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September 21-22, 2018 | Dallas, USA

## e-Poster Presentation

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# Arsenic pollution and its detoxification potential of marine bacteria isolated from Alang-Sosiya ship breaking yard, India

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The aim of the present study was to assess the arsenic contents at Alang-Sosiya, world's largest ship-breaking yard, India. Annually, hundreds of ships have been dismantled, which lead to discharge large amounts of detrimental and persistent pollutants at this location. ICP-OES analysis reveals that the average arsenic contents at Alang-Sosiya were 20.01mg/kg and 18.75µg/L respectively in coastal sediment and seawater samples. The pollution index values of arsenic in coastal surface sediment from the sampling station A1–A6 ranged between 2.95 to 4.23, indicating moderate to high level of arsenic pollution. The marine environment affected by ship-scrapping activity and contaminated with arsenic is the potential location to get arsenic hyper-tolerant bacterial isolates. Out of 16 isolated bacterial strains, KKDK-1 and KKDK-2 sustained 600mM and 500mM arsenate respectively. The 16S rRNA ribotyping identified strains KKDK-1 and KKDK-2 as *Halomonas* species. The strain KKDK-1 showed the maximum arsenic accumulation of 21.7±3.3 mg g-1 cell dry weight at exponential phase (60h), followed by sudden extrusion of arsenic during stationary phase (84 h) of bacterial growth. Whereas, strain KKDK-2 accumulated 6.8±1.12 mg Arsenic $g^{-1}$ cell dry weight during exponential phase (72 h), which remains almost invariable during stationary phase (96-144 h) of bacterial growth. TEM analysis revealed that the significant amounts of intracellular electron dense particles accumulated in both KKDK-1 and KKDK-2 treated with arsenic. EDAX analysis confirmed the presence of heavy metal arsenic. These results indicate the hypertolerance of arsenic with higher accumulation capacity, signifying KKDK-1 and 2 as potential candidates for arsenic detoxification of arsenic-contaminated sites.

## Biography

Devang Bharatkumar Khambholja has completed his PhD in Biochemistry. After completion of his Masters in 2011, he was appointed as Research Fellow (JRF & SRF) in Ministry of Earth Sciences, Government of India sponsored project. He has published 3 papers in peer reviewed international journals and contributed a book chapter in Handbook of Arsenic Toxicology, Academic Press (Elsevier). Also he has presented and attended various National and International Conferences. Since 2017 He is working as an Assistant Professor at BN Patel Institute of Paramedical and Science (Paramedical Division), Anand, Gujarat, India. Presently, he is working on project entitled "Efficacy of Natural antibacterial agents incorporated onto guided tissue regeneration membrane against periodontal pathogens".

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**Notes:**

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# Accepted Abstracts

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# Designing structures that test and optimize recruitment: Coral restoration using innovative 3D technology

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Anthropogenic damage is causing a decline in physical coral reef structure. Damaged reef structure and decreasing live coral coverage can consequently limit ecosystem services that coral reefs provide. With over 500 million people directly dependent on coral reefs for food, protection, and livelihood, it is essential we develop effective and sustainable methods to restore coral ecosystems. Coral reef restoration efforts aim to reestablish live coral coverage and/ or increase reef structure to damaged reefs. Traditional restoration practices have severe limitations and show inconsistent success rates. The inability to retain coral larvae on reefs also hinders the sustainability of these methods, without continuous human intervention. Research efforts which prioritize understanding larval dynamics can open possibilities for additional restoration tools in the future. Enhancing live coral on artificial substrates may be one way to propagate larvae and increase coral recruitment in physically degraded reef areas. Deploying specially designed settlement substrates would provide immediate structural complexity to damaged reefs, encouraging fish and invertebrate colonization, while simultaneously facilitating coral recruitment. By testing the role of multi-scale structural complexity on the larval settlement, this study identifies characteristics that are beneficial to improve larval recruitment on artificial substrates, adding to the tools available for coral reef restoration. This research uses innovative 3D technology to develop substrates that incorporate multi-level structural complexity to facilitate larval settlement and post-settlement survival. The resulting settlement structures serve as an example of for 3D technology used in marine conservation and coral restoration, specifically. Novel technologies, such as 3D scanning and printing, allow researchers to address questions that were not previously considered, due to experimental restraints and complications and increase ease of addressing some previously considered settlement questions. Methods in this research also showcase the scalability of 3D models and set the stage for this technology to revolutionize restoration in the future.

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# A study of the impact of thermal pollution on the physical and chemical characteristic of the sediment of the Lagos Lagoon

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The need to generate power worldwide had given rise to the use of various sources such as nuclear, gas, coal, wind, hydro, thermal and solar. Some of these are not environmentally friendly and create challenges particularly when the world is facing a major crisis, global warming. The effect of coolant or waste heat discharge on the sediment characteristics, at the Egbin area of the Lagos lagoon, were investigated from March to August 2012 at five (5) stations. The bottom sediment quality reflected the influences of coolant water introduction, net tidal seawater inflow in the dry season and freshwater incursions effects in the raining season. Five sites were sampled between 900h and 1100h. During the study period, rainfall ranged between 104mm-476mm. The physical and chemical parameters of sediment investigated were pH, moisture content, total organic content, total organic matter, nitrate, phosphate, copper, chromium, lead, nickel, zinc. Sediment type was predominantly sandy to muddy sand with changes in the nature of the substratum within relatively short distances. Effort should be made on carrying out more research on this study sites in subsequent time to establish a database in relation to pollution. This would serve as a sort of baseline data for further research. Furthermore, comparative studies could be carried out on other benthic community to determine species diversity and consequence of the effect of elevated water temperature.

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# Distribution of organic compounds and suspended matter on the atmosphere–water geochemical barrier zone in the Atlantic and Indian Oceans

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The concentrations of suspended particulate matter (SPM) and particulate forms of the organic compounds (hydrocarbons, lipids, and chlorophyll a) were determined in the surface water layer and aerosols of the Atlantic Ocean in February-May 2012, 2014 and 2015 and the Indian Ocean in December 2015-February 2016 and January-March 2017. The route of the vessel covered tropical, subtropical, and moderate zones in the humid and arid regions of the oceans. Suspensions and organic matter were assayed by routine methods used in oceanology. It was stated that the distribution of concentrations of the studied components is mainly affected by the location of frontal zones and seasonal variability. Circumcontinental zonality is manifested in the increase of aerosol concentrations in coastal regions: the shores of South America – because of the streams of Patagonia, and the coasts of Europe, from humid regions and industrial centers (in the Atlantic Ocean) and Malacca, Bab-El-Mandeb straits and Suez channel (in the Indian Ocean). However, the highest increase of the concentration of aerosols was influenced by the migration from arid zones of the African deserts in the middle Atlantic and of the Arabian Peninsula in the Gulf of Aden and the Red Sea. The last led to increasing of SPM concentrations in the surface waters in arid zones. However, in surface waters, the distribution of SPM and organic compounds is also affected by the water productivity and the flow of hydrocarbons from the oil pollution. The lowest concentrations of suspended matter were observed in the central waters of the Indian Ocean and Mediterranean Sea. The occasional sharp increase of hydrocarbon concentrations caused by anthropogenic pollution was registered at local parts of water areas in the east of the Atlantic Ocean.

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# Ocean energy of Taiwan East coast

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At the east coast, especially Taitung coast full of ocean energy, wave energy, ocean current particularly ocean thermal energy conversion (OTEC). Offshore nearly 3 km away from Taitung and Hualien Coast and reaching 1000 to 1500 meter deep, in deep ocean water (DOW) temperatures being around 0 to 4 degrees, whereas sea surface temperature around 25 to 28 degrees, the temperature difference is more than 20 degrees. If ammonia is used as a catalyst, it is easy to generate electric power. Offshore 33 km from Taitung coast and about 5 km from Green Island, there exits 3-4 knots' Kuroshio currents. MOEA (Ministry of Economic Affairs) is planning to develop 3 gigawatts power. The SHOTEC power plant is a good solution to OTEC. That scheme not only offers more thermal efficiency to that of conventional OTEC plant but also circumvents the difficulties of deployment of deep seawater pipe and evaporator biofouling problems. For convenience to develop Ocean Energy and Ocean Resources, the planning of an airport and seaport is shown for future transportation of energy and DOW (Deep Ocean Water) products. The multi-functional arrangement is stretched. The Taitung Ocean Energy development is welcoming an international technical cooperation to take part in its ongoing promotion and future developing.

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# Diel migration of microzooplankton Tintinnid in Masinloc Oyon-Bay Marine Reserve

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Diel vertical migration (DVM) is considered as a general characteristic of the zooplankton community. During the night, most of the zooplankton have a high occurrence in the surface layer of the water to feed on phytoplankton and descends during the day to avoid predators, however, reverse patterns also occur to other organisms. Tintinnids, a cosmopolitan group of microzooplankton, have been observed to be abundant on the upper layers both in coastal and open seas. This study aimed to assess the diel migration of tintinnids in marine environment and test if they follow the zooplankton general diel characteristic. Tintinnids were collected on the month of July 2017 at 8 stations in Masinloc-Oyon Bay. Plankton net with 20µm mesh size was horizontally towed at 1-meter depth for 10mins with a speed of 1.5-2.0 knots. Vertical tows were also performed by lowering the net at 1 meter above the bottom to the surface. Night sampling was done at 9pm-4am while the day-time collection was conducted at 9am-4pm. Both sampling periods were conducted during high tide with a depth range of 11-21 meters. One of the noteworthy findings of this study is the recorded visibility of tintinnids in the surface layers both in the night and day-time collection. No significant difference was observed between night and day-time abundances using horizontal tow. A significant difference was recorded between night and day-time abundance with vertical tow. The results suggest that tintinnids might deviate from the generalized diel characteristic of the zooplankton community. This current work presented a potential area of interest about tintinnids distribution pattern.

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# Abundance and diversity of Tintinnid Ciliates within power plant discharge and marine protected areas in Masinloc-Oyon Bay

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Tintinnids are one of the ubiquitous microzooplankton in marine waters and are recognized as indicator species of water quality. This study is a survey of the composition, diversity, and abundance of tintinnids along 8 stations in Masinloc–Oyon Bay (MOB). Tintinnids were collected through plankton net with 20 µm mesh size on July 2017. Temperature, salinity, pH, DO and TDS of the water were measured using YSI 6600 meter. The nine identified tintinnid species in this study are first records for the MOB. The warm water species *Helicostomella longa* (Brandt, 1906) dominated the tintinnid assemblage. Diversity range of 0-1.9 H' indicates that MOB is moderate to the heavily polluted bay. Anthropogenic activities and industrialization such as mining, port construction, oil spills, power plant thermal discharge and fish cages might affect the species diversity index of the bay. Multivariate analysis created a cluster of the stations (2-5) within Marine Protected Ares (MPAs) and a separate cluster of the stations (1, 6-7) far from MPAs. The station within the power plant's outfall had the lowest abundance and diversity. Higher diversity indices were recorded at the station within MPAs. The results can support the notion that MPAs are promoting resilience in the MOB. The tintinnid variation in this current work showed the uniqueness and diversity of the MOB's marine environment. The present study is the first bay wide assessment of Masinloc-Oyon Bay using biological and environmental parameters.

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# Carbon sequestration in seagrass habitats: Studying the effects of environmental heterogeneity on this key ecosystem service

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There is currently a need for initiatives of Climate Change mitigation through active Green House sequestration, particularly of $CO_2$. Seagrasses are one of only three marine habitats that provide this ecosystem service, storing carbon in living tissue through photosynthesis and buried in their sediments for up to thousands of years. However, seagrass meadows are also highly threatened and are continuing to decline worldwide, threatening the capacity of this ecosystem to serve as a carbon sink. Seagrass management and conservation initiatives need adequate understanding of the spatial and temporal variability of carbon storage in these ecosystems, which is currently limited. The effect of varying environmental and biological conditions on spatial and temporal variability of carbon storage was studied in subtropical and tropical seagrass meadows. In the Coral Sea, seagrass biomass and sediment cores were collected at multiple locations across a water quality gradient in Moreton Bay, Australia. High resolution seagrass biomass mapping was developed through remote sensing and mapping techniques. Sediment carbon content and seagrass structural complexity were determined for each location. Environmental variables were determined from field data (water quality) and modelled data (wave height). Spatial variability in carbon content among sites was linked to variations in seagrass canopy complexity, water turbidity, depth and wave energy. Seasonal variability was limited and overshadowed by spatial variability. Variation at longer time frames was analyzed by dating sediment cores up to 2m sediment depth. Carbon content, vertical accretion and carbon accumulation rates varied within Moreton Bay and were higher following European settlement. Findings from the Coral Sea are now being compared to new studies in the Caribbean and Eastern Tropical Pacific. The findings on spatial and temporal variability of the ecosystem service of carbon sequestration in seagrass meadows provide useful information for the development and implementation of blue carbon conservation and management initiatives.

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## Coastal flooding events due to remote forcing along the South-West coast of India

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The paper deals with the study of coastal flooding events along the southwest coast of India particularly during the non-monsoon period when the sea conditions are calm. In recent years there has been an increase in the number of coastal flooding events reported and because of this several studies have been initiated to understand the causative factors responsible for the occurrence of such events. It is observed that this type of flooding events usually occurs without any precursors and sometimes may last for a few hours causing hardship to the coastal community. During such events, the fishermen community is most affected as their boats and houses (which are located in low lying coastal areas) are badly damaged due to the surging of water inland especially when the berm-beach face is narrow and the backshores are of low elevations. Detailed analysis of the hydrodynamic data available during such localized events indicates that the flooding in most of the cases is due to remote forcing. Here the remote forcing is due to the arrival of distant storm waves in the form of swells from the Southern Indian Ocean. Whenever the height of the swell waves rises above 1.5m and the peak period exceeds 15 seconds the swell waves have a damaging effect compared to the conducive environment favorable for beach building which the swell waves normally create when their heights are less than 1m and the period is around 10-14 s. Depending on other factors like the orientation of the shoreline magnitude and direction of the coastal wind, tidal conditions, beach sediment characteristics, foreshore and berm characteristics, coastal vegetation etc. the intensity of coastal flooding can vary spatially even if the nearshore wave conditions are more or less similar. Hence site-specific long-term field data collection is essential to understand the actual processes that lead to the flooding events.

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# Spatial dynamics of water quality changes for monitoring the existence and migration of fish resources in the Estuary, Southeast Sulawesi, Indonesia

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This study was carried out with the aim of evaluating the spatial variation of the water quality in the Roraya and Lanowulu river estuary at RAWN Park coastal zone. Water quality in seven stations along the estuary was monitored including, temperature, salinity, turbidity, dissolved oxygen (DO), chlorofil-a and nutrients (NO2, NO3, NH4, PO4). This study was analyzed by surfer 11 software using the interpolation method and Principal Component Analysis (PCA) for an elucidation of the spatial dynamics of physicochemical qualities of two rivers estuary. The results showed that the spatial classification of water quality decline due to freshwater flow at low tide and input of sea water at high tide. The levels of DO, turbidity, chlorophyll-a, NO2, NO3 and NH4 of the Roraya river estuary were higher as compared with Lanowulu river estuary. The existence of natural mangrove in the Lanowulu river estuary plays an important role in maintaining of water quality. several types of fishery resources found in the estuary and survive with depressed environmental conditions such as fish, crabs, shrimp, and shellfish. Human activities around the Roraya River such as mining, agriculture, fishery and household waste activities are the main responsible factors for spatial variation of the monitored variables.

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# Self-governance of fishing institutions and community resilience: An anthropological inquiry of fishing villages in Godavari Valley, Andhra Pradesh, India

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It is well informed in the academic circles that Fishing sector is in transition as any other sector. Direct and indirect role of market forces affected the fishing sector and as a cause and affect the rights and entitlements of the fishing community are at stake not only in India but also in the world. Many studies have highlighted several issues, like migration, mechanization, fishing rights, issues and operationalization of ICZM, middlemen domination, post-harvest technology facilities; dwindling catches, gender relations, and occupational shift, etc. Very few studies have focused on the indigenous institutions and the customary rights and Governance structure of these institutions. Especially in India the focus on Indigenous institutions in the fishing sector is not well documented by the researchers. This paper is an outcome of a rigorous anthropological investigation into the indigenous knowledge and practices of the fisherfolk of the Coastal Andhra. Indigenously evolved institutional form, "Walakatlu", evolved over centuries in the past, is still in vogue in the fishing villages. This institution provides fish catch to the share-cropper (the right comes through lineage as ancestral immovable right) on the day of their turn (Vantu). Another institution "Ayyalu", a community institution, includes both consanguineal and affinal kin members as partners. In light of this, the proposed paper discusses the structure of these institutions, rules, and regulations, allocation of rights over territories, income levels of appropriators, investment patterns, debt repayment mechanism, the role of middlemen, transfer of rights, sanctions on violators of norms, etc. The paper primarily examines the role of indigenous institutions in shaping the socio-economic fabric of the fishing community. Secondly, it proposes to look at how these institutions are made use of by the community for creating sustainable livelihoods. Thirdly, it examines the community's perspective of livelihood options derived out of rural developmental programmes (State Sponsored) and the livelihood choices carved out of rich natural resource base.

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# Earth's expansion and its relation to continental drifting and ocean formation

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Formation of continental fragments and oceans, together with mid-oceanic ridges have been explained in the paper with the help of an expansion-based global tectonics termed "Unified Global Tectonics" which based on Hilgenberg's Earth expansion theory considers that the planet Earth was originally considerably small and devoid of ocean basins. It has been pointed out by the author that since such an Earth would be ocean-less, the ocean-forming water must have, therefore, been initially associated with the mantle, thereby turning that geosphere considerably fluid or semi-fluid exceedingly suitable for expansion and continental drifting. Expansion of the planet was manifested chiefly by expanding the semi-fluid mantle bringing forth a number of major changes on Earth. It was owing to upward bulging of the mantle–caused by gravitational attraction of a planetary body, probably the moon, the solid sialic covering or the crust of the small planet was fragmented forming a number of separate continental blocks. Through the expansion cracks, a large quantum of basic lava disgorged which deposited on it's both sides forming rudimentary basins. On the continued process of expansion, associated with the upliftment of continental fragments, the small basins gradually turned into large ocean basins. Associated with the expulsion of lava, a large amount of volatiles chiefly composed of moisture also came out from the mantle which on condensation deposited as ocean water continuously filling up the ocean basins. The expansion cracks which were formed owing to planetary expansion, initiating the process of ocean formation, in due course turned into mid-oceanic ridges. The processes of expansion, continental displacements, and ocean formation continued till the mantle was sufficiently fluid. However, due to drying up of the mantle owing to the emission of moisture-rich volatiles, the mantle rock eventually turned into a solid and rigid geosphere when ocean enlargement and all associated processes were stopped.

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# Marine biodiversity in India with special reference to conservation, status, and issues

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India has a vast coastline of 8000 km, of which, 5,423 km belong to Peninsular India and 2,094 km to the Andaman, Nicobar, and Lakshadweep Islands, and with an EEZ of 2.02 million sq.km. There are about 13,000 recorded marine species in India. Indian coastal zones have a variety of habitats like Mangrove, estuarine, coral reefs, seagrass beds, lagoons, sand dunes, rocky shore, cliffs, intertidal mudflats, etc. The coastline of India has also supported nearly 250 million people and the ecological services of marine and coastal ecosystems of India play a vital role in India's economic growth. The marine floral diversity includes 844 species of marine alga (seaweeds) belonging to 217 genera, 14 species of seagrasses and 69 species of Mangroves. The marine faunal diversity includes a wide variety of life forum. The Indian coastal water harbours 451 species of sponges, more than 200 species of corals, more than 2900 species of crustacean, 3370 species of marine molluscs, more than 200 species of bryozoans, 765 species of echinoderm, 47 species of tunicates, more than 1300 marine fishes, 26 species of sea snakes, 5 species of sea turtles and 30 species of marine mammals including dugong, dolphins, whales etc. In addition, a wide variety of seabirds can be observed around the coast. There are ten species of sharks and rays including whale shark, all species of seahorses, all cetaceans, dugong, nine species of shells, five species of sea turtles, one species of otter, all species of corals, all species of sponges and all holothurians that occur in coastal and marine areas of India are considered under threat, therefore, protected under the Wildlife (Protection) Act, 1972 by listing them in the Schedule. Major anthropogenic direct drivers of ecosystem degradation and destruction include habitat conversion to other forms of land use, overexploitation of species and associated destructive harvesting practices, the spread of invasive alien species, and the impacts of pollution from agricultural, domestic and industrial effluents. In this paper, the major issues related to coastal and marine biodiversity conservation and measures taken to address them have been highlighted.

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## Status of coastal ecosystems and management in India

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India has a coastline of more than 7500 km. Marine resources are spread over in the Indian Ocean, Arabian Sea, and the Bay of Bengal. The economic zone (EEZ) of the country has an area of 2.02 million sq km comprising 0.86 million sq km on the west coast, 0.56 million sq km on the east coast and 0.6 million sq km around the Andaman and Nicobar islands. Marine fish production has increased from 0.5 million tonnes in 1950 to 3.8 million tonnes in 2015, contributing substantially to nutritional security, income, and livelihood of a large population of the country. Available information indicates that the oceans and coastal biomes contribute substantially to the ecosystem services that make up the country's natural capital. India has opportunities to reap many economic benefits from living and non-living resources of coastal and marine areas including fisheries and biodiversity. In India, a large number of people are dependent on the coastal and marine ecosystems and their resources for survival and livelihood. For conserving and managing coastal and marine resources and ecosystems, a strong legislative framework exists in India. The acts and supporting rules and regulations directly and indirectly related to management of coastal and marine areas and biodiversity are as follows: Coast Guard Act, 1978; Merchant Shipping Act, 1958; Wildlife (Protection) Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976; Forest Conservation Act, 1980; Marine Fishing Regulation Acts, 1981 (separate acts promulgated by each coastal State/UT based on a model. Bill prepared by the Union Ministry of Agriculture); Coastal Pollution Control Series, 1982; Environment Protection Act, India has established 31 Coastal & Marine Protected Areas (CMPAs). For the purpose of conserving and protecting the coastal areas and marine waters, the Coastal Regulation Zone (CRZ) area is classified as CRZ I, CRZ II, CRZ III and CRZ IV. The areas that have been developed up to or close to the shoreline are included in CRZ II, generally referred as the area within the municipal limits, CRZ III includes areas that relatively undisturbed, less built up and rural areas, and CRZ IV includes the water area from the Low Tide Line to twelve nautical miles on the seaward side. The areas that are ecologically sensitive and the geomorphologic features which play a role in maintaining the integrity of the coast is referred to as CRZ I.

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# Camera calibration: What is important and what is important for underwater imagery

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Camera calibration is an essential part of image processing pipeline resulting with a 3D scene reconstruction. Traditionally, this term encompasses determination of properties of individual cameras (intrinsic parameters) and calculation of mutual poses of cameras (extrinsic parameters). Processing of underwater imagery adds another layer of complexity related to waterproof housings that enclose cameras, with transparent windows refraction index of which is different from that of air and water. Thus, light rays reflecting from an imaged object bend two times before arriving at a sensor–at water/window and window/air interfaces. For commonly used flat or dome-shaped windows, accounting for refraction adds three more calibration parameters. Until recently, many researchers were attempting to describe refractive distortion in terms of radial lens distortion, but this approach was proven to be not viable, as in presence of refraction camera becomes varifocal. Any quantitative result obtained from image processing requires knowledge of uncertainty related to calibration accuracy. We assume that resources available to researchers–measured in monetary and time units–are limited, and thus the guidance how to achieve maximal accuracy with minimal cost is important. This paper presents a comprehensive investigation of factors affecting the accurate determination of all calibration parameters. These factors include pixelation noise, shape, and pattern drawn on a calibration object, the necessary number of acquired images, the structure of a multi-camera rig, etc. For underwater cameras, with refractive interfaces, we propose a novel technique for determination of refraction-related parameters. This technique is fast and reliable, as it requires the only optimization in one dimension for flat interfaces. Experimental results demonstrate a good correlation between calculated parameters and the parameters that were possible to measure manually. Accurate knowledge of refractive calibration parameters allow for incorporation of refraction effects in a 3D scene reconstruction workflow and dramatically improves reconstruction results.

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