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The impact of microplastics on coral reefs: A review from the Indian perspective

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Abstract

Coral reefs are among the most diverse biological ecosystems on the Earth, providing essential services to marine life and coastal communities. However, they face an array of anthropogenic stressors, including climate change, overfishing, and pollution. In recent years, microplastics, which are plastic particles smaller than 5 mm have become a big threat to marine organisms. Coral reefs being a very sensitive ecosystem are very adversely affected by the microplastic pollution. This review focuses on the impact of microplastics on coral reef ecosystems, particularly in the Indian Ocean and Indian coral reef systems. The sources, distribution and environmental consequences of microplastics in these marine ecosystems are being explored here. At the end, some of the policies relevant to India and future research directions in this field have been enlisted.

Keywords: microplastics; coral reef; marine ecosystem; pollution; Indian ocean.

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The Application of Cyanobacteria in Oncology: A Review

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Abstract

Cancer biology is an imperative branch of research. An extensive range of secondary metabolites produced by cyanobacteria are employed as medicines. Several anticancer drug leads have been derived from cyanobacteria. These anticancer agents prevent cancer by interrupting the cell cycle and promoting apoptosis. Various cyanobacterial species have potential anticancer effects; however, the Genus *Lyngbya* is a promising source of numerous potent anticancer drugs. Clinical trials approved some medicines against several cancer cell lines. This area of research in oncology is a requirement of this world as the demand for effective treatment for the threatening disease, cancer is still high.

Keywords: Cyanobacteria; Oncology; Anticancer drugs; Apoptosis; Secondary metabolites.

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The algal Genus *Cosmarium* Corda from Anjani Dam of Jalgaon District (Part-II), Maharashtra

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Abstract

The present investigation deals with the diversity of the genus *Cosmarium* (Desmidiaceae) from Anjani Dam of Erandol Tahsil of Jalgaon district, Maharashtra. The samples of algae were collected from different sites of Anjani Dam for two years. A total of 90 taxa of *Cosmarium* belonging to the order Desmiales of the family Desmidiaceae have been recorded during the study. During the present investigation, only 30 taxa of *Cosmarium* with 17 species, 12 varieties and 01 forma were documented and described systematically with illustrations. Of which *Cosmarium pseudoprotuberans* var. *pseudoprotuberans*, *Cosmarium pseudoprotuberans* var. *trigonum*,

Cosmarium pseudowembaerense, *Cosmarium pyramidatum* var. *convexum* were recorded as new additions to the desmids flora of India.

Keywords: Anjani dam; *Cosmarium*; Desmids; Desmidiaceae; Desmidiiales; Maharashtra.

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Novel Preservation Approach in Idli Batter Using Selected Seaweed

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Abstract

Microbial food spoilage poses significant challenges to the food industry, affecting product quality and shelf life. Synthetic additives, commonly used for preservation, raise health concerns, urging the exploration of natural alternatives. This study investigates *Gracilaria edulis* seaweed as a natural preservative for idli batter, aiming to combat microbial food spoilage without synthetic additives. Seaweed powder characteristics include a mean diameter of $45 \pm 2 \mu\text{m}$, zeta potential of $-24.6 \pm 1.3 \text{ mV}$, UV-visible absorption peak at 280 nm and FT-IR fingerprint with peaks at 3400, 1630 and 1020 cm^{-1} . The seaweed powder was then incorporated into idli batter at varying proportions (0.25, 0.50, 0.75 and 1 g) and physiochemical, microbial and sensory analyses were conducted. Results indicated that the seaweed powder significantly influenced the fermentation kinetics of the idli batter, with higher proportions delaying the process. Microbial analysis indicated reduced lactic acid bacteria ($7.8\text{--}6.2 \log \text{ CFU/g}$), yeast ($5.2\text{--}3.4 \log \text{ CFU/g}$) and mould counts ($4.6\text{--}2.8 \log \text{ CFU/g}$) with increasing seaweed powder concentrations, showing antimicrobial efficacy. Sensory evaluation favoured lower seaweed content for idlis, while higher concentrations enhanced taste and flavour. In conclusion, *Gracilaria edulis* powder effectively extended idli batter shelf life by curbing microbial growth, suggesting a natural alternative to synthetic additives for improved food safety and quality.

Keywords: Fermentation kinetics *Gracilaria edulis*; Idli batter; Preservatives; Seaweed.

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A study on isolation and phytochemical profiles from the ethanol extract of *Limnospira platensis* (Gomont) K.R.S. Santos and Hentschke 2023

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Abstract

The present investigation was conducted in the Kosasthalaiyar River. It is one of the important water reservoirs in Chennai. Water samples were collected from the River and cultured using CFTRI medium. The microalga *Limnospira platensis* was isolated as a pure culture. The phytochemical constituents (qualitative and quantitative) were studied in *Limnospira platensis* using ethanol extract. Preliminary phytochemical analysis of the ethanol extracts from *Limnospira platensis* revealed significant amounts of carbohydrates, flavonoids, and phenols, measured at 19.39, 9.66 and 10.92 mg/g respectively. The advantage of the strain is lesser carbohydrate content than the existing strains. The protein content was observed to be 57.074 mg/g. The protein content was high in the isolated *Limnospira plantensis*.

Keywords: Kosasthalaiyar River; CFTRI medium; Phytochemical Analysis; Ethanol extract; *Limnospira platensis*.

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Temporal variation of phytoplankton richness and abundance in relation to certain physicochemical attributes of Chandubi wetland, Assam, Northeast India

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Abstract

Temporal variation of phytoplankton was studied in Chandubi wetland of Assam in 2022. Forty nine species were recorded under 48 genera belonging to 20 families and 6 classes. The species richness among the classes was in the order: Chlorophyceae > Bacillariophyceae > Cyanophyceae > Euglenophyceae and Dinophyceae > Chrysophyceae. The temporal variation of phytoplankton abundance attained the maxima in June (monsoon period) and the minima in February (winter period). *Pandorina*, *Pediastrum*, *Zygnema*, *Staurastrum*, *Cosmarium*, *Spondylosium*, *Xanthidium*, *Ceratium*, *Dinobryon*, *Navicula*, *Asterionella* and *Tabellaria* were the important taxa. Diversity index (Shannon_H) revealed the highest during the retreated monsoon. The Canonical Correspondence Analysis (CCA) with nine abiotic factors explained 50.46% and 30.13% together 70.59% cumulative variance of phytoplankton along Axis 1 and 2. Abiotic variables exhibited mixed impact on the phytoplankton biomass, water temperature appeared to have the highest influence along with pH and nitrate content of water.

Keywords: Abundance; Chandubi; Diversity; Phytoplankton; Richness.

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Extraction, Optimization, Antibacterial and Antioxidant Activity of Crude Secondary Metabolite, Isolated from *Bacillus subtilis* KI1 Strain

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Abstract

In this research, we isolated a bacterial strain from lake water, identified as *Bacillus subtilis* KI1, and evaluated the antibacterial and antioxidant effects of its crude secondary metabolites. Using 16S rRNA sequencing, we confirmed the identity of the strain. We extracted the secondary metabolites from *B. subtilis* KI1 using ethanol and tested their antibacterial properties against multidrug-resistant bacteria using the agar well diffusion method. Our results showed that these metabolites inhibited the growth of the pathogenic bacteria. Additionally, the metabolites demonstrated effective antioxidant activity by scavenging DPPH radicals in vitro. Growth optimization studies revealed that *B. subtilis* KI1 thrives growth parameter optimization. These findings suggest that, with further in-depth analysis and purification of the metabolites, followed by relevant clinical testing, the secondary metabolites from *B. subtilis* KI1 may consider to be developed into powerful antibiotics and anticancer drugs.

Keywords: *Bacillus subtilis* KI1; optimization; extraction; antibacterial; antioxidant.

Exploring the Marvels of *Avicennia marina*: Unveiling Nature's Treasure trove of Healing Potential with Cultural Wonders, Habitat and Phytochemistry

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Abstract

The mangrove species *Avicennia marina* is widely distributed along the Indian and Pacific coastlines and holds significant historical importance in traditional medicine. This review explores its habitat, morphology, reproduction, ethnobotanical uses, and phytochemistry. *Avicennia marina*, reaching heights of approximately 10 m, has been utilized for millennia in treating various ailments such as tumors, diabetes, smallpox, and ulcerations. Recent research validates its therapeutic efficacy, attributed to a plethora of phytochemicals including alkaloids, glycosides, phenols, saponins, tannins, terpenoids, and flavonoids. The geographical distribution of the *Avicennia marina* is delineated, alongside its comprehensive ethnobotanical applications. By elucidating its mode of reproduction and botanical description, this paper provides a holistic understanding of *Avicennia marina*, shedding light on its medicinal properties and potential as a source of bioactive compounds.

Keywords: *Avicennia marina*; mangrove; phytochemistry; pharmacological properties; reproduction; ethnobotanical uses.

Assessing the Nutrient Removal Capabilities of Macrophytes: Insights from a Lab-Scale Experiment

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Abstract

Eutrophication is a widespread problem in rivers, lakes, and coastal regions, caused by over enrichment with nitrogen and phosphorus and invasion of alien organisms. Aquatic plants have been used extensively in phytoremediation of water systems. The nutrient and other physicochemical parameter removal efficiencies by three aquatic macrophytes were studied in a lab scale experiment. Among studied macrophytes, *Pistia stratiotes* showed highest removal of most of the parameters followed by *Eichhornia crassipes* and *Lemna minor*. All the studied experimental systems showed highest removal efficiency for phosphate followed by ammonia, nitrite, BOD, COD and lowest removal efficiencies for TDS and EC. Control showed highest removal of ammonia and lowest for COD and BOD. There was an increase in TDS and EC in control system due to algal growth. The nutrient removal efficiencies were higher during second and third week of the experimental period due to highest increase in biomass during that period. Nutrient content in tissues of studied macrophytes were also maximum during second week of the experimental period.

Keywords: Macrophytes; Eutrophication; Nutrient; Phytoremediation; *Eichhornia crassipes*.

Comparative Analysis of the Effect of Cold Storage Conditions on the Proximate Composition, Vitamin and Mineral Content of the Freshwater Fish Species *Labeo rohita* (Hamilton, 1822)

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Abstract

Fish has a high nutritional value and is a good source of proteins, lipids and other micronutrients that are crucial for the upkeep of good health. The aim of the study was to determine the change of nutritional value of *Labeo rohita* in different duration of cold storage. The results showed that during different storage periods, proximate, vitamin and mineral content slightly decreased and some of the changes were significant. In the fresh sample, the moisture content was found to be 78.75 ± 0.09 , which decreased to 78.16 ± 0.03 ; the protein content was 16.54 ± 0.08 in fresh; decreased to 16.18 ± 0.21 ; the lipid content decreased from 2.48 ± 0.06 in fresh to 2.34 ± 0.05 ; the ash content was 1.26 ± 0.19 in fresh which declined to 1.13 ± 0.02 ; the carbohydrate content was 0.97 ± 0.31 in fresh which increased to 2.19 ± 0.16 after 96 h of cold storage. Among the fat soluble vitamins, vitamin D concentration was highest, 38.03 ± 0.35 and vitamin K was having lowest concentration, 0.52 ± 0.09 . Vitamins showed considerable changes in storage hours. Among the macro minerals, Potassium was present in highest concentration and magnesium was the lowest in fresh fish muscle. Minerals showed significant change during storage.

Keywords: Cold storage; *Labeo rohita*; Minerals; Proximate composition; Vitamins.

Length-weight relationship and morphometric traits of four freshwater fish species from Assam, India

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Abstract

The present study has examined the length-weight relationship (LWR), as well as measured the morphometric traits of four fish species, viz., *P. sophore*, *P. ticto*, *S. sarana* and *P. javanicus*, over the period from April, 2022 to March, 2023. Fish samples were obtained from local fishermen in Pathsala, Assam and a total of 11 morphometric traits were analyzed. The recorded range for total length was 5–8.6, 4.5–6.9, 5.1–9.1 and 11.7–16.4 cm for *P. sophore*, *P. ticto*, *S. sarana* and *P. javanicus* respectively and recorded range for weight were 4.43–8.8, 2.3–4, 3–9.72 and 30–75 g for *P. sophore*, *P. ticto*, *S. sarana* and *P. javanicus* respectively. The results indicated a negative allometry growth ($b < 3$), with the 'b' values for *P. sophore*, *P. ticto*, *S. sarana*, and *P. javanicus* being 0.971, 0.894, 2.014 and 2.818 respectively. The regression coefficient values were observed as 0.918, 0.766, 0.900 and 0.924 for *P. sophore*, *P. ticto*, *S. sarana* and *P. javanicus* respectively. Additionally, the condition factor for each species was determined as 2.421, 1.687, 1.435 and 1.896 for *P. sophore*, *P. ticto*, *S. sarana* and *P. javanicus* respectively.

Keywords: length-weight relationship; morphometric; allometry; regression coefficient; condition factor.

Acute Toxicity and Behavioural effects of the Neem-Based Biopesticide “Azaray” (1% Azadirachtin) on the Freshwater Murrel, *Channa punctata* (Bloch, 1793)

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Abstract

A static renewal bioassay test was conducted to evaluate the acute toxicity of the neem based biopesticide Azaray (1% Azadirachtin), generally applied to the different croplands of India. The fingerling stage of *Channa punctata*, with an average size of 8.17 ± 0.86 cm and body weight of 7.53 ± 0.65 g was used as the test fish for the experiment. The physicochemical parameters of the test water were conducted in accordance with standard protocols. Throughout the research period, the ethological responses of exposed fish were observed. The 96-h LC_{50} (Probit) value for “Azaray” (1% Azadirachtin) was determined to be 1.22 mgL^{-1} . The fish under toxicity stress showed a variety of aberrant behaviours in response to an increase in the concentrations of the toxicant pesticide, including hyperactivity, irregular and rapid movement, random swimming, increased surface activity, body imbalance, and loss of homeostasis. The proper dose of the biopesticide needs to be determined before application in the field.

Keywords: Neem; bio pesticide; LC_{50} ; Azadirachtin; *Channa punctata*.

Assessment of acute toxicity of tetrachlorocatechol in conjunction with haematological, biochemical and reproductive impacts on *Clarias batrachus*

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Abstract

The goal of the current study was to assess the acute toxicity of tetrachlorocatechol (TCC) to *Clarias batrachus* as well as its impact on the haematological, biochemical and reproductive alterations that occur in fish exposed for 45 days. The 96 h median lethal concentration (LC_{50}) of TCC along with its 95% fiducial limits was 7.56 (7.02–8.14) mg/l. Apart from 30-day exposure, a significant ($p < 0.05$) variation in the haemoglobin (Hb) level was noted as the concentration of TCC increased. Over the course of the experiment, there was no significant variation ($p > 0.05$) in whole erythrocyte count (WEC) between the chronic dosages (0.38, 0.76 mg/l) with the increase in TCC concentration, apart from when comparing them to the control ($p < 0.05$). Throughout the 45-day exposure period, a significant change ($p < 0.05$) in whole leucocyte count (WLC) was noted in relation to the rise in TCC concentration. After 45 days of exposure, there was a significant difference ($p < 0.05$) in the mean corpuscular haemoglobin (MCH) value between the various TCC dosages, including the control. For all three exposure days—15, 30, and 45 days—a significant difference ($p < 0.05$) in whole serum protein (WSP) was noted between the greater sublethal dose and the control group. During the whole duration of the exposure (15, 30, and 45 days), there was a significant rise ($p < 0.05$) in whole serum glucose (WSG) in the following order: control < lower sublethal dose < higher sublethal dosage. For both male and female fish, there was a significant ($p < 0.05$) drop in maturity index (MI) across all TCC treatments (0.00, 0.38, and 0.76 mg/l). The results of the experiment could be used to predict acceptable TCC levels and provide information on fish health in natural water bodies.

Keywords: Tetrachlorocatechol; *Clarias batrachus*; LC_{50} ; Haematology; Biochemistry; Reproduction.

Aspirin-mediated Alleviation of Arsenic trioxide Triggered Histological Anomalies in Heart Tissue of *Cyprinus carpio*

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Abstract

Heavy metals, naturally occurring elements in the earth's crust, pose significant threats to aquatic ecosystems due to their persistence, non-biodegradability, bioaccumulation and biomagnification. Arsenic, a toxic metalloid, contaminates water supplies, causing severe health issues such as cardiovascular, dermatologic, carcinogenic and neurologic impacts. This study investigates the histopathological effects of arsenic trioxide on the heart tissue of freshwater fish, *Cyprinus carpio* and also assesses the alleviating potential of aspirin. Fish were exposed to varying concentrations of arsenic trioxide (0.9, 1.3, and 1.8 mg/kg) for 10, 20, and 30 days. The findings revealed significant cardiac alterations, including hypertrophy, nuclear atrophy, muscle fragmentation and haemorrhages. Higher concentrations and prolonged exposure intensified these effects. Aspirin treatment demonstrated a protective role, mitigating arsenic-induced damage. Aspirin-treated fish exhibited reduced nuclear atrophy, minimized muscle degeneration and preserved structural integrity of cardiac tissues. The study underscores the sensitivity of fish hearts to heavy metal toxicity and the potential of aspirin to counteract such adverse effects. Given the lower costs and rapid reproduction rates, fish models prove advantageous for pharmaceutical research and safety testing. This research highlights the importance of monitoring histopathological biomarkers in environmental studies and suggests aspirin's potential as a therapeutic agent against heavy metal toxicity in aquatic organisms. The findings contribute to understanding arsenic's toxicological impact and the efficacy of aspirin in preserving cardiac health in contaminated environments.

Keywords: Arsenic trioxide; aspirin; *Cyprinus carpio*; toxicity; amelioration.

A Preliminary study of Tardigrada (moss piglet) from Nashik, Maharashtra, India

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Abstract

Tardigrade, the water bears are cosmopolitan in distribution and they have extreme level of tolerance hence they can survive in extreme hot and cold. Tardigrades can survive for several years in dormant stage by formation of tun and they can revive when hydrated. The Tardigrada is the phylum of Micrometazoan animals and are very poorly studied in India. In the present study, we tried to report tardigrades from Nashik region by using samples from urban and non-urban region for the period of January 2020 to December 2022. Different samples such as moss, lichen, mud and leaf foliage were considered for tardigrade study. *Echiniscus* sp. and *Diphyscon* sp. were found in our study, belong to two different classes: **Heterotardigrada** and **Eutardigrada** respectively. The distribution of tardigrades in Nashik region is very poor.

Keywords: Tardigrade; water bear; *Diphyscon*; moss piglet; *Echiniscus*.

Microplastic Accumulation in Edible Fish Species from Kayamkulam Kayal, Kerala

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Abstract

The ubiquitous existence of microplastics (MPs) in aquatic ecosystems poses significant risks to both environmental and human health. This study investigates the microplastic contamination in three commercially and ecologically important freshwater fish species—*Heteropneustes fossilis* (stinging catfish), *Megalops cyprinoides* (Indo-Pacific tarpon), and *Anabas testudineus* (climbing perch)—collected from Kayamkulam Lake, a eutrophic brackish lagoon affected by urban and industrial pollutants in Kerala, India. Using Fourier Transform Infrared (FTIR) spectroscopy, the types and distributions of microplastic polymers in the gut, flesh, and gills of these fishes were identified. Polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET) were the dominant polymers detected, with significant differences in accumulation patterns. *Megalops cyprinoides* exhibited higher intensities of PE and PP in the gut and flesh, while *Heteropneustes fossilis* showed unique accumulations of low-density polyethylene (LDPE) and nylon in the gills, reflecting its benthic feeding behavior. *Anabas testudineus* displayed a predominance of PE in gut tissues, consistent with its omnivorous feeding habits. These findings highlight the extensive contamination of Kayamkulam Lake with microplastics, primarily driven by local anthropogenic activities, and underscore potential health risks for aquatic organisms and humans consuming these fish. This research calls for urgent interventions in waste management and pollution control to mitigate microplastic pollution in vulnerable freshwater ecosystems.

Keywords: Microplastic contamination; Edible Fish species; Kayamkulam Kayal; Aquatic pollution; FTIR.

Ichthyo-faunal diversity, abundance, distribution and conservation status of Ayiramthengu region, a south-west coast ecosystem of Kerala, India

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Abstract

A study was conducted to monitor the fish diversity, conservation status and diversity indices of the Ayiramthengu region, a bar-mouth area connecting the Arabian Sea with the Kayamkulam backwater. During the present study conducted from October 2021 to September 2022, 66 fish were recorded belonging to 14 orders, 30 families and 46 genera. Perciformes formed the most species-rich order with 18 species, and Carangidae and Mugilidae were the most species-rich families, comprising seven species from each. The study also revealed that 34 species were abundant throughout the period of study. Fish species of 19 were common, whereas three were not common. Three species were under the rare category, and seven were very rare. Various diversity indices calculated during the study indicated higher regional species richness and diversity (Shannon-Wiener diversity – 3.28 and Margalef species richness – 7.22). According to the latest Red Data List of the International Union of Conservation of Nature (IUCN, 2024), 52 species came under Least Concern, and six were under the Not Evaluated category. The status of another six species was found to be Data Deficient, and two were under the vulnerable category.

Keywords: Ayiramthengu region; bar-mouth; diversity indices; ichthyo-fauna; IUCN status; Kayamkulam backwater.

Seasonal Variation in Zooplankton Communities of Two Streams at Tarai Region, Uttarakhand, India

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Abstract

The present paper deals with the seasonal variation in zooplankton communities of Baini and Chackferi stream at Tarai region, Uttarakhand, during the period September 2020 to August 2022. A total of 58 zooplankton species were recorded across both streams. The Baini stream showed greater diversity, with 30 species identified, compared to 28 species in the Chackferi stream. In both the streams, rotifers were the most dominant group, followed by copepods, protozoans, cladocerans, and ostracods. Seasonal variation in the Baini stream showed zooplankton peaking in summer (27%), followed by autumn (26%), winter (24%), and reaching its lowest during the monsoon (23%). Similarly, in the Chackferi stream, the highest zooplankton was observed in summer (26%), with autumn and winter both at (25%), and the lowest during the monsoon season (24%). Zooplankton also serve as effective bio-indicators of pollution. The presence of species such as *Brachionus calyciflorus*, *Mesocyclops leuckarti* and *Moina micrura* in these streams signals organic pollution and advancing eutrophication. Regular monitoring and focused treatment are essential for conserving these stream ecosystems.

Keywords: Zooplankton; Communities; Streams; Pollution; Eutrophication.

New species of Aglajid (*Philinopsis nigricans* sp. nov.) from the east coast of India

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Abstract

The knowledge of Indian heterobranchs was well documented mostly from the reef areas along the peninsular coastal areas and islands ecosystems. One species of aglajid heterobranch *Philinopsis nigricans* sp. nov. was described from intertidal zone of Mandarmani Coast of West Bengal, India for the first time. The specimen was readily recognizable and found distinct from other related aglajids by its black body colour with varying amounts of tiny brown dots. Body of the species was distinctly divisible into anterior and posterior shields. Anterior end was blunt and with rows of barbs. The detailed morphometric and anatomy of this newly described species was presented in this research work. Description of this new species would contribute to the documentation of aglajid species in Indian mainland.

Keywords: Sea slug; Mandarmani; Heterobranch; Aglajid; Intertidal zone.

De-colorization of MB dye solution using high voltage pulsed discharge for aquatic life system improvement

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Abstract

Advanced oxidation processes (AOPs) are needed to bridge the gap between the treatability reached by traditional physio-chemical and biological treatments and the everyday restrictions imposed by environmental regulation. They are particularly crucial for eliminating anthropogenic pollutants, and in recent years, they have even been applied to the treatment of a variety of industrial wastewater flows. One of the Advanced Oxidation Processes (AOP) used to de-colorize the dye Methylene Blue (MB) was examined in this research work. It entailed using a Dielectric Barrier Discharge (DBD) medium to apply a high energy pulse. Many industries and rapid urbanization poisoned water bodies for many years, which had a detrimental effect on the ecology. Biological and chemical effluents are starting to pose serious, urgent problems for enterprises, governments, and the general public. Injecting a high energy pulse into a DBD medium is the best substitute technique discovered for quickly de-colorizing Methylene Blue dye without the usage of biological or chemical agents. When high energy pulsed discharges are applied, the greatest results are achieved when the Methylene Blue dye is effectively de-colored. This is beneficial for aquatic life.

Keywords: DBD – Dielectric Barrier Discharge; AOP – Advanced Oxidation Process; MB – Methylene Blue; POP – Persistent Organic Pollutant; HV – High Voltage.

Assessing Heavy Metal Contamination in Sediment of Paravur Lake, Kerala: A Multi-Site Analysis of Urban Impact

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Abstract

The present study assesses heavy metal contamination in the sediments of Paravur Lake, an urban-adjacent brackish water system in Kollam, Kerala, India. Three sites with varying exposure to urban discharge were analyzed: Ithikkara River Mouth (IRM), Screw Gauge System (SGS), and Kollam Canal Discharge (KCD). Sediment samples were evaluated for heavy metals—copper (Cu), chromium (Cr), cadmium (Cd), lead (Pb), nickel (Ni), and zinc (Zn)—using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Pollution indices, including the Contamination Factor (CF) and Geo-accumulation Index (Igeo), were applied to quantify contamination intensity, while Principal Component Analysis (PCA) explored the influence of environmental parameters on heavy metal distribution.

The results revealed significant spatial and seasonal variations in heavy metal concentrations, with KCD exhibiting the highest contamination due to proximity to urban discharge and industrial runoff. Metals such as nickel and zinc showed seasonal peaks during the Southwest and Northeast Monsoons, emphasizing the role of runoff in pollution dynamics. In contrast, IRM recorded consistently low contamination levels, reflecting relatively pristine conditions. CF and Igeo values were predominantly below contamination thresholds, classifying the sediments as uncontaminated to moderately contaminated for most metals, with cadmium and nickel showing slightly elevated values in urban-proximal sites. PCA results indicated strong associations between heavy metals and organic carbon, pH, and conductivity, highlighting the role of sediment composition in metal retention.

The study underscores the vulnerability of Paravur Lake to heavy metal contamination amidst increasing urbanization in Kollam City. While current pollution levels remain low, proactive management strategies are critical to mitigate future risks. Implementing pollution control measures, managing urban runoff, and monitoring seasonal influx are essential to preserve the ecological health of Paravur Lake, a vital resource for local fisheries and biodiversity.

Keywords: Heavy metal pollution; Sediment contamination; Paravur Lake; Pollution indices; Principal Component Analysis (PCA).

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Exploration of Phenolic and Flavonoid Content of Marine Brown Algae *Stoechospermum Marginatum* and *Dictyota maxima*

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Abstract

The demand for marine brown algae is increasing due to its usability as food, fodder and fertilizer. Marine brown algae show ample amount of natural products which are bioactive in nature. *Stoechospermum marginatum* and *Dictyota maxima* are brown marine algae which are distributed across the coasts of Indian and Australian oceans. Recent studies have thrown light on these marine brown algae that can be potential bio resources as higher phenolic and flavonoid contents could be a significant source of natural antioxidants. In the present article; estimation of total phenolic and flavonoid content for both aqueous and methanolic extracts of *Stoechospermum marginatum* and *Dictyota maxima* was carried out. Also, the FT-IR and CHNS elemental analyses were also done. Results revealed that aqueous extract of *Stoechospermum marginatum* has higher total phenolic and flavonoid content compared to its methanolic extract as well as extracts of *Dictyota maxima*. FT-IR analysis of both the seaweed extracts indicated the presence of different bonds, which confirmed the presence of the functional groups like alcohols, phenols, alkanes, alkyne, alkenes, aromatic compounds amines and ethers. CHNS analysis revealed the presence of sulphated polysaccharides in seaweeds and also more C, H, N and S elements in *Dictyota maxima* as compared to *Stoechospermum marginatum*.

Keywords: Maharashtra Coast; Marine brown algae; Elemental analysis; Flavonoids and Phenols; FTIR.

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Study on ovarian fecundity of climbing perch, *Anabas testudineus* (Bloch, 1792) in Puthimari beel, Barpeta District, Assam

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Abstract

Anabas testudineus (Bloch, 1792) is a commercially important fish in most of the South Asian countries. Its natural populations are seriously decreasing due to heavy exploitation and other ecological changes in its habitat. This study illuminates the fecundity, Gonadosomatic Index (GSI) and condition factor of *A. testudineus* collected from the Puthimari beel in Sorbhog, Assam, India. A total of 12 fish specimens were examined from the month of June to July. The total length, body weight, gonadal length, gonadal weight was analysed with the help of classical tools. Water quality parameters like dissolved oxygen, pH, temperature was monitored periodically and

the values ranged optimal. The fecundity showed a positive growth which recorded from 5188.8–17834.23 and the recorded GSI value ranged between 15.2 and 22.3%. The current study might be helpful for maintaining the production of the fish in Barpeta district and overall in the state of Assam and raise the economic status of fisherman cultivating this species.

Keywords: *Anabas testudineus*; Fecundity; Gonadosomatic Index; Ovary; Economic status.

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Seasonal Dynamics of Physicochemical Parameters and Algal Biodiversity in Sarangkhedha Barrage: Implications for Sustainable Water Management

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Abstract

The Sarangkhedha Barrage plays a crucial role in supporting fisheries, agriculture, and drinking water needs. This study investigates the seasonal dynamics of physicochemical parameters and algal diversity from June 2022 to May 2023, emphasizing their interdependence and implications for water quality. Key parameters such as water temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), free CO₂, nutrients, and hardness were analyzed alongside the density of major algal groups—Cyanophyceae, Chlorophyceae, and Bacillariophyceae. Results reveal significant seasonal variations: summer exhibited elevated temperatures (30.6°C), high TDS (333.72 mg/L), and reduced DO (4.60 mg/L), contributing to algal blooms dominated by Bacillariophyceae (41.66%). In contrast, winter featured optimal conditions for Chlorophyceae (34.57%) and Cyanophyceae (23.75%) growth, with lower temperatures (23.3°C) and higher DO (7.07 mg/L). Monsoon brought nutrient enrichment and dilution effects. Strong correlations were observed, such as between temperature and CO₂ ($r = 0.920$) and between phosphate and nitrate ($r = 0.965$), highlighting nutrient-driven algal dynamics. This study underscores the need for sustainable water management to mitigate pollution and eutrophication, especially during summer months. Regular monitoring of physicochemical and biological indicators is essential to preserve aquatic biodiversity and ensure water safety.

Keywords: Sarangkhedha Barrage; water quality; physicochemical parameters; algal diversity; seasonal variations.

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Evaluation of Physico-chemical Parameters of a Freshwater Pond of Madora Village, In Jalaun District, Bundelkhand Region, India

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Abstract

Water is indispensable for human survival; however, the complexities of urbanization often lead to the contamination of water resources available in the regions, making them improper for consumption and agriculture. Since ponds are lentic water bodies, they are particularly vulnerable to anthropogenic activities of various types. The present study aims to evaluate the physico-chemical properties of a freshwater pond, located in Madora village

of Bundelkhand region. The monthly data were collected over a year, from January 2022 to December 2022. These data were then categorized by season and analysed for standard deviation and water quality index. The study focused upon various parameters of water like average temperature, pH, levels of dissolved oxygen and Biochemical Oxygen Demand (BOD), Total alkalinity levels, Hardness level, the amount of Nitrate-Nitrogen and Phosphate in the water. The study resulted into the fact that the alkalinity levels of the Madora pond water exceeded the Indian standard (IS 10500) limits and World Health Organization's (WHO, 2009) permissible limits. While some measured variables fell within the acceptable range, many others surpassed them. This indicates that the water in Madora pond is approaching or has exceeded eutrophic conditions and is not suitable for drinking or supporting aquatic life.

Keywords: Madora pond; fresh water; physico-chemical characters; B.O.D; eutrophication; Bundelkhand region.

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Heavy metal accumulation in fresh water edible fish species from Morar River Gwalior Madhya Pradesh, India

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Abstract

Heavy metals are the most dangerous chemical water pollution due to bioaccumulation and biomagnifications. This research evaluates the possible health risks imposed by five heavy metals such as Zinc, Cadmium, Arsenic, Lead and Chromium uptake by edible fish species. This research evaluates the possible health risks imposed by heavy metals such as zinc (Zn), cadmium (Cd), Arsenic (Ar), lead (Pb) and chromium (Cr) detected in selected edible fish species utilizing atomic absorption spectroscopy (AAS). Such toxic metals are poisonous in nature and can enter the human diet via fish ingestion. The results of this investigation revealed the concentrations of heavy metals in fish species collected from different locations of river exceeded the permitted limits established by the international standard references (FAO/WHO, USFDA, MOFL, and EC). The cumulative impacts of all metals in this study surpassed from allowable limit of 1 for HI (hazard index) in selected fish species. Studies showed that heavy metals cause severe damage on fish thus endanger fish health and ecosystem and constitute respectable risks to human health via consumption of heavy metal contaminated fish. This study suggests that heavy metal surveillance of fish in contaminated rivers be carried out on a frequent basis through government environmental health management authorities to enforce regulatory criteria.

Keywords: Heavy Metal; Edible fish; Organs; River; Pollutants.

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Metabolic profiling, Antioxidant, Cytotoxic and Antibacterial activities of Two Marine Macroalgae from Southeast coast of Tamil Nadu, India

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Abstract

Macroalgae, rich in bioactive compounds, have the potential for developing medicinal applications in disease prevention and treatment. Studies on *Stoechospermum marginatum* and *Gracilaria corticata* from the Mandapam coastal area of Rameshwaram, Tamil Nadu, India, revealed the presence of antioxidant and anti-cancer properties in their extracts. The GC-MS analysis identified bioactive compounds with antioxidant and anti-cancer properties, such as phytol, bis (2-ethylhexyl) phthalate, n-hexadecanoic acid, neophytadiene, tritetracontane, cholesterol, and others. The DPPH assay showed moderate antioxidant activity, with IC₅₀ values of 1172.31 µg/ml for *Stoechospermum marginatum* and 1976.28 µg/ml for *Gracilaria corticata*, indicating potential as natural antioxidant sources. The MTT assay showed substantial cytotoxicity on MDA-MB-231 breast cancer cells, with the highest cytotoxicity of 53.78% for *Stoechospermum marginatum* and 55.78% for *Gracilaria corticata*. The findings of this research work reveal the potential of these macroalgal species for developing natural products in the nutraceutical and pharmaceutical industries.

Keywords: Macro algae; Bioactive; GC-MS; MTT assay; Nutraceuticals.

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Assessing the quality of drinking water: A case study of open well groundwater sources in a region of Kerala, India

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Abstract

The global water crisis presents a significant challenge, particularly concerning the scarcity and quality of freshwater resources, especially groundwater. Over-extraction and pollution make groundwater increasingly vulnerable, threatening public health, wildlife, and aquatic ecosystems. Access to safe drinking water and sanitation is crucial, especially during outbreaks of infectious diseases such as cholera, typhoid, and the most recent COVID-19 outbreak. This study investigates the physicochemical properties of groundwater from ten open well sources serving to around 150 individuals in the Muriyad, Thrissur district of Kerala, India, to assess their quality and suitability for drinking and other uses. Groundwater samples were collected during the pre-monsoon season and analysed according to the guidelines set by the American Public Health Association (APHA), World Health Organization (WHO), and Bureau of Indian Standards (BIS). Key parameters evaluated include pH, temperature, acidity, alkalinity, turbidity, total dissolved solids, chlorides, magnesium, calcium, and total hardness. The findings highlight the varying quality of groundwater in the region, underscoring the need for effective water management practices to ensure public health and environmental sustainability. This research aims to inform local policies and practices to mitigate the impacts of groundwater pollution and safeguard this essential resource.

Keywords: Groundwater quality; physicochemical properties; water pollution; public health; Kerala.

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Studies on the Diversity and Abundance of Zooplankton in some selected Lakes of Kolar District, Karnataka

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Abstract

Zooplankton are microscopic, free floating animals in the water column, whose distribution is primarily determined by water currents and mixing. Correct identification of freshwater organisms is an essential part of managing aquatic bodies. The present study was undertaken to record and identify the taxa of zooplankton from Uttanur lake and Muduvadi lake in the Kolar district. The water samples from the surface to different depths were filtered in a No. 20 bolting silk cloth net with mesh size of 1.16mm and preserved by adding 2 ml of 4% formalin. From January 2023 to December 2023, 19 species were identified from Muduvadi lake and 18 from Uttanur lake water. From January 2024 to June 2024, 19 and 17 species were identified in Muduvadi and Uttanur lakes respectively. Zooplankton diversity showed mainly Euglenaceae (*Euglena sanguine*, *E. viridis*), Asplanchnidae (*Asplanchna priodanta*), Brachionidae (*Brachionus caudatus*, *B. forficula*, *B. falcatus*, *Keratella cochlearis*), Lecanidae (*Lecane bulla*, *L. quadridentata*, *L. lunaris*), Lepadellidae (*Lepadella ovalis*, *Colurella uncinata*), Trichocercidae (*Trichocerca pusilla*, *T. weberi*), Trochosphaeridae (*Filinia opoliensis*), Copepoda (Cyclopoida, Calanoida), and Diplostraca (*Daphnia magna*, *Moina*). Further, the variation in the species diversity was also noticed which might be due to the influence of environmental conditions of water bodies.

Keywords: Zooplankton; Euglenaceae; Asplanchnidae; Brachionidae; Copepoda.