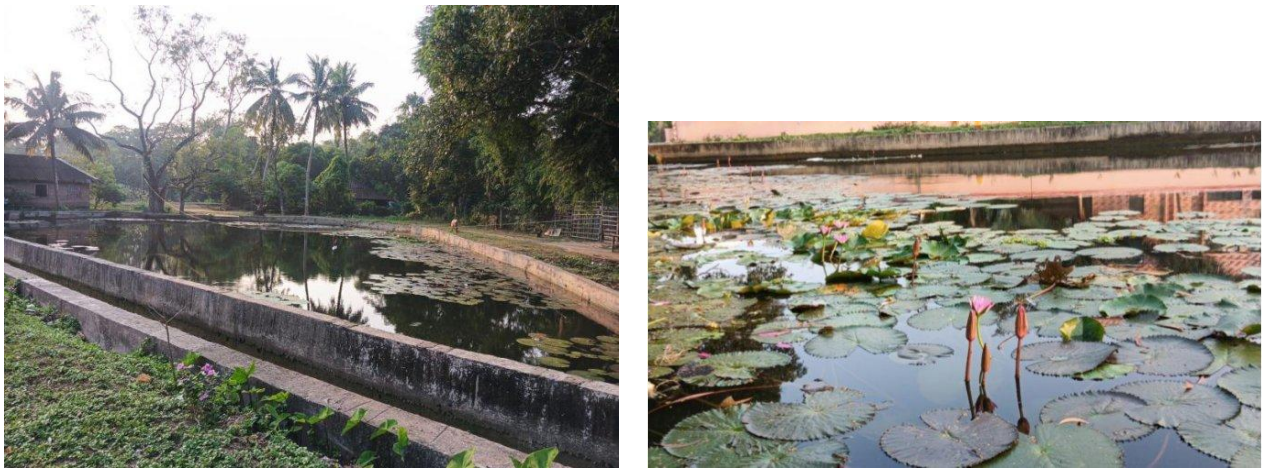


Figure 50. *Jamakhala Community Pond - Restored by Centurion University*

CUTM demonstrated its commitment to collaborative aquatic ecosystem stewardship through engagement with Kailash Hatchery (Orissa) along with the broader community partnerships documented by the School of Fisheries. These collaborations provide platforms for technical knowledge exchange, capacity building, responsible aquaculture and community participation. Collectively, they contribute to the long-term maintenance and sustainable management of shared aquatic ecosystems. In 20/08/2025-24/08/2025 total 44 students went there. They got trained in chinese hatchery operation for carp culture. They trained in freshwater fish culture specially for catfish.





Figure 51. *Chinese hatchery for freshwater fish culture*

Case Study: Field Visit to Ramsagar Reservoir - Collaborative Freshwater Ecosystem Management

The School of Fisheries, Centurion University of Technology and Management (CUTM), organised a field visit to Ramsagar Reservoir, Gajapati District, Odisha, on 23 April 2025, involving approximately 40 second-year students and two faculty members. The visit focused on freshwater ecosystem observation, water and sediment sampling, and the management of unwanted aquatic vegetation.

Students observed the reservoir's aquatic environment, collected water and sediment samples, and participated in removing unwanted aquatic weeds from accessible areas under faculty guidance.

These activities provided practical exposure to freshwater ecosystem monitoring and the ecological considerations involved in maintaining aquatic habitats.

The visit aligns with CUTM's broader efforts to support the sustainable management of shared freshwater ecosystems. The University has previously documented reservoir restoration initiatives involving aquatic weed management, fish biodiversity studies and collaboration with the State Fisheries Department to support fisheries development at Ramsagar Reservoir. Such initiatives demonstrate the relevance of coordinated scientific and management efforts to maintaining aquatic ecosystem health and supporting the communities that depend on freshwater resources. Through field-based learning and practical engagement, the 2025 visit strengthened students' understanding of freshwater ecosystem management and the importance of responsible, locally informed approaches to aquatic vegetation control, water resource conservation and sustainable fisheries.



Figure 52. *Field Visit to Ramsagar Reservoir - Collaborative Freshwater Ecosystem Management*

6.5 Watershed Management Strategy Based on Location-Specific Aquatic Biodiversity (14.5.5)

> **Indicator focus**
> Have implemented a watershed management strategy based on location-specific diversity of aquatic species.

3 watershed ponds managed by species and use	**4** native fish species bred on the Aquaculture Research Farm	**35** farmers trained in two NABARD-sponsored sessions, 2025	**1,512 mm** average annual rainfall on the campus catchment

1. Overview

CUTM's watershed management strategy covers four parts: capturing rainfall across the campus catchment and retaining it in a year-round wetland and ponds; managing three watershed ponds according to their species composition and use; breeding native fish species of the region; and training local farmers in location-specific species selection and water management. In 2025 the three watershed ponds were assessed and stocked on 21 March 2025, and 35 farmers were trained in two NABARD-sponsored sessions on 26 August and 23 November 2025.

2. Campus Catchment and Water Retention

The Paralakhemundi campus spans about 104 acres of gently rolling terrain in a region with an average annual rainfall of 1,512.3 mm. Rainwater is captured from a rooftop catchment of 879,556 sq. ft, a pavement area of 76,170 sq. ft and a road area of 152,340 sq. ft, and is channelled into collection tanks and recharge pits that replenish groundwater and reduce surface runoff. At the centre of the campus is a wetland ecosystem, replenished mainly by rainwater, which stays active throughout the year and provides habitat for aquatic plants and animals. All campus wastewater is treated in four sewage treatment plants

and reused, so no effluent enters the ponds or wetland untreated. The University's Sustainability Policy requires the campus green landscape to include water bodies for biodiversity.



Figure 53. *Campus pond with fish and aquatic plants, Paralakhemundi, 16 September 2025*



Figure 54. *Fish in a campus pond, Paralakhemundi, 16 September 2025*

Source: Environmental Audit Report 2024–25, CUTM Paralakhemundi (audit of 17–18 June 2025); CUTM Sustainability Policy, Version 2 (2024)

3. Watershed Ponds Managed by Species and Use

The Aquaculture Research Farm has 21 nursery, rearing and broodstock ponds, constructed in 2020. The School manages three ponds as distinct watershed units, each with its own species composition and objective. All three were assessed and stocked on 21 March 2025; the Triangle Pond stocking trial was carried out by four students of the Field Experiential Learning Programme (FELP).

Table 38. Watershed ponds and their location-specific management

Pond	Management objective	Species	Biodiversity consideration	2025 activity
Triangle Pond	Intensive aquaculture; research on stocking densities matched to pond carrying capacity	Indian major carps: rohu, catla, mrigal	Stocking density and species chosen to suit local water chemistry, temperature and nutrient levels	Stocking trial, 21 March 2025 (4 FELP students)
WAPCOS Pond	Polyculture; comparison of native and introduced species	Indian major carps with pacu (Piaractus brachypomus) in controlled numbers	Pacu, an exotic species, is kept under containment and its interactions with native carps are monitored	Species-diversity assessment and restocking, 21 March 2025
Tribal Village Pond	Community use and water conservation for tribal communities	Native species chosen with local tribal communities	Native biodiversity, water retention and traditional knowledge of the community	Community stocking and consultation, 21 March 2025



Figure 55. *In-pond cage system at Paralakhemundi Campus, part of the watershed pond infrastructure*

4. Native Species Breeding

The Aquaculture Research Farm breeds native fish species of Odisha's rivers, ponds and seasonal water bodies, so that stocking in the watershed ponds and on farmers' ponds uses locally adapted species.

Table 39. Native species bred on the Aquaculture Research Farm

Species	Common name	Role in the local aquatic ecosystem
Labeo rohita	Rohu	Dominant native carp of Odisha's inland waters and fisheries
Catla catla	Catla	Surface feeder; key species in traditional polyculture
Cirrhinus mrigala	Mrigal	Bottom feeder; supports nutrient cycling in ponds
Heteropneustes fossilis	Singhi (stinging catfish)	Native air-breathing catfish of rainfed and seasonal ponds

Exotic species such as pacu are cultured only in contained systems, including the WAPCOS Pond and the Recirculating Aquaculture System (RAS) unit, and the introduction of exotic species into open or shared water bodies is actively discouraged.

5. Farmer Training on Location-Specific Watershed Management

Under a NABARD-sponsored project, the School of Fisheries trained 35 farmers in two watershed training sessions on managing the different types of water bodies found in and around Gajapati District.

Table 40. NABARD-sponsored watershed training

Date	Format	Farmers trained
26 August	Training programme	20
23 November	Three-day training	15
Total		35

Ecosystems covered: rainfed ponds (seasonal water availability, stocking densities and drought-resilient species); hill streams (species ecology, flow and riparian vegetation); village tanks and community ponds (traditional management combined with water-quality monitoring); and water-use efficiency in integrated farming and fish-culture systems.

Practices taught: choosing species suited to the local ecology, pond type and seasonal water; biosecurity and disease surveillance; reducing runoff and conserving water in pond catchments; and stocking rates based on pond area and carrying capacity.



Figure 56. *Farmers and faculty at the NABARD-sponsored training, 2025*

7. Cross-SDG Integration

CUTM's SDG 14 initiatives are strategically aligned with:

- **SDG 6: Clean Water and Sanitation** – through wastewater treatment and reuse, rainwater harvesting and water-quality monitoring.
- **SDG 2: Zero Hunger** – through sustainable fish production, native seed supply and training for small-scale farmers.
- **SDG 12: Responsible Consumption and Production** – through the plastic waste action plan and waste-to-feed recycling.
- **SDG 13: Climate Action** – through low-discharge aquaculture and research on ocean warming and coastal impacts.
- **SDG 15: Life on Land** – through wetland research, watershed management and the restoration of native biodiversity.
- **SDG 17: Partnerships for the Goals** – through collaboration with INCOIS, ICAR institutes, NABARD, MPEDA and the State Fisheries Department.

8. Conclusion

Centurion University's SDG 14 programme shows how a university can contribute directly to the health of aquatic ecosystems and to the communities that depend on them. Zero-effluent wastewater management, structured monitoring of campus water bodies and low-discharge aquaculture keep the University's own footprint on aquatic ecosystems small, while restoration at Jamakhala Pond, coastal clean-ups with fishing communities and watershed management based on native species extend that care beyond the campus.

The same facilities serve as classrooms for students and training grounds for farmers, fishers and SHG members, so that practices tested on campus are carried into villages, ponds and landing centres across the region. Research with national institutions adds evidence on ocean warming, wetland pollution and pollutant removal. Building on these results, the University will extend technology transfer to more farm-level units, increase the number of fishing communities reached, and further reduce plastic waste towards its 2030 targets.

"CUTM's model for SDG 14 blends innovation, education and inclusion — translating research into real-world aquatic sustainability."



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