

14 LIFE BELOW WATER



LIFE BELOW WATER

GOVERNANCE AND OPERATIONS

UCSI University supports Sustainable Development Goal 14 (Life Below Water) through the protection and sustainable management of aquatic ecosystems. This can be seen from a combination of education, research, community engagement and institutional sustainability practices that the university implements. The university provides educational outreach and public engagement activities that raise awareness on freshwater ecosystem conservation, sustainable water management, responsible fisheries and aquaculture practices, and the impacts of overfishing and destructive fishing methods. Through environmental campaigns, sustainability forums and community events, UCSI promotes the conservation and responsible use of oceans, rivers, lakes and other aquatic resources. Research conducted by academic staff, particularly in environmental science and engineering, contributes to the monitoring and protection of aquatic ecosystems through studies on water quality, river basin conditions and pollution mitigation technologies. The university also collaborates with local communities, industry and government stakeholders to support ecosystem conservation and sustainable resource management. In terms of campus operations, UCSI implements sustainability initiatives such as plastic waste reduction, responsible waste management and compliance with national water quality and wastewater discharge regulations to minimise pollution and protect surrounding ecosystems. These efforts are complemented by institutional policies and sustainability programmes that encourage responsible environmental stewardship and contribute to broader efforts to safeguard aquatic biodiversity and ecosystem health.

TEACHING AND LEARNING

1. PUBLIC AWARENESS ON INVASIVE FISH SPECIES

UCSI University Faculty of Applied Sciences featured Aquatic Science lecturer Dr Lim Keng Chin on Malaysian TV channel RTM1's Selamat Pagi Malaysia to address the threat of invasive fish species in Malaysia's rivers and lakes. The session aimed to raise public awareness of how invasive species disrupt aquatic ecosystems, reduce biodiversity and threaten freshwater and marine health. This measure directly supports SDG 14 by promoting aquatic biodiversity conservation.

Through expert insights and knowledge sharing, viewers gained accessible information on the causes, ecological impacts and management of invasive fish species. The immediate impact was strengthened public understanding and awareness of responsible environmental behaviour. At a broader level, the initiative also contributes to SDG 12 by encouraging sustainable practices that reduce ecological disruption and support responsible management of natural resources.



2. WHAT CAN THE MICROBIOME TELL US ABOUT THE HEALTH OF THE OCEAN?

UCSI University hosted a lecture titled “What Can the Microbiome Tell Us About the Health of the Ocean?” by Visiting Professor Prof Dr Punyasloke Bhadury from the Indian Institute of Science Education and Research Kolkata. The event addressed declining ocean health caused by climate change, pollution and ecosystem imbalance, aiming to highlight the role of marine microbiomes in maintaining ecosystem resilience, directly championing SDG 14 by supporting sustainable marine ecosystem management and research capacity.

Participants gained insights into microbial interactions, climate impacts and biodiversity relevance, strengthening understanding of ocean conservation and sustainable management. The session increased scientific awareness and knowledge dissemination in marine ecology. At a broader level, the initiative also contributes to SDG 12 by raising awareness of human impacts on oceans and encouraging responsible practices that reduce pollution and resource overexploitation.



3. SDG BLUE ECONOMY FORUM

UCSI University, through the Faculty of Applied Sciences, hosted the SDG Blue Economy Forum during the National Climate Governance Summit 2025 to address ocean sustainability challenges, including overfishing, coral reef degradation and governance gaps. The forum aimed to promote sustainable management of marine resources and advance knowledge in line with SDG 14, particularly Targets 14.2 and 14.7.

Distinguished experts, including Prof Dr Dato’ Ahmad Ibrahim, Prof Dr Eric Chan Wei Chiang, Dr Mohd Kushairi Mohd Rajuddin and Ts Dr Sathiabama T. Thirugnana, shared insights on sustainable ocean use, climate impacts and regional governance. The forum strengthened national and regional collaboration, informed evidence-based policymaking and generated actionable recommendations for marine conservation. It also directly advances SDG 12 by promoting sustainable resource use and reducing overexploitation and SDG 13 by addressing climate impacts on oceans.



RESEARCH AND DISCOVERY

1. A CRITICAL REVIEW OF MICROPLASTICS AND NANOPLASTICS IN WASTEWATER: INSIGHTS INTO ADSORBENT-BASED REMEDIATION STRATEGIES

(Environmental Pollution, Volume 382, (2025). Assoc Prof Ir Dr Lee Kiat Moon)

This review aims to provide a comprehensive overview of the current state of research on the removal of microplastics and nanoplastics, with a focus on adsorption-based solutions. The presence of plastic particles in the environment is a growing concern due to their widespread distribution across aquatic, terrestrial and atmospheric systems. To address this environmental issue, researchers have explored various removal technologies, including coagulation, sand filtration, membrane filtration and adsorption. A bibliometric analysis of 7641 keywords from 771 publications reveals that adsorption is the most widely studied removal technique. Thus, this has led to a deeper exploration of various adsorbents and their mechanisms, including their interactions with plastic particles and how they can be optimised for higher removal performance. The main adsorption mechanisms involve electrostatic interactions, hydrogen bonding, π - π interactions, and hydrophobic effects. Chemisorption is the primary interaction in the adsorption process, while physisorption is affected by the size and surface properties of plastic particles. A trend analysis indicates that carbon-based and metal-based adsorbents dominate the research landscape, with higher publication rates compared to biopolymer-based adsorbents. However, from an environmental perspective, biopolymer-based adsorbents are preferable due to their biodegradability, low toxicity, and renewable nature. This review discusses the mechanisms of these adsorbents, evaluates the limitations of current removal technologies, and outlines future research directions aimed at developing advanced and sustainable adsorbents to address the growing challenge of plastic pollution (including in oceans and rivers).

2. METABOLOMIC AND PHYSIOLOGICAL ANALYSES OF TWO PICOCHLOROPHYTES FROM DISTINCT OCEANIC LATITUDES UNDER FUTURE OCEAN ACIDIFICATION AND WARMING

(Marine Environmental Research, Volume 208, (2025). Distinguished Professor Dr Phang Siew Moi, FASc, FMBA (UK))

Phytoplankton are cosmopolitan marine photosynthetic organisms that are vital to biogeochemical cycles and marine ecosystems. The current rise in atmospheric CO₂ and surface ocean temperatures are poised to disrupt the ecological niches of phytoplankton. Picochlorophytes, a broad taxon of small green eukaryotic phytoplankton, have been shown to perform well under future rising oceanic CO₂ and temperature scenarios. This study investigates the acclimation responses of cosmopolitan picochlorophytes from the Chlorella-lineage under high CO₂ (1000 p.p.m.) and a rise of 4 °C (8 °C – polar picochlorophyte; 32 °C, tropical picochlorophyte). In order to determine how the future ocean warming and acidification might affect picochlorophytes, a polar strain of Chlorella and a tropical Parachlorella were selected, and their physiology and GCMS-based metabolomics were investigated. Growth rate and cellular dimensions (diameter, volume, and surface area) of Chlorella significantly increased in all environmental future scenarios compared to Parachlorella. Photosynthetic parameters of the picochlorophytes studied showed acclimation, with high temperature and high CO₂ triggering the adaptation of Fv/Fm, NPQmax, and Ek of Chlorella and Parachlorella, respectively. High CO₂ induced the most changes in the Chlorella metabolome, altering the levels of metabolites related to amino acids and their derivatives, glutathione production, carbohydrates, and photochemical quenching. Combined high CO₂/temperature altered Parachlorella's metabolome, though with a small number of biomarkers detected. This study provided evidence to support the hypothesis that picochlorophytes could thrive in a more acidified and warmer ocean.

COMMUNITY AND PARTNERSHIP

1. OCEAN SCOUTS: EXPLORING AQUATIC FLORA AND LOCAL CULTURES IN SERIBU ISLAND

UCSI University participated in the Ocean Scouts 2025 Summer Course: Exploring Aquatic Flora and Local Cultures in Seribu Island from 7 to 18 July 2025, hosted by IPB University, Bogor and Seribu Island, Indonesia. The programme addressed marine ecosystem degradation and biodiversity loss while strengthening youth capacity in ocean conservation, contributing directly to SDG 14, particularly goals 14.2 and 14.a.

UCSI was represented by Aminath Zana Shiraz and Ashiyath Layan Ahmed, with support from Assoc Prof Dr Wong Chen Wai. Participants gained scientific knowledge and practical skills in marine conservation, producing outputs such as mangrove and seagrass restoration, seaweed sampling and research projects that received national recognition. The programme strengthened cross-border collaboration, supported sustainable marine management as well as promoted SDG 4 through experiential learning and SDG 13 by fostering ecosystem resilience to climate impacts.



2. FIELD TRIP TO L'TUR CAVIAR STURGEON FARM

On 1 August 2025, UCSI University students from the BSc (Hons) Aquatic Science and Diploma in Aquaculture with Entrepreneurship programmes participated in an educational field trip to the L'TUR Caviar Sturgeon Farm in Tanjung Malim. The visit aimed to enhance students' understanding of aquaculture practices and sustainable aquatic resource management, supporting SDG 14. Industry representatives AJ Lim and Chan shared insights into sturgeon farming, including breeding, hatching processes and aquaculture operations.

The field trip provided students with practical exposure to commercial aquaculture systems and strengthened their understanding of aquatic species management and industry practices. The experience enhanced technical knowledge, industry awareness and interest in sustainable aquaculture careers. At a broader level, the initiative contributes to capacity-building in marine and aquatic resource stewardship, while also supporting SDG 4 and SDG 8 by promoting experiential learning and preparing students for future roles in the aquaculture sector.

