

First Research Symposium of the Ocean University of Sri
Lanka

Aquatic Research for Prosperity of the Nation

December 23, 2019

Message from the Vice Chancellor

As an island nation, Sri Lanka is fortunate to have a large exclusive economic zone with further potential for its expansion. As a result, we are endowed with a large amount of living and non-living marine resources. Sri Lanka also has a greater potential to be the maritime logistics center of the Indian Ocean because of its geographical position. In order to use these assets for the sustainable development of Sri Lanka, a systematic research of all sectors is vital.

Developing human resources for ocean, marine and maritime sectors are prime objectives of the Ocean University of Sri Lanka. It is our responsibility to conduct extensive research in these sectors. Eventually, such researches transfer knowledge not only for poverty alleviation of fishing community but also to develop Sri Lanka as a nation.

I would like to congratulate the Research and Publication Committee for taking the initiative in organizing the very first research symposium of the Ocean University of Sri Lanka and thus, sowing the seeds for creation of new knowledge. I would also like to congratulate the Conference Coordinating Committee for organizing this event successfully in a very short period of time.

I hope this conference would be a stepping stone towards achieving a greater research success for the students and staff of the University.

Prof. Nalin Ratnayake
Vice Chancellor
Ocean University of Sri Lanka

Editors

Mr. S.U.P. Jinadasa	Editor in Chief
Dr. H.B. Jayasiri	Editor
Dr. J.K. Rajapaksha	Editor
Dr. Champa. Amarasiri	Editor

Reviewers

Mr. S.U.P. Jinadasa	Senior Lecturer, Ocean University of Sri Lanka
Dr. H.B. Jayasiri	Senior Lecturer, Ocean University of Sri Lanka
Dr. J.K. Rajapaksha	Senior Lecturer, Ocean University of Sri Lanka
Dr. M.P. Kumara	Senior Lecturer, Ocean University of Sri Lanka
Dr. Lanka Dimuthu	Senior Lecturer, Ocean University of Sri Lanka
Dr. Wasantha Pahawattaratchi	Principal Scientist, National Aquatic Resources R & D Agency (NARA)
Dr. D.A. Amarathunga	Senior Scientist, NARA
Mr. Wimalasena	Senior Scientist, Socio-economic and Marketing
Mr. A. Maheepala	Senior Scientist, NARA
Dr. D.G.G.L. Dahanayake	Senior Lecture, Open University of Sri Lanka
Dr. Champa Amarasiri	Academic Consultant, Ocean University of Sri Lanka
Dr. D.C.T. Dissanayake	Senior Lecturer, University of Sri Jayawardenapura
Ms. Nishanthi Perera	Academic Consultant, Ocean University of Sri Lanka
Dr. Laghari Muhammad Younis	Associate Professor, University of Sindh Jamshoro Sindh, Pakistan

Organizing Committee

Mr. S.U.P. Jinadasa	Chairman
Dr. J.K. Rajapaksha	Member
Dr. H.B. Jayasiri	Member
Dr. M. F.M. Fairoz	Member
Dr. M. P. Kumara	Member
Dr. Dimuthu Lanka	Member
Mr. H.K.R Thushara	Member
Mr. Hemantha Rathnayake	Member
Ms. Shamali Rathnasiri	Member
Ms. Madushi Puswella	Member
Mr. Ishara Rathnasooriya	Member

LaTeX Text processing:	Dr. Jagath Rajapaksha
Cover page designing:	Mr. Anuruddha Rathnayake, NARA
Printing:	Vijitha Printers, Borella

Sponsors

South China Sea Institute of Oceanology (SCSIO)

Tokyo Cement Group

Port City Project

Skill Sector Development Program

Contents

Message from the Vice Chancellor	ii
Editors	iii
Reviewers	iii
Organizing Committee	iv
Sponsors	iv
Occurrences of Tidal internal waves in the East China Sea (<i>*S.U.P. Jinadasa and P.N. Ranasinghe</i>)	1
Deep and surface water mass evolution in the northeastern Indian Ocean since the last glacial (<i>*Dhanushka Devendra, Rong Xiang, Pavani Vithana and Fuchang Zhong</i>)	2
Best Practices of Marine Spatial Planning for Integrated Coastal Zone Management; A Case Study in Mannar Area (<i>*Wijesundara W.A.A.P.</i>)	3
Work done by atmospheric winds on mesoscale ocean eddies (<i>*Chi Xu, Xiaoming Zhai, Xiaoming Zhai and Xiao-Dong Shang</i>)	4
Remote forcing impact on the developing stage of Sri Lanka Dome (<i>*K.B.S.S.J Ekanayaka, W. Wang, H.B. Jayasiri, and U. S. P. K. Liyanage</i>)	5
Vertical Temperature Structure on Tuna Catch Rates of Sri Lankan Longlines (<i>*Jagath Rajapaksha and Ms. S.M. Bhagya Sinhakula</i>)	6
Morphodynamics of a Sand Spit Bar at Monsoon Affected River Outlet: A Case Study in Kalutara Coastal Zone (<i>*GP Gunasinghe, NP Ratnayake, AS Ratnayake, GVI Samaradivakara and KA Dinusha</i>)	7
Comparative Systematic Analysis of Proxy to Indicate Younger Dryas Cooling in Late Pleistocene in Sri Lanka (<i>*Aravinda Ravibhanu Sumanarathna, Jinadasa Katupotha, Kanchana Rajapaksha and Majda Aouititen Haouari</i>)	8
An assessment of the applicability of satellite derived Sea Surface Salinity over the Arabian Sea (<i>*W.N.D.S Jayarathna Yan Du, Yuhong Zhang, Qiwei SUN and S.U.P Jinadasa</i>)	9
Study of major reef fish families and their feeding habits in relation with size variations at Polhena reef, Matara, Sri Lanka (<i>*K.F.A.Ahamed and M.F.M.Fairoz</i>)	10
Incorporation of Light and Vibration Sensitivity of Goldfish to Development of Automatic Fish Feeder for Aquarium (<i>*H.K. Kande Kapuge, M.I.G. Rathnasuriya, and N.P.G. Palliyaguru</i>)	11
Development of a fish paste using physically damaged Tuna and <i>Garcinia gummi gutta</i> as a natural blood cholesterol level reduction food (<i>*H.R.T.D.Gunathilake, B.A.N. Indika, and N.P.G. Palliyaguru</i>)	12
Effect of different light types and the color on growth performances of <i>Cryptocoryne wendtii</i> (<i>*U.H.I.L. Kularathna and M.I.G. Rathnasuriya</i>)	13
Growth performance variances of marine phytoplankton; <i>Nannochloropsis</i> sp. and <i>Cheatocecos</i> sp. with deferent nitrogen sources (<i>*K.P.R.S. Kondasinghe, H.B. Jayasiri, J. Mallawaarachchi, K.P.G.K.P. Guruge and E.P.D.N. Thilakarathna</i>)	14

Composition of sediment and abundance of microbes in Polhena fringing coral reef (*Fairoz M.F.M. and Kularathna A.M.K.N.)	15
Dynamics of catch composition of Chondrichthyes from Southern province of Sri Lanka (*A.G.G.C. Bandara and M.F.M. Fairoz)	16
Variations in fatty acid composition of gonads in different maturity stages of Selected marine fish species (*D.S.Shanuke, A.C.W.W.M.C.L.K.Coswatte and, S.C.Jayamanne)	17
Cultivation of Seaweeds in ex-situ environment (*Uluwitiya D.P and Wickramasinghe D.L)	18
Reef Fishes in Kayankerni Marine Sanctuary in the Eastern Coast of Sri Lanka (*Karunaratna M.M.C, *Jayasinghe R.P.P.K and Haputhantri S.S.K)	19
Scalloped Spiny lobster (<i>Panulirus homarus</i>) fishery in Hambanthota district- A case study (*Liyanage, U.S.P.K., Jayanatha, J.S., Wickramasinghe, W.A.L. and Jayasuriya S.P.)	20
Climate change in brackish water environments: Potential Impacts of increasing water temperature on brackish water fish fauna (N.P. Nanayakkara, H.D. Ruwanthi, K.T.N.P. Gunarathna, *T.N. Munasinghe, A.G.G.C. Bandara, K.R.P.S. Premarathne and M.P. Kumara)	21
Surviving ability of Seaweeds in oil-polluted areas: Potential as Bio indicators (*Jayarathne K.S.L, Rajapaksha R.M.Y.E and Wickramasinghe W.A.A.D.L)	22
Microplastic accumulation in marine fish in the South China Sea: From onshore to offshore (Heng-Xiang Li, Lang Lin, Yun-Feng Pan and *Xiang-Rong Xu)	23
Prospecting for Rare Earth Element (REE) potential in offshore sources around Sri Lanka (*Dushyantha NP , Batapola NM , Premasiri HMR , Abeyasinghe AMKB , Rohitha LPS , Iankoon IMSK , Ratnayake NP , Dissanayake DM-DOK and Dharmaratne PGR)	24
Microplastics in marine fish from Beibu Gulf, South China Sea (*J. Bimali Koon-golla , Xiang-Rong Xu , Heng-Xiang Li and Lang Lin)	25
Zooplankton Abundance and Diversity of East Coast of Sri Lanka (*K. Koshika , H.B.U.G.M. Wimalasiri , R.P.P.K. Jayasinghe , and K.P.G.K.P. Guruge1)	26
Forecasting and Nesting Habitats of Waterbirds in Mankulumban (*G. Kandasamy , D. K. Weerakoon , A. Sivaruban and H. B. Jayasiri)	27
Assessment of water quality parameters of surface waters in Rekawa Lagoon, southern coast of Sri Lanka (*Premarathne K.R.P.S and Indika.B.A.N)	28
Health status of the coral colonies in Pareviwella and Polhena Reefs, Southern Sri Lanka (*H.A.P.S. Senaratne and W.A.A.Upasanta-Kumara)	29
Distribution of benthic categories between Pareviwella and Polhena coral reefs, Southern Sri Lanka (*M.M.P.M.B.Marasinghe and W.A.A.Upasanta Kumara)	30
Temperature Dynamics of Pigeon Island and Paraviwella coral reefs, Sri Lanka (Fairoz M. F. M. and *Sajith K.N.M)	31
Preliminary investigation of benthic fauna in a tidal pool at Cinnamon Bay, Beruwala, Sri Lanka (Haleema T.F. and *Fairoz M.F.M.)	32
Concentration of trace elements in sea cucumber species <i>Holothuria atra</i> in selected sites of Sri Lanka (*Buddhika H.B.P.H , Upasanta-Kumara W.A.A. and Handagiriathira H.M.N.L)	33
Microplastics Contamination in Selected Beaches of Sri Lanka (V.L. Rathnayaka , *A.A.D. Amarathunga , H.B. Jayasiri and H.D. Liyanage)	34
The Effectiveness of Low-coast Treatment System Integrated with Herbal Plant Materials to Treat Well-water in Selected Coastal Regions of Sri Lanka (R.M.C.Y. Rathnayaka , *A.A.D. Amarathunga , B.K.A. Bellanthudawa , S. Rathnasri and C. Amarasiri)	35

Phytoplankton community structure in relation to physico-chemical parameters in coastal waters from Colombo Fort to Panadura (<i>H.D. Liyanage , *A.A.D. Amarathunga , H.B. Jayasiri , V.L. Rathnayaka , H.K.R.Thushara , and B.R.C. Mendis</i>)	36
Species composition and checklist of freshwater ichthyofauna of Colombo urban wetlands (<i>A.G.G.C. Bandara and P.H.M.G.C. Priyadarshana *W.A.A.D.L. Wickramasinghe</i>)	37
Assessment of TouristsTheir Performance for Accommodation Closer to Polhena Coral Reef, South of Sri Lanka (<i>*Liyantha Thanthri Gamage W.K. and Fairoz M.F.M.</i>)	38
The Human–Crocodile conflict in Nilwala River, Matara (<i>*T.R.V. Palliyaguru</i>) . .	39
Evaluation of Visitor Characteristics and Willing to Pay for the Beach Park in Crow Island (<i>V.S. Gunasinghe , *U.A.D.P. Gunawardena , D. Rajapaksha , S. Rathnasiri and C. Amarasiri</i>)	40
Exploratory Study Why Women are Under Represented in Higher Managerial Positions in Logistics Industry in Sri Lanka (<i>*Kosgoda, TM and Jayasundara, A.K.C.H</i>)	41

OCCURRENCES OF TIDAL INTERNAL WAVES IN THE EAST CHINA SEA

*S.U.P. Jinadasa ¹ and P.N. Ranasinghe ²

¹Department of Oceanography, Ocean University, Crow Island, Colombo 15, Sri Lanka

² Department of Oceanography and Marine Geology, University of Ruhuna, Matara, Sri Lanka

Abstract

The formation of internal waves was reported first in 1838 based on observations of a single unchanging hump in the shallow waters of the Scottish Canal. However, in 1909, Hansen and Nansen found that substantial change of temperature and density profiles within one hour during the expedition in the Icelandic Sea. The phenomena is referred as "puzzling waves" and named as internal waves (IWs) which oscillate within a fluid medium, rather than on its surface. The IWs is the source of a curious phenomenon called dead water as it stops complete forward movements. Satellite and aircraft observations of highly rational quasi periodic variations of surface roughness were interpreted as surface signatures of underlying internal waves. The IWs are high frequency short period waves which leading to ocean mixing, bio-geo-chemical transports in the ocean boundary layers to increase surface layer productivity. The current research focuses on investigation of tidal internal waves formed in the East China Sea area during August 13–16, 2006. Three dimensional current profiles were obtained using Acoustic Doppler Current Profiler (ADCP) which was deployed in the area. High frequency current data was acquired during the period of seventy (70hrs) with 1 min intervals. Data cleaning and processing were done using Grapher software and Data interpretation and analysis were done in Matlab. The aim of the investigation was to identify the source of internal wave generation. The research further extended to develop a mechanism for formation phases in the stratified ocean. The results indicated that series of individual internal wave packets were taken place during the measurements period. The hodograph shows clockwise rotational tidal flow in the study area. The formation of internal wave trains are formed periodically and it indicates barotropic tidal origin. Further, it was noticed that signatures of IW oscillations were restricted to the pycnocline and spread in the entire water column. The analysis of zonal velocity component implies that tidal IWs are lasted approximately within 3 hours indicating periodicity. The formation of IWs is often coincides with the low tidal phases.

Keywords: mixing, turbulence, ocean, internal waves, pycnocline

**Corresponding author–email: dewmina07@yahoo.com*

DEEP AND SURFACE WATER MASS EVOLUTION IN THE NORTHEASTERN INDIAN OCEAN SINCE THE LAST GLACIAL

*Dhanushka Devendra ^{1,2}, Rong Xiang ¹, Pavani Vithana ¹ and Fuchang Zhong ¹

¹Key Laboratory of Ocean and Marginal Sea Geology, CAS, South China Sea Institute of Oceanology, Guangzhou 510301, China

²Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Matara, Sri Lanka

Abstract

New planktonic and benthic foraminiferal stable isotope records from sediment core YDY05 (northeastern Indian Ocean) make a significant structure to previously published records, and comparison provides new insights into paleoceanographic changes in the Indian Ocean during the last glacial period. In this study, we examined benthic and planktonic foraminiferal stable isotopes recorded through a sediment core in order to decipher the evolution of surface and deep water masses in the central Bay of Bengal during the last glacial. Stable isotope measurements (^{18}O and ^{13}C) were performed on two foraminifera species, one benthic (*Cibicides wuellerstorfi*-size fraction $> 150\mu\text{m}$) and one planktonic (*Globigerinoides ruber*-size fraction $> 250\mu\text{m}$) species. The distinct ^{18}O decrease observed during the mid-Holocene and the beginning of the deglaciation suggests that the reduction in surface salinity in central BoB water is probably due to intensified precipitation during the Indian Summer Monsoon (ISM). Concurrent river discharge and rising sea levels beginning during the Holocene are indicated by the low ^{18}O of *G. ruber* at the core-site. The planktonic ^{18}O shifts between the last glacial maximum (LGM) and the Holocene (1.62%), exceeding the ice volume effect by 0.62% due to a decrease in glacial SST by $2 - 3\text{ }^\circ\text{C}$. In contrast to the ^{18}O records, the ^{13}C records from YDY05 do not contribute clearly to explain the glacial-interglacial changes. Benthic ^{13}C variation and ^{13}C Planktic-Benthic offset variation in core sampling site explained that the significant variations in source water characteristics during the glacial-interglacial period. The drastic depletion in ^{13}C records in the deep water during the glacial period exhibits a significant reduction in North Atlantic Deep Water (NADW) intrusion and the progressive influx of Antarctic Bottom Water (AABW) rich Circumpolar Deep Water (CDW) with low ^{13}C into the central BoB. The large ^{13}C Planktic-Benthic offset during the glacial period suggests a more sluggish deep water circulation, and lower ^{13}C Planktic-Benthic since the deglaciation suggests an enhanced deep water circulation in the central BoB. The differences in benthic ^{18}O between the LGM section and the Holocene exceeds the ice volume effect by 0.5%, suggesting that the glacial deep water was $2 - 3\text{ }^\circ\text{C}$ colder than in the Holocene, without considering the salinity changes.

Keywords: Stable isotopes; northeastern Indian Ocean; water mass evolution; Holocene; Last Glacial Maximum

*Corresponding author-email: dhanu.dev44@gmail.com

BEST PRACTICES OF MARINE SPATIAL PLANNING FOR INTEGRATED COASTAL ZONE MANAGEMENT; A CASE STUDY IN MANNAR AREA

*Wijesundara W.A.A.P.

National Aquatic Resources Research and Development Agency (NARA), Crow Island, Colombo 15, Sri Lanka

Abstract

Marine ecosystem plays a major role in coastal countries, providing numerous benefits and services. Marine spatial planning (MSP) is an area-based management framework for improving decision making with the use of marine resources and space that addresses multiple management objectives to ensure sustainability in ocean's use. Most countries already designate ocean space for numerous of human activities and consequently the conflicts are arising among human uses and the marine environment. The MSP addresses both these types of conflict in terms of demand for the use of the resources of producing goods and services and deliver management strategies to maintain and safeguard the marine ecosystem. The current works discuss the implications of MSP through the guidelines of IOC-UNESCO for achieving eco-system based management to have significant economic, social and environmental benefits of the marine environment for integrated coastal zone management. It's a new form of public process that collects, analyses, and identifies where human activities occur, and sets into motion planning of future activities in order to achieve agreed upon ecological, economic and social goals. Implementing of MSP as a conservation and resources management tool in Mannar area was carried out with adequate consideration of the existing healthy, productive and resilient marine ecosystem. The area is already designated for the oil and gas exploration, fishing and aquaculture, tourism, renewable energy production and the scientific research. The marine environment of this region is highly affected by such human activities in terms of demands for the use of the resources for producing goods and services. The results indicated that most of the landing sites are available on the dugong conservation areas and fish trawling activities running closed to the Vankalai coastal wetland which is consists of several ecosystem of scrubland, grassland, sand dunes, mangroves, salt marshes, lagoons, tidal flats, sea-grass beds and shallow marine areas. The end product is supporting high ecosystem and species diversity identified as the best suitable location in Sri Lanka for implementing MSP where oil and gas exploration and fishing activities are running in this highly productive area. Further, it emphasize that MSP is the best solution for overcome increasing development pressures on the marine environment and arising the multiple use conflicts in such areas.

Keywords: marine ecosystem, marine spatial planning, ocean zoning, marine environment, coastal zone management.

*Corresponding author-email: anusha@nara.ac.lk

WORK DONE BY ATMOSPHERIC WINDS ON MESOSCALE OCEAN EDDIES

*Chi Xu ^{1,2,3}, Xiaoming Zhai⁴, Xiaoming Zhai⁴ and Xiao-Dong Shang ^{1,2,3}

¹State Key Laboratory of Tropical, Oceanography, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, China

²Southern Marine Science and Engineering Guangdong Laboratory (Guangzhou), Guangzhou, China

³Innovation Academy of South China Sea Ecology and Environmental Engineering, Chinese Academy of Sciences, Guangzhou, China

⁴Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia, Norwich, UK

Abstract

Mesoscale eddies are ubiquitous in the ocean and dominate the ocean's kinetic energy. However, physical processes influencing ocean eddy energy remain poorly understood. Mesoscale ocean eddy–wind interaction potentially provides an important energy flux into or out of the eddy field, but its effect on ocean eddies has not yet been determined. Here we examine work done by atmospheric winds on more than 1,200,000 mesoscale eddies identified from satellite altimetry data. For each eddy detected, we collocate the simultaneous QuikSCAT scatterometer wind stress measurements and then calculate wind power input to each individual eddy using τu_s , where τ is the scatterometer wind stress and u_s is the eddy surface geostrophic velocity derived from sea level anomalies. It shows that atmospheric winds significantly damp mesoscale ocean eddies, particularly in the energetic western boundary current regions and the Southern Ocean. We then show that the large-scale wind stress curl systematically injects kinetic energy into anticyclonic (cyclonic) eddies in the subtropical (subpolar) gyres, while mechanically damps anticyclonic (cyclonic) eddies in the subpolar (subtropical) gyres. Given that the global eddy energy is estimated to be in the range of 1.40 – 3.25 EJ ($1EJ = 10^{18}J$), damping by the relative wind stress gives an average eddy energy spin-down time of 1.6 – 3.7 years. This spin-down time suggests that mesoscale eddy–wind interaction can play a non-negligible role in determining the level of eddy energy in the ocean.

Keywords: Oceanic mesoscale eddies, Wind power input, Mesoscale eddy–wind interaction

*Corresponding author–email: Email: xuxr@scsio.ac.cn

REMOTE FORCING IMPACT ON THE DEVELOPING STAGE OF SRI LANKA DOME

*K.B.S.S.J Ekanayaka ¹, W. Wang ¹, H.B. Jayasiri ², and U. S. P. K. Liyanage ³

¹State Key Laboratory of Tropical Oceanography, South China Institute of Oceanology, Chinese Academy of Sciences, Guangzhou

²Coastal and Marine Resources Management Department, Ocean University, Crow Island, Colombo 15, Sri Lanka

³National Aquatic Resources Research and Development Agency (NARA), Crow Island, Colombo 15

Abstract

Sri Lanka Dome (SLD) is one of the most important physical oceanographic phenomena on the off eastern coast of Sri Lanka during the southwest monsoon. Previous studies have well described the negative impact of Rossby waves as the arrival of warm Rossby waves on to the SLD region. This study evaluate the hidden mechanism of the remote forcing (Rossby Waves) on the formation of SLD using two decadal (1988–2008) Simple Ocean Data Assimilation reanalysis. The monthly variation of Rossby wave analysis shows that there is a positive gradient during the developing stage of SLD. Therefore, it is important to study the impact of Rossby waves on SLD during the developing stage. The hovmöller diagram shows that four main Rossby signals propagates from east to west of the Bay of Bengal as two cold and two warm Rossby waves. They propagate as one warm Rossby wave after the cold Rossby wave all the way. Although, only the first cold Rossby wave (upwelling) (Jan–Jul) and the second Warm Rossby wave (downwelling) (Mar–Oct) are important for the SLD mechanism. During developing phase of the SLD the first upwelling Rossby wave gives a positive impact on the SLD as it strengthen the western flank and northern flank of the SLD while the second downwelling Rossby wave gives positive impact by strengthening of eastern flank. The monthly variation of meridional velocity in eastern flank and zonal velocity in northern flank reveals that the same signal pattern transfers through both regions throughout the year. But the northern flank feels the Rossby signals little bit later than the eastern flank as it is located at a higher latitude. This time gap is favorable for developing stage of SLD from May to July owing to the opposite phase of Rossby signals arrives in northern and eastern flanks simultaneously. Therefore, in conclusion it is possible to state that developing stage of SLD is positively affecting from consecutive cold and warm two Rossby signals during May to August.

Keywords: Sri Lanka Dome, Positive impact, Rossby Wave, Northern flank, Eastern flank

*Corresponding author–email: janaranjanaekanyaka@gmail.com

VERTICAL TEMPERATURE STRUCTURE ON TUNA CATCH RATES OF SRI LANKAN LONGLINES

*Jagath Rajapaksha ¹ and Ms. S.M. Bhagya Sinhakula ²

¹Department of Oceanography, Ocean University, Crow Island, Colombo 15, Sri Lanka

²Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Sri Lanka

Abstract

Longline is a common fishing gear used for Yellowfin Tuna (YFT) harvesting in offshore and high seas fishery sector. The objective of this work is to investigate hook penetration depths of Sri Lankan longlines and catch efficiency on the variability of vertical temperature structure. The temperature depth recorders (TDR) were used in longlines operations to find the depth penetration of longlines. Buoy-line and branch-line lengths were ranged between 20–30 m and 6–7 numbers of hooks per basket have been used. Depth penetration of hooks was ranged from ~ 65 m close to buoy-lines while it is ~ 90 m in the middle of a basket. Horizontal spacing of branch-lines and their appropriate depth penetration shown a linear relationship ($r^2 = 0.99$). Catch per unit effort was ranged between 15–70 kg per 100 hooks. The thermocline depth was varied between 100–125 m during the study period. Time series of depth wise temperature daily data were obtained from Copernicus Marine Environmental Monitoring Service for the fishing period. Time series catch rates of fishing locations were matched with temperature of hooking depths. The improved catch rates were shown in places where the fishing lines have reached to the thermocline depth that varies in space and time. Sagging depth of hooks have shown a linear relation to the horizontal space as Sri Lankan long-liners are not using line-shooters in deployment. The catch rates have affected by the temperature vertical structure as the longline configuration is not being changed by fishers. Other environmental conditions such as oxygen and food availability may also be affected for the catch rates, the adjustment of longline configuration have a considerable impact on successful fishing operations.

Keywords: thermocline, longline, yellowfin tuna, temperature depth sensors

*Corresponding author-email: jagath_r@hotmail.com

MORPHODYNAMICS OF A SAND SPIT BAR AT MONSOON AFFECTED RIVER OUTLET: A CASE STUDY IN KALUTARA COASTAL ZONE

*GP Gunasinghe ^{2,1}, NP Ratnayake ¹, AS Ratnayake ³, GVI Samaradivakara ¹ and KA Dinusha ²

¹Department of Earth Resources Engineering, University of Moratuwa, Sri Lanka

²Department of Spatial Sciences, KDU Southern Campus, Sri Lanka

³Department of Mineral Resources and Technology, Uva Wellassa University, Sri Lanka

Abstract

Coastal zones usually consist of sandy beaches, estuaries, lagoons, and sand spits. A sand spit is defined as a narrow and elongated sand body (parallel to the shoreline) connected to land from one end and other end terminates to open waters. In addition, sand spit barriers are world famous tourist destinations providing recreational and residence facilities. The wave induced nearshore hydro and sediment dynamics are the main factor of sand spit to develop and main advantage of sand spits is to protect the main land from high energy waves during storms and tsunamis. Kalutara is a commercially important coastal city in the Western Province of Sri Lanka and Kalutara sand spit (Calido Beach) protects the city from erosion and saltwater intrusion. In May 2017, the major portions of connecting sand barrier to the land were removed to control flooding due to heavy rains in the upper catchment area of the Kalu-Ganga River. This has led to complete destruction of the sand bar. Consequently, the alteration of hydrodynamics and sediment-dynamics patterns in the area, new sand bar is created in south to the Kalu-Ganga River mouth. The present investigation is mainly focused on assessing morphodynamics of newly created sand bar using the methods of beach boundary survey and volumetric survey. The temporal beach boundary survey results show that the sand accretion is prominent in south and north ends of the spit during southwest monsoon season. The sand coming from south are partly deposited in south end of the spit bar and partly pass to the north along spit bar due to long shore current. In addition, volumetric survey reveals that the gradual decrease of the sand volume of spit bar is noticeable during first inter-monsoon (from 149, 458 m^3 to 109, 224 m^3) and southwest monsoon (from 109, 224 m^3 to 100,688 m^3) season. Furthermore, gradual increase of sand volume is noticeable during northeast monsoon (from 107, 012 m^3 to 149, 458 m^3) season. Compiling of results can suggest that morphodynamics of newly created sand spit bar is controlled by the influence of hydrodynamics and sediment dynamics pattern based on monsoon seasonality.

Keywords: Sand spit bar, Hydrodynamics, Longshore current, Beach boundary, Sediment dynamics

*Corresponding author-email: prasadh.gunasinghe@gmail.com

COMPARATIVE SYSTEMATIC ANALYSIS OF PROXY TO INDICATE YOUNGER DRYAS COOLING IN LATE PLEISTOCENE IN SRI LANKA

*Aravinda Ravibhanu Sumanarathna ¹, Jinadasa Katupotha ², Kanchana Rajapaksha ³ and Majda Aouititen Haouari ³

^{1, 2, 4} South Asian Astrobiology & Earth Sciences Research Unit : Eco Astronomy Sri Lanka

²Department of Geography University of Sri Jayewardenepura

³Ministry of Defence Centre for Research Development

⁴Doctoral Program: University Abdelmalek Essaadi, Tétouan : Morocco

Abstract

A controversial theory that suggests an extraterrestrial body crashing to Earth almost 12,800 years ago caused the extinction of many large animals and a probable population decline in early humans is gaining traction from research sites around the world. The Younger Dryas Impact Hypothesis, controversial from the time, it was presented in 2007, proposes that an asteroid or comet hit the Earth about 12,800 years ago causing a period of extreme temperature variation that contributed to extinctions many species of megafauna. As focusing study for developing onshore Digital Elevation Model (DEM) to predict paleo sea level drop around 12800 years before present in Sri Lankan coastal based on comparative systematic analysis of proxy to indicate Younger Dryas cooling in late Pleistocene. Model of DEM implement from images of Unmanned Aerial Vehicles (UAV) platform which able to examine the location images of beach rock & eroded cut in an enfield coastal sandy soil along the coastline of Sri Lanka. Resulting of systemic comparison in modern data platform which evaluated from proxy (pCO_2 , $SST_{Mg/Ca}$, alkalinity), images of UAV in between carbon dating relevant to quaternary research in sri lanka and milankovitch cycle, able to reveled as conclusion, sea level fluctuation (26000 ybp) of 7.5 meters and has been reduced to 2.5 m in Younger Dryas cooling period of late Pleistocene Sri Lanka.

Keywords: Pleistocene, Sri Lanka, Proxy, Sea Level, DEM-UAV

*Corresponding author-email: ara22ravibhanu@gmail.com

AN ASSESSMENT OF THE APPLICABILITY OF SATELLITE DERIVED SEA SURFACE SALINITY OVER THE ARABIAN SEA

*W.N.D.S Jayarathna ^{1,2,3} Yan Du ^{1,2}, Yuhong Zhang ¹, Qiwei SUN ^{1,2} and S.U.P Jinadasa ⁴

¹South China Sea Institute of Oceanology, Chinese Academy of Sciences, State Key Laboratory of Tropical Oceanography, Guangzhou, China

²University of Chinese Academy of Sciences, Beijing, China

³Department of Animal Science, Uva Wellassa University, Badulla, Sri Lanka

⁴Department of Oceanography, Ocean University of Sri Lanka, Crow Island, Colombo 15

Abstract

Since little research has been done on the north-central Arabian Sea, this study was conducted in selected areas of the North Central Arabian Sea (CNAS). In this study, we used the Aquarius, Soil moisture and Ocean Salinity (SMOS) satellite data and Argo field observation data to study the Sea Surface Salinity (SSS) changes in the Northern Arabian Sea. We have performed statistical and quality checks on the data set to understand the applicability of these data in the Arabian Sea before use SSS for this research. It was noticed that SMOS, Aquarius satellite and Argo data have a good similarity with World Ocean Atlas (WOA09) in terms of average SSS during the quality inspection process in the region. Winter is considered from December to February, while summer is from June to August. The SMOS shows significant deviations of SSS near the mainland where the lowest average SSS reaching to 35.6 psu. The average SSS of SMOS is significantly reduced along the coast but does not appear in Aquarius and Argo SSS data. Standard Deviation (STD) of SSS obtained from Argo and Aquarius is much similar in CNAS. The STD of SMOS is reaching to 0.3437psu in CNAS which is higher than Argo and Aquarius STD (> 0.15). The Comparison of other data sets, SMOS satellite suffers from terrestrial, luminance temperature calculation bias and Radio Frequency Interference (RFI) induced effects. However, SMOS near the equator is more consistent with SSS from Argo and Aquarius. As qualitative assessments indicated that SMOS is more reliable with studies away from land, data should be carefully examine during coastal applications. The results further indicated Aquarius and Argo data more accurately represent the annual SSS cycle than SMOS in the area. The Aquarius and Argo SSS fields are more reliable for studying SSS variability in CNAS. Also, it was noticed that the northern part of the Arabian Sea shows a strong salinity gradient from high latitude to the equator. The highest salinity in the region during the summer is 36.7 psu and lowest SSS is reported as 36.2 psu at the end of the summer monsoon. The significant seasonal SSS anomalies may be due to the advection and excessive evaporation in the region.

KeyWords: SMOS, Aquarius, Sea Surface Salinity, North Central Arabian Sea, Radio Frequency Interference

*Corresponding author–email: dsdagat.dushan@gmail.com

STUDY OF MAJOR REEF FISH FAMILIES AND THEIR FEEDING HABITS IN RELATION WITH SIZE VARIATIONS AT POLHENA REEF, MATARA, SRI LANKA

*K.F.A.Ahamed¹ and M.F.M.Fairoz¹

¹Faculty of Fisheries and Ocean Sciences, Ocean University, Tangalle, Sri Lanka

Abstract

Reef fish are pointers of reef health as their feeding types directly disturb the benthic environment. The present study was achieved at the Polhena reef at Matara, Sri Lanka with the objective of study the major reef fish families and their feeding habits with size variations. Data were collected between January to March 2019. Permanent 5 transects were established each of 20m on the reef, parallel to the shore respectively t1,t2,t3,t4 and t5. Reef fish species were also observed with respect to their feeding habit [i.e, herbivores (H), carnivores (C) and omnivores (O)]. Reef fish were identified using field guides. During the study fish species were observed and they were belong to 4 major families: Surgeon–Acanthuridae (Ac), Damsel–Pomacentridae (Po), Wrasse – Labridae (La), Butterfly–Chaetodontidae (Ch)) and 3 different sizes: Small (S), Medium (M), Large (L). Results showed that higher % of small omnivores fish were recorded [(O – 74), (H – 22), (C – 4) & (S – 79.00), (M – 40.75), (L – 20.00)]. There were no significant difference with the fish size and Quantity (Anova test, $p > 0.05$), observation were showed Comprised with habitat favorable for mixed feeders.

Keywords: Reef fish, feeding habits, Polhena

*Corresponding author–email: kfashkar96@gmail.com

INCORPORATION OF LIGHT AND VIBRATION SENSITIVITY OF GOLDFISH TO DEVELOPMENT OF AUTOMATIC FISH FEEDER FOR AQUARIUM

*H.K. Kande Kapuge, M.I.G. Rathnasuriya, and N.P.G. Palliyaguru

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka

Abstract

Food and feeding are the most important elements for growth and production in the ornamental fish culture. Manual feeding mostly practices in aquarium requires availability and time. Automatic feeder is best available solution to solve those matters with improvement based on the species specific fish behavior. Present study aimed to incorporate behavioral adaptation of Goldfish (*Carassius auratus*) to different sensors 1) light and 2) vibration to develop efficient automatic feeding for aquarium. Automatic fish feeder was prepared with help of readily available materials (i.e. DC motor, yogurt cup, alarm clock, and simple electric circuit). Six tanks were prepared separately with three tanks for each sensor, light and vibration. Five Goldfish individuals approximately same size were introduced to each tank set up. Within three months of period, positive response time of individual fish to the each sensor and number of such responded fish were recorded by means of video recorder to avoid disturbances. Mann–Whitney statistical test was used to test the mean respond time and number of responded individuals of fish for two sensors. According to the general observation there was slightly higher response of fish for the light than the vibrator. Results of Mann–Whitney test showed that here was no significant difference between behavioral adaptation for light and vibration sensitivity of *C. auratus*. Therefore incorporation of light and/or vibration sensitivity to upgrade automatic fish feeder is useful for aquarium purposes.

Keywords: automatic feeder, light, vibrator, behavior, *Carassius auratus*

DEVELOPMENT OF A FISH PASTE USING PHYSICALLY DAMAGED TUNA AND GARCINIA GUMMI GUTTA AS A NATURAL BLOOD CHOLESTEROL LEVEL REDUCTION FOOD

*H.R.T.D.Gunathilake, B.A.N. Indika, and N.P.G. Palliyaguru

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle

Abstract

Physical damages of fish affect the market value and consumer preference. Researches reveal, the highest physical damage of marine fish species could be seen in Tuna species which influence greater economic loss in Sri Lanka. Present study is an attempt to provide a considerable value addition to physically damaged Tuna species. According to researches Gamboge (*Garcinia gummi gutta*) has the ability of lowering triglycerides and Low Density Lipoproteins (LDL) and raising High Density Lipoproteins (HDL) as a natural ingredient. A series of fish paste was prepared by grinding the relevant spices and Gamboge with minced flesh of Tuna. Gamboge was boiled until the internal temperature become $70^{\circ}C$ for 15 minutes followed by grinding. The final paste was pasteurized at $85^{\circ}C$ for 15 minutes. A sensory panel test (Hedonic scale ; 1-poor to 5- excellent) for colour, aroma , appearance, sour taste , spreading ability and overall taste was done in one hour of storage under room temperature ($35 \pm 2^{\circ}C$).A significant median difference could be seen in sour taste and spreading ability of the fish paste ($P < 0.05$;kruscal-wallis test) with increased gamboge level. Out of 0 g, 8 g, 12 g, 16 g and 20 g fish paste, the fish paste with 16g of Gamboge was selected the best considering all the evaluated characteristics. No significant difference in median of colour, aroma, appearance and overall taste could be seen ($P > 0.05$; kruscal-wallis test). Therefore it can be determined Gamboge incorporated fish paste is sensory wise accepted as a ready to eat product. Further researches needed to be done on the proximate composition, shelf life and acceptability of the product. Therefore gamboge incorporated fish paste can be introduced as a novel product to overcome the problem of Economic loss of physically damaged Tuna.

Keywords: Fish paste, *Garcinia gummi gutta*, Sensory evaluation, value addition, Triglycerides

*Corresponding author-email: tdgunathilake994@gmail.com

EFFECT OF DIFFERENT LIGHT TYPES AND THE COLOR ON GROWTH PERFORMANCES OF *CRYPTOCORYNE WENDTII*

*U.H.I.L. Kularathna and M.I.G. Rathnasuriya

^Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela road, Tangalle, Sri Lanka

Abstract

Cryptocoryne wendtii 'brown' (Family Araceae) is a popular endemic aquatic plant in Sri Lanka and this species is important as an ornamental plant in local and export markets. Habitats of *C. wendtii* are mostly streams and rivers. Due to the high market demand, wild *C. wendtii* populations are being harvested heavily causing threatened conditions to this species. Therefore, tissue culture in laboratories and cultivation in ponds were introduced to meet the increasing demand. Light is one of the main key factor that stimulate the growth of *C. wendtii* however, researches on this aspects are scanty. , This has limited our knowledge on manipulating light for better growth of *C. wendtii* in commercial cultivations. Therefore, the present study was carried out to investigate how different intensities of different color LED lights (white, red, and blue) and sunlight effect on the growth performance of *C. wendtii* under laboratory conditions. Replicates of *C. wendtii* were grown under four different light conditions [sunlight (1165.45 lux), white (625.71 lux), red (152.26 lux), and blue (237.88 lux)] for 60 days. According to the One-way ANOVA test, the growth of plants under the four different light conditions were significantly different ($p < 0.05, n = 2$). Plants grown under the sunlight condition had the highest growth rate, followed by blue, white and red light. Higher brown color of the *C. wendtii* was also achieved under the sunlight condition. According to the results, natural sunlight can be recommended as the best light source to culture *C. wendtii*.

Keywords: Aquatic plant, *Cryptocoryne wendtii*, Cultivation, LED, Light

*Corresponding author–email: isharalakshitha97@gmail.com

GROWTH PERFORMANCE VARIANCES OF MARINE PHYTOPLANKTON; NANNOCHLOROPSIS SP. AND CHAETOCEROS SP. WITH DEFERENT NITROGEN SOURCES

*K.P.R.S. Kondasinghe¹, H.B. Jayasiri², J. Mallawaarachchi³, K.P.G.K.P. Guruge¹ and E.P.D.N. Thilakarathna¹

¹Department of Animal Science and Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

²Department of Coastal and Marine Resources Management, Ocean University, Crow Island, Colombo 15, Sri Lanka

³National Aquatic Resources Research and Development Agency, Colombo 15, Sri Lanka

Abstract

Phytoplankton are cultured to feed bivalve molluscs (all life stages), the early larval stages of crustaceans, and the zooplankton (rotifers, copepods) that are used as live food in fish hatcheries. An indoor experiment was conducted to identify the growth variances of Nannochloropsis sp. and Chaetoceros sp. with deferent nitrogen sources. For the study, F/2 culture media was used in control culture which contains $NaNO_3$ as the source of nitrogen. F/2 culture media was prepared by replacing the $NaNO_3$ into KNO_3 ($9\text{ }gl^{-1}$), CH_4N_2O (urea) ($27\text{ }gl^{-1}$) and NH_4Cl ($47.3\text{ }gl^{-1}$) as sources of nitrogen. The experiment was consisted in triplicate for Nannochloropsis sp. and two replicates for Chaetoceros sp. During the ten days of indoor culture, constant temperature ($27\text{ }^{\circ}C$) and salinity of 25 ppt were maintained with continuous aeration. The results of the study revealed that *chlorophyll_a* and cell density varied significantly with nitrogen sources and sampling day for both cultured species (Two-way ANOVA: $P < 0.05$). The highest *Chlorophyll_a* and cell density were reported in the F/2 culture media with urea other than in F/2 culture media with $NaNO_3$ (control culture media), KNO_3 , CH_4N_2O and NH_4Cl for both cultured species. The significantly highest *Chlorophyll_a* and cell density were reported in 3rd day for Nannochloropsis sp. and 4th day for Chaetoceros sp. from cultures than that of the other culturing dates. Urea can be recommended as a more effective source of nitrogen for F/2 culture media to obtain high biomass of both species of microalgae Nannochloropsis sp. and Chaetoceros sp. This study provides the information on effective nitrogen sources to elevate the higher biomass of Nannochloropsis sp. and Chaetoceros sp.

Keywords: Indoor culture, Nannochloropsis sp, Chaetoceros sp, nitrogen sources, cell density, *chlorophyll_a*

*Corresponding author–email: ruwindi93kp@gmail.com

COMPOSITION OF SEDIMENT AND ABUNDANCE OF MICROBES IN POLHENA FRINGING CORAL REEF

*Fairoz M.F.M. and Kularathna A.M.K.N.

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela road, Tangalle, Sri Lanka

Abstract

Increased sediment runoff and sedimentation adjacent to coral reefs reduces the transparency of coastal water and restrict the coral growth. Sediment deposited in coral reefs and the degradability is not yet understood in Sri Lankan reefs. A pilot study is needed on the sediment composition and associated biological entities. The objective of the present research was to study the composition of deposited sediment, associated in fauna particularly microbes. Eight sediment samples were collected using a PVC core which had 12" in length and 1.5" diameter from 23rd October to 13th November, 2018 from Polhena fringing reef, Southern Sri Lanka. Collected sediment samples were analyzed to determine the percentage of sediment composition through settlement yields, count infauna and microbial abundance. Composition of sediments were determined using settlement yields and sediment sub samples were sieved mesh through sieve plates of sizes 1 mm and 0.5 mm to determine percentage of particles size. Classification of infauna and abundance of microbes were recorded using direct observation and selective culture media respectively. Percentage of medium sand, very fine sand, silts and clay (<0.5 mm) composition of sediment (72.4%) in Polhena is relatively higher than sand (1 mm–0.5 mm) and other (>1mm coral rubbles, pebbles, etc. includes). From the eight samples total of 30 invertebrates which able to observe using dissecting microscope were reported as infauna and identified to Phylum level (*Cnidaria* – 3, *Arthropoda* – 8, *Annelida* – 10 and *Mollusca* – 9). These infauna specimens were preserved and mounted for detailed microscopical examination. Microbial abundance for the sediment in selective culture media indicated that presence of colonies of *Vibrio* sp, *E coli* sp and *Shigella* sp. This preliminary results shows the composition of sediment and associated microbial abundance in Polhena coral reef.

Keywords: Polhena reef, sediment composition, Infauna, microbial abundance

*Corresponding author–email: fairoz.mfm@gmail.com

DYNAMICS OF CATCH COMPOSITION OF CHONDRICHTHYES FROM SOUTHERN PROVINCE OF SRI LANKA

*A.G.G.C. Bandara and M.F.M. Fairoz

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle

Abstract

Chondrichthyes are considered as a highly valuable fish group globally by their ecological and economical aspects. They play a key role in marine ecosystems by maintaining the balance of healthy systems. But global decline from world's ocean has been recognized as of significant environmental concern. Though previously considered as a by catch, today chondrichthyan fishery has become one of the major target fishery in Sri Lanka due to the increasing demand in global market. But their catch composition surveys, which help to manage the fishery are scanty in local context. Main objective of this study was to fill this gap and discover the variations of chondrichthyan landing dynamics with respect to Southern province of Sri Lanka. Data collection was performed from 2015 to 2017 for a period of three years which obtained from Department of Fisheries and Aquatic Resources of Sri Lanka. Mean monthly catch data were obtained in three different fishery districts (Galle, Matara and Tangalle) of Southern province. The mean average catch composition of chondrichthyes was significantly different in three districts ($p < 0.05$; $DF = 2$; $F = 13.07$; $p = 0.000$; Two-way ANOVA test). Highest was recorded in Tangalle followed by Galle and Matara. In contrast there was no significant difference between the years ($p > 0.05$; $DF = 2$; $F = 3.51$; $p = 0.034$; Two-way ANOVA test). Also there was a significant interaction between the districts and years. The highest monthly average catch was recorded on August 2015 (355.8 individuals) in Tangalle fishery district. The average catch was increased from year 2015 to 2017 in Matara and Tangalle districts; but decreased in Galle district. Since this was a preliminary study, continuous studies are highly recommended to carry out especially within the aim of studying the spatial and temporal variation of chondrichthyan landings in Sri Lankan waters. Results of such studies could be utmost important for future conservation and management of chondrichthyan fishery resources in Sri Lanka.

Keywords: chondrichthyes, Sri Lanka, Southern province, catch composition

*Corresponding author–email: gayarandy2010@gmail.com

VARIATIONS IN FATTY ACID COMPOSITION OF GONADS IN DIFFERENT MATURITY STAGES OF SELECTED MARINE FISH SPECIES

*D.S.Shanuka, A.C.W.W.M.C.L.K.Coswatte and, S.C.Jayamanne

Department of Animal Science, Uva Wellassa University, Badulla, Sri Lanka

Abstract

Lipid content of fish roe varies with the maturation process. The energy requirement of developing fish eggs is fulfilled by the lipids, carbohydrates and protein. These roe lipids contain essential fatty acids which are important to human health and have a potential of producing edible fish roe oil and production of fatty acids. But fish roe is discarded as a waste in commercial marine fishery sector in Sri Lanka. Present study was conducted to determine the variations in fatty acid composition with respect to gonad maturity stages of selected marine fish species. Roe of *Thunnus albacares*, *Katsuwonus pelamis* and *Canthidermis maculata* were selected representing different maturity stages (immature, maturing and mature). Maturity levels of roe were determined by measuring roe diameter and examined under light microscope. 10 g of fish roe from each maturity stages were homogenized and extracted with chloroform: methanol (1:2 v/v) to recover total crude lipid. Fatty acid composition of extracts was analyzed by Gas Chromatography. Major 12 types of fatty acids with different saturation levels for each maturity stages were detected. Fatty acid profiles of each roe samples were dominated by poly unsaturated fatty acids (PUFAs) including Docosahexaenoic acid, Eicosapentaenoic acid and followed by saturated Fatty acids. Docosahexaenoic Acid shows significant in quantity among omega-3 poly unsaturated fatty acid in all fatty acid profiles. Most of the fatty acid yields were changed with the fish species instead of the roe maturity level ($p > 0.05$). However, highest total fatty acid yield was recorded in maturing roe of *Thunnus albacares* (28.21%). Highest percentage of Omega-6 fatty acids was found in maturing roe of *Katsuwonus pelamis* (0.163%). Among saturated fatty acids, Hexadecanoic acid (C 16:0) was found to be the major fatty acid and roe of *Canthidermis maculata* recorded the highest yield (22.26%). Omega-6, Octadecadienoic acid was the only fatty acid which recorded different yields with fish species and also with different maturity levels of roe ($p < 0.05$). In conclusion, roe of *Thunnus albacares*, *Katsuwonus pelamis* are rich sources of omega-3 poly unsaturated fatty acids and roe of *Canthidermis maculata* is an ideal source of saturated fatty acids.

Keywords: Roe, Gonadal Maturity, *Canthidermis maculata*, Fatty Acids, Omega-3

*Corresponding author–email: shamodshanaka@gmail.com

CULTIVATION OF SEaweEDS IN EX-SITU ENVIRONMENT

*Uluvitiya D.P and Wickramasinghe D.L

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Tangalle, Sri Lanka

Abstract

Seaweeds are economically and ecologically important to the human being. It has close relationship with the sustainability of marine aquaculture. Ex-situ cultivation of seaweeds involve with the algal species to be cultivated and other parameters of the environment. Seaweed culture is not much familiar in Sri Lanka except commercial base *Kappaphycus alvarezii* farming initiated after 2008 in the northern costal line. For the ex-situ cultivation of seaweeds growth were investigated from February (09) to April (04) 2019. A specially constructed shallow-depth boat shape fiber tank closed with black mackintosh, was dipped into the soil with a slight slope. Marine water was refilled from Pallikkudawa shore line area (06°03' N , 80°79' E) using plankton net (mesh size 55), seaweed species (*Sargassum crassifolium*, *Ulva pertusa*, *Gracilaria canaliculata*) were collected from same area. Dry weight and length were measured before installation and every third day within the study period. Maximum accretion of *Sargassum crassifolium* was recorded as 5.5 cm and at the same time *Gracilaria canaliculata* was recorded a maximum length of 2 cm within the study period. Bleaching of *Ulva pertusa* was observed while leaving only the holdfast. *Gracilaria canaliculata* also was observed an accretion of length with similar fluctuations. It was observed that *Sargassum crassifolium* requires some time for adaption to the new environment. Cleaned Sea water (through filtration) was refilled to the tank within time interval of two days by a volume of one third . During the study period, the growth rate (*Sargassum crassifolium* 72.7%, *Ulva pertusa* 13.3% and *Gracilaria canaliculata* 14%) of cultured species was in a considerably low rate. This can be due to removal of rotted cutting ends and at the same time *Ulva pertusa* was stressed in the artificial tank environment. Based on this study of artificial cultivation of seaweeds, *Sargassum crassifolium* was observed as the best species compared to *Gracilaria canaliculata* and *Ulva pertusa*.

Keywords: ex-situ environment, seaweeds cultivation, Sri Lankan coastal line

*Corresponding author-email: dpuluvitiya@gmail.com

REEF FISHES IN KAYANKERNI MARINE SANCTUARY IN THE EASTERN COAST OF SRI LANKA

Karunaratna M.M.C, *Jayasinghe R.P.P.K and Haputhantri S.S.K
National Aquatic Resource Research and Development Agency

Abstract

The Kayankerni reef situated in the Eastern coast of Sri Lanka is a little known reef and was considered as one of the major reef fish collection sites in the ornamental aquarium fish industry. The reef and adjacent marine habitats have been gazetted as a new marine sanctuary in 2019. This study was undertaken with the aim of collecting baseline information on the diversity and density of coral reef fishes of Kayankerni reef. An underwater visual census (UVC) survey was conducted in September 2019 at six sampling sites selected within and just outside the reef. The belt transect method (5m width and 50m length of transect) was used to estimate the reef fish diversity and abundance. A total of 108 fish species representing, 30 families such as Acanthuridae, Apogonidae, Balistidae, Blenniidae, Caesionidae, Carangidae, Chaetodontidae, Cirrhitidae, Diodontidae, Fistulariidae, Gerridae, Gobiidae, Holocentridae, Kyphosidae, Labridae, Leiognathidae, Lethrinidae, Lutjanidae, Mullidae, Muraenidae, Nemipteridae, Ostraciidae, Pempheridae, Plotosidae, Pomacanthidae, Pomacentridae, Scaridae, Serranidae, Siganidae and Zanclidae were recorded during the survey in the inner reef area and 70 species were recorded in just outside reef area. The results of the study showed that the estimated mean fish density ($1500/1000m^2$) was significantly different from the estimated mean reef fish density in just outside the reef $1200/1000m^2$ ($\alpha = 0.05$) However the estimated target species density between inside and outside the reef showed no significant difference at 0.05. Similarly the density of non target species inside and just outside also showed no significant difference. These results indicate that target fish densities inside and outside the marine sanctuary were more or less same. The study emphasises the need of introduction of further conservation and management measures in order to improve the reef fish populations of Kayankerni reef.

Keywords: Kayankerni reef, marine sanctuary, diversity, density, coral reef fish

*Corresponding author–email: prabath.jayasinghe@yahoo.com

SCALLOPED SPINY LOBSTER (*PANULIRUS HOMARUS*) FISHERY IN HAMBANTHOTA DISTRICT- A CASE STUDY

*Liyanaage, U.S.P.K., Jayanatha, J.S., Wickramasinghe, W.A.L. and Jayasuriya S.P.
National Aquatic Resources Research and Development Agency

Abstract

The coastal stretch of Hambanthota district has been identified as the most favorable ecosystem for the Scalloped spiny lobster *P. homarus* in Sri Lanka and also this fishery is dominant among the small scale artisanal fishes of the area. As a luxurious food commodity, growing demand and increasing prices in the global market always accelerate the fishing effort resulting threatening the wild stock. Scientific knowledge of the stock size and the status of the fishery is vital aspects for update the available management regulations. The current status of the spiny lobster stock in the major lobster landing sites (Tangalle, Hambanthota, Kirinda, Amaduwa) was examined based on monthly sampling and continues monitoring during January to December 2018 excluding the closed seasons (February, September, October). Species composition, length frequencies, sex ratio, the presence or absence of spermatogonia or external eggs of the catch were examined while the sampling. Scalloped spiny lobster (*P. homarus*) play a major role in the Hambanthota district Spiny lobster fishery contributing 72.24% (n=825 from 1218) to the catch. Length frequency analysis revealed that undersize lobsters (minimum legal size, carapace length 6 cm) which were very rarely (N=13, 1.6%) brought to the collecting centers. However, it was observed that a significant amount of baby lobsters was sold to the local market at cheaper prices. Mean carapace length (CL) of the catch 7.37 cm which higher than the minimum legal size 6.0 cm. Also it was noted that 47% of the total catch consisted lobsters above the mean CL. The expected average annual sex ratio (0.9) of the catch (Male 393: Female 434) was changed with the season. Mean CL of the male, female and pooled both sexes are consecutively 7.27 cm, 7.46 cm and 7.37 cm showed that females in the catch are bigger than the males having significant difference (F 1.01; F critical 1.17, $\alpha = 0.05$). Percentage of berried females or having spermatogonia (to the total catch) were peaking from November to January period consecutively 31%, 25% and 34%, revealed that fishermen are violating regulation regarding berried lobsters. Since Hambanthota district spiny lobster fishery has been managed under the co management mechanism, presently closed season has to be revised and regulation regarding the berried lobsters should be implemented strictly.

Keywords: Scalloped Spiny lobster, *Panulirus homarus*, Berried female

*Corresponding author-email: upulliyanaage@hotmail.com

CLIMATE CHANGE IN BRACKISH WATER ENVIRONMENTS: POTENTIAL IMPACTS OF INCREASING WATER TEMPERATURE ON BRACKISH WATER FISH FAUNA

N.P. Nanayakkara, H.D. Ruwanthi, K.T.N.P. Gunarathna, *T.N. Munasinghe, A.G.G.C. Bandara, K.R.P.S. Premarathne and M.P. Kumara

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Tangalle, Sri Lanka

Abstract

Brackish water fishes provide numerous ecological and economic services whilst the increasing atmospheric temperature resulted by the ongoing climate change likely to cause impacts on them as their body temperature varies according to the outer environmental temperature. An updated literature review is needed on this regard for synthesizing the available knowledge. Such a literature survey was conducted and the study highlighted that increasing temperature likely to result: (a) reduced growth, behaviors, immune capabilities, foraging and competitive actions for fish species which already live in their upper temperature limits (b) induced fish migrations to high-latitude cold waters (c) degraded migration pathways of diadromous fishes (d) higher potential to trigger invasive fish species (e) species-specific impacts on fish abundances (f) impacts on lifespan process including growth, reproduction, egg and larval improvement, recruitment, oxygen consumption, somatic manufacture, swimming, immunity utility and antipredator performances (g) negative effects on shell fish's growth and reproduction (h) Increased metabolic rates in some crab species (i) affected physiology and fitness and (k) increased mortality at higher temperature increments. The current study reviewed following findings. Most of the predicted impacts are negative however, higher growth of some crabs and marine migratory fishes stays as possible positive prediction. The border temperature tolerance shown by fish juveniles would also be an advantage for some species. The severity of the predicted impacts found to be vary on: the amount of temperature increased, water depth and other physicochemical parameters, faunal species affected, life phase of the affected organism, ontogenetic variations of the affected organism and the geographical region of the brackish waterbody.

Keywords: Brackish water, Fish Fauna, Climate change, Temperature,

*Corresponding author–email: tharindunandika7@gmail.com

SURVIVING ABILITY OF SEaweEDS IN OIL-POLLUTED AREAS: POTENTIAL AS BIO INDICATORS

*Jayarathne K.S.L, Rajapaksha R.M.Y.E and Wickramasinghe W.A.A.D.L

Faculty of Fisheries and Ocean Sciences, Ocean University Of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka

Abstract

Ports and harbors located within urbanized areas are the mostly affected by oil pollution. This causes for serious damages to the fishery and mariculture through physical contamination, toxic effects on stock and disrupting to business activities. Previous studies were not reported on the survival ability of seaweed in the oil polluted areas so that to be used as bio-indicators for oil pollution. Therefore, current study is focused to examine the potential of seaweeds to tolerate certain amount of oil in their tissues to survive in oil contaminated areas. Further, the research extended to study the relationship of the oil content within the seaweeds and surrounding seawater. Different species of seaweeds that were available at both Tangalle and Kudawella harbors (highly oil contaminated sites) were collected. Two species of red algae; *Gracilaria sp.* and *Gelidium spp.* were only found at both sites. The crushed *Gracilaria sp.* and *Gelidium spp.* of each sample were obtained. Both crushed samples were squished separately and obtained oil mixed secretions of 24ml and 26ml for *Gracilaria sp.* and *Gelidium spp.* respectively. Three milliliter (3ml) from each species was poured into a separatory funnel and 6 ml of 4% Chloroform was added. The content is mixed properly while losing the lid of separatory funnel time to time in order to release the gas. The liquid mixtures in the funnels were kept 12 hours until separate the organic and inorganic layers. The lower layer of chloroform with dissolved oil in the funnel was collected and measured as 4ml and 5ml respectively. A control experiment was done under laboratory conditions using same seaweed species of red algae with other two species (*Ulva sp.* and *Sargassum sp.*) for representing green and brown algae respectively. Those species were collected from unpolluted areas of oil. The samples were cleaned thoroughly with clean seawater and dried till constant weight under solar drier for 3 days. Each dried samples (1 g) were placed in four containers and added 49 ml of seawater plus 1 ml of crude oil obtained from boat engine. After 30 minutes, each seaweed sample was removed and the remaining solvents were mixed with 20 ml of chloroform in separatory funnels and followed the previous procedure for separation. The absorbed amount of oil in each species were measured as 0.3 ml, 0.5 ml, 0.9 ml and 1.2 ml from *Ulva sp.*, *Sargassum sp.*, *Gracilaria sp.* and *Gelidium sp.* respectively. The results from the field study indicated that oil content in *Gelidium spp.* is higher than *Gracilaria sp.* The laboratory experiment also showed the highest *Gelidium sp.* that followed by *Gracilaria sp.*, *Sargassum sp.* and *Ulva sp.* amount of absorbed oil. This clearly proved that red algae have higher potential of oil absorption among red, green and brown algae, hence higher tolerance in oily sea water. Therefore, these seaweeds can be recommended to use as bio indicators for oil-polluted areas.

Keywords: Oil extraction, Algae, *Gelidium spp.*, Harbors, Pollution.

*Corresponding author-email: lakminij18@gmail.com

MICROPLASTIC ACCUMULATION IN MARINE FISH IN THE SOUTH CHINA SEA: FROM ONSHORE TO OFFSHORE

Heng-Xiang Li, Lang Lin, Yun-Feng Pan and *Xiang-Rong Xu

South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou 510301, China

Abstract

In recent years, microplastics have caught growing concerns as an emerging environmental contaminant in the global oceans. Standing at the top of marine food chains, marine fish are of great concerns due to the reason that microplastic accumulation in fish may cause potential impacts on food safety as well as human health. In this study, marine fish from the Pearl River Estuary, the wetlands of Zhanjiang mangrove, the offshore areas of Beibu Gulf and the coral reef system of Nansha Island were collected and microplastic accumulation in fish were analyzed and compared. The results proved that the microplastics were widespread in fish species collected from the onshore to offshore areas of South China Sea. Accumulation of microplastics in fish samples from the open waters of Beibu Gulf was the lowest among those from the estuarine area, the mangrove wetland and coral reef system. Microplastics were detected in gills, stomach and intestine, and not found in muscles and livers. Fibers were the dominant microplastic shapes. Transparent and small sizes were found in greater percentages in onshore fish than those in offshore fish. Positive relationship was found between microplastic abundance and fish body length or weight of. It was found that the microplastic abundances in fishes depend on their living habitats and feeding habits. Microplastic abundances in marine fish from the South China Sea were lower compared with the levels reported in fish from similar areas in other countries.

Keywords: Microplastics, Marine fish, Accumulation, Onshore, Offshore

*Corresponding author–email: xxr@scsio.ac.cn

PROSPECTING FOR RARE EARTH ELEMENT (REE) POTENTIAL IN OFFSHORE SOURCES AROUND SRI LANKA

*Dushyantha NP ¹, Batapola NM ¹, Premasiri HMR ¹, Abeyasinghe AMKB ¹, Rohitha LPS ¹, Ilankoon IMSK ², Ratnayake NP ³, Dissanayake DMDOK ¹ and Dharmaratne PGR ¹

¹Department of Earth Resources Engineering, University of Moratuwa, Sri Lanka

²School of Engineering, Monash University, Malaysia

³Ocean University, Colombo 15, Sri Lanka

Abstract

Rare earth elements (REEs) are a set of elements comprising fifteen lanthanides from La to Lu with Y and Sc. Although these elements are more abundant as much as the other industrial metals in the Earth's crust, they are very rarely found in economically mineable concentrations. Therefore, exploration and extraction of REEs have become challenging approaches in the present world. However, REEs have unique physiochemical properties that makes them essential elements in many high-tech components. As a result, these elements are considered as critical and strategic ingredients in the high technological products used in our daily lives. Moreover, REE market is expected to grow rapidly during the next decade with expansion of REE applications in various sectors, such as defense, emerging economies, green technology and R&D sectors. Due to the ever-increasing future demand, exploration for new potential REE sources has become a necessity in the modern world. Since available resources on land will not be enough to cater the future demand, offshore sources are also identified as a promising REE source. In the global context, deep-ocean manganese nodules and iron-manganese crusts found in the Pacific Ocean are identified as REE deposits with higher amount of heavy REEs. Deep-sea mud throughout the eastern south and central north Pacific is enriched with REE and it is also identified as a low-grade REE deposit with low thorium content. REEs are also associated with phosphorite in economical concentrations in upwelling regions. In this regard, seasonal upwelling of Southern coast of Sri Lanka observed during Southwest monsoon can be a potential candidate for a REE source. REE explorations can also be carried out within the Exclusive Economic Zone around the island. Since there are no detailed REE prospecting studies have been carried out in offshore to date, afore-said explorations will be able to unveil new REE sources. Therefore, sampling program will be carried out in aforesaid areas to prospect the REE potential in offshore sources around Sri Lanka. Once economically viable REE sources have been identified, they must be utilized via mining and processing operations to get the maximum benefit. This will allow Sri Lanka to contribute the REE supply chain to overcome future REE scarcity.

Keywords: Rare earth elements (REEs), Sri Lanka, Offshore sources, Rare earth exploration

*Corresponding author–email: nimila.dush@gmail.com

MICROPLASTICS IN MARINE FISH FROM BEIBU GULF, SOUTH CHINA SEA

*J. Bimali Koongolla^{1 2}, Xiang-Rong Xu¹, Heng-Xiang Li¹ and Lang Lin^{1 2}

¹South China Sea Institute of Oceanology, CAS, Guangzhou 510301, China

²University of Chinese Academy of Sciences, Beijing 100049, China

Abstract

Microplastic is a key anthropogenic threat to the global oceanic ecosystem and has reached in many oceans with adverse impacts on marine biota. Furthermore, there is a potential risk of chemicals carried by microplastics passing on to the human consumer through seafood species. However, little is known about the occurrence of microplastics in marine fish species captured from South China Sea.

In this study, morphological description, physical classification, chemical characterization and distribution variation of accumulated microplastics in onshore and offshore fish were evaluated among 60 sites from Beibu Gulf, South China Sea which was collected during August 2018. Results indicated that microplastics were presented in 23 fish species at an average abundance of 1.019 ± 0.184 items individual⁻¹ in onshore, while 12 species in offshore with an average of 0.228 ± 0.08 items individual⁻¹. Fiber type microplastics were dominated within size ranges of 0.02–1.00 mm in both locations. Black, blue and transparent color microplastics were prominent in onshore whereas 83% of collected particles were transparent in offshore. Chemical analysis was followed using micro-FTIR and Polyethylene terephthalate (32%) is the dominant polymer type in onshore when polyester (44%) highlighted in offshore samples. However, Polypropylene, Polyethylene and Polyacrylic found in common. With respect to the habitat variation, higher abundances of microplastics were found in benthic fish compared to the pelagic species.

The highest abundance of microplastic accumulation of fish was typically associated with onshore fish than offshore fish. The levels of microplastic abundance found in this study aligns with the previous studies that have reported high exposure to microplastics with proximity to Beibu Gulf area. Given these significant abundances, future work needs to focus on the contaminants on plastics and their bio-availability to the ingesting fish species.

Keywords: Microplastics, Accumulation, Fish, Abundance, Polymer

*Corresponding author–email: jayaminibimali@gmail.com

ZOOPLANKTON ABUNDANCE AND DIVERSITY OF EAST COAST OF SRI LANKA

*K. Koshika¹, H.B.U.G.M. Wimalasiri², R.P.P.K. Jayasinghe², and K.P.G.K.P. Guruge¹

¹Department of Animal Science, Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

²Marine Biological Resources Division, National Aquatic Resources Research and Development Agency, Colombo 15, Sri Lanka

Abstract

Zooplankton plays a vital role in marine environment by transferring the energy to higher trophic levels through the food web. However, the studies on zooplankton in the coastal water of Sri Lanka especially in the east coast are deficient. The present study was conducted to investigate zooplankton abundance in the east coast of Sri Lanka using the Research Vessel: Dr. Fridtjof Nansen during June to July 2018. Twenty five samples were obtained from five transects using Working Party 2 plankton net with 180 m mesh size. The samples were collected vertically from 30 m, 100 m and 200 m depths. In the laboratory, zooplankton were identified to the lowest possible taxonomic groups using standard keys and counted. The results revealed that zooplankton are dominated by the Phylum Arthropoda (63.0%) followed by Chordata (20.6%), Sarcomastigophora (7.4%), Chaetohnatha (4.0%), Cnidaria (2.5%), Annelida (1.0%), Echinodermata (0.4%), Mollusca (0.4%) and Ciliophora (0.2%). The highest mean abundance of 2562.32 ± 1213.36 was observed at near Panama transect and the lowest of 1149.66 ± 847.17 was at the transect near Point Pedro. The study showed that there was no significant difference ($p > 0.05$) of the abundance of zooplankton among the sampling transects. However, zooplankton abundance was significantly varied ($p < 0.05$) between depths. At the same time, there is no significant differences of the Shannon wiener's index among transects and depths. The diversity index was higher in North East coast of Sri Lanka. This study revealed that there are spatial variations of zooplankton in the East coast of Sri Lanka and it may affect the fish production in the area. Therefore, further comprehensive studies on zooplankton are recommended to find out the possible reasons for such variations which could be useful in managing the marine environment.

Keywords: Zooplankton, East Coast, Abundance, Diversity

*Corresponding author–email: koshikugan@gmail.com

FORECASTING AND NESTING HABITATS OF WATERBIRDS IN MANKULUMBAN

*G. Kandasamy¹, D. K. Weerakoon², A. Sivaruban¹ and H. B. Jayasiri³

¹Department of Zoology, University of Jaffna, Sri Lanka

²Department of Zoology, University of Colombo, Sri Lanka

³Ocean University, Colombo 15. Sri Lanka

Abstract

Coastal wetlands are important foraging and breeding habitats for waterbirds. Studies on foraging and nesting habitats of waterbirds are essential for the conservation strategies. The present study was carried out in Mankumban to identify significant waterbird habitats for foraging and nesting in the Jaffna Peninsula. Three counting blocks in length of 500 m transects with open width were selected. Each block was separated at least by 500 m to avoid double counting. Bird counting was done by slowly walking along the transect-line, once a month for 18 months from December, 2016. Overall 55 waterbird species were recorded in Mankumban, of these 29 were breeding residents and 26 were migrants. The highest species richness (49) was recorded in Block 1 compared to Block 2 (45) and 3 (45). The waterbird assemblage was classified into ten foraging guilds. The dabbling ducks (40.12%) were the dominants guild followed by shorebirds (31.23%), fishing sea birds (10.37%), stalking herons and egrets (7.19%), shallow water divers (5.80%), filter feeders (4.36%), Fishing Pelicans (0.27%), water-associated raptors (0.50%), water-associated kingfishers (0.09%) and vegetation gleaners (0.08%). The highest Shannon – Wiener Index and Pielou’s Evenness Index (3.04 and 0.78) were recorded in Block 1 compared to Block 2 (2.99 and 0.77) and 3 (2.87 and 0.75). Spot-billed duck, *Anas poecilorhyncha*, considered as a very rare migrant which has established breeding population in Jaffna and Mannar recently. Adult with five ducklings and adult with 13 ducklings of *Anas poecilorhyncha* were observed in January and February in 2018 respectively. As this species critically endangered in the national level and breeds only in Mannar and Jaffna in Sri Lanka, presence of Spot-billed duck with ducklings indicated the conservation value of Mankumban as a nesting habitat. Density of waterbirds was significantly varied among different months based on the Kruskal – Wallis test (Chi-square = 46.40, $p = 0.00$). That might be due to migration of waterbirds and availability of water in the habitat. The present study reveals that Mankumban is a significant foraging and nesting habitats for waterbirds. Charty beach nearby Mankumban is ideal for swimming, sunbathing and for other recreational activities. The presence of Greater Flamingos which is major attraction among avitourists and Charty beach makes Mankumban an ideal location for the development of Avitourism in the northern region.

Keywords: Coastal wetlands, Foraging, Nesting, Mankumban, Jaffna

*Corresponding author–email: vadhana.gk@gmail.com

ASSESSMENT OF WATER QUALITY PARAMETERS OF SURFACE WATERS IN REKAWA LAGOON, SOUTHERN COAST OF SRI LANKA

*Premarathne K.R.P.S and Indika.B.A.N

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka

Abstract

Rekawa Lagoon covers an area of approximately 250 ha and located in the intermediate climate zone on the south coast of Sri Lanka. The objective of the current study was to determine the status of some water quality parameters which are important for understanding of lagoon environment. The study was conducted from 6.00 am to 10.00 am in June and July 2018 in 86 randomly selected representative sampling locations. The lagoon area was divided into three distinct sites (S1, S2 and S3) based on the distance (1.5 km intervals) from the major fresh water input (Kirama oya) to the head of the lagoon. Three water quality parameters such as temperature ($^{\circ}\text{C}$), salinity (ppt) and turbidity (NTU) were measured in duplicates at each of these locations only considering the surface water layer. Data were analyzed using Minitab 16 statistical software. The $mean \pm SE$ temperature, salinity and turbidity of the lagoon were (28.3 ± 0.8) , (7.2 ± 2.7) and (20.5 ± 8.1) respectively. There was a significant difference in all water quality parameters between three sites (One-way ANOVA; $P < 0.05$). S1 recorded the highest ($mean \pm SE$) temperature (28.7 ± 0.9) while S3 recorded the lowest (28.0 ± 0.7) . S2 recorded the highest ($mean \pm SE$) salinity (8.3 ± 1.9) while S3 recorded the lowest (6.3 ± 3.1) . Turbidity showed the highest fluctuation ($range = 24.3$) compared to other parameters; temperature ($range = 5$) and salinity ($range = 10$). Highest turbidity was recorded for S3 (25.3 ± 8.9) and the lowest was recorded for S1 (16.1 ± 6.0) . Temperature ($P = 0.002$; $R^2 = 0.7073$) and Turbidity ($P = 0.000$; $R^2 = 0.7109$) measures had respective significant negative and positive significant relationships with distance from the fresh water input (Linear regression; $P < 0.05$). However, no such significant relationship was observed for salinity variation (Linear regression; $P = 0.288$; $R^2 = 0.013$). The results concluded that in Rekawa Lagoon, high amount of Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) tend to accumulate in areas where there is no fresh water intrusions. However, salinity and temperature could be greatly varied depending on the monsoonal patterns. Long term assessment of these parameters would provide water quality impacts to lagoon environment in the Rekawa Lagoon.

Keywords: Rekawa Lagoon, Temperature, Salinity, Turbidity

*Corresponding author–email: pasindushaneth9@gmail.com

HEALTH STATUS OF THE CORAL COLONIES IN PAREVIWELLA AND POLHENA REEFS, SOUTHERN SRI LANKA

*H.A.P.S. Senaratne and W.A.A.Upasanta-Kumara

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka

Abstract

The corals of the southern coast of Sri Lanka have been subjected to a variety of disturbances and those disturbances now appear to be more frequent and in high magnitude than previous. We used point count method using a quadrat to assess the health status of coral colonies. The aims of this study were; 1) to assess of 9 health statuses of coral colonies (i.e. healthy, bleached, diseased, sedimented, algal overgrown, Calcareous Algae (CA) overgrown, predation, totally dead and others.) between two coral reefs (i.e. Pareiwella and Polhena) and, 2) to assess the health status which showed the highest percentages at both reefs. We used a large quadrat ($0.25m^2$) and within it a mini-quadrat ($100cm^2$) where there are 25 squares (36 points) separately in both quadrats. Mini quadrat was used to evaluate the status of the coral in fine scale. Sites were selected randomly to place quadrats comprising 10 points at Pareiwella and 18 points at Polhena. The health status of the colony under each point was noted down and the genus of the coral colonies was identified. The measurements were taken from 22/12/2018 to 28/02/2019. There was a significant difference (Mann-Whitney U test: Asymptotic $p < 0.05$) in CA overgrown, sedimented, bleached, and algal overgrown corals between Pareiwella and Polhena. The most abundant health status of corals at Pareiwella and Polhena Reefs was the healthy category which were respectively as 77.22 ± 13.97 % per coral area and 82.63 ± 13.90 % per coral area. Coral colonies of both reefs appear to be in a good condition since they were having a comparatively higher healthy area than the areas presented with compromised health signs and that was prominent in Pareiwella than the Polhena..

Keywords: Health status, Point count method, coral colonies, Pareiwella, Polhena

*Corresponding author–email: prathibhasnrtn@gmail.com

DISTRIBUTION OF BENTHIC CATEGORIES BETWEEN PAREVIWELLA AND POLHENA CORAL REEFS, SOUTHERN SRI LANKA

*M.M.P.M.B.Marasinghe and W.A.A.Upasanta Kumara

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela road, Tangalle, Sri Lanka

Abstract

Coral reefs are considered as vital ecosystem have been subjecting to variety of stressors leading to degradation. To implement successful restorations for such reefs, it is essential to know current status of the reefs and the composition of benthic categories. The aim of this study was to estimate and compare the percentage cover of the dominant benthic categories (i.e. live hard coral (HC), Soft coral, Rock, Reef, Sponge, Dead coral, Seagrass, Calcareous Coralline Algae (CCA), recently dead coral, Sand, Silt, Macro algae (MA), Turf algae (TA) and Coral rubble) between Polhena and Pareiwella reefs. Pareiwella reef is comparatively protected and has little freshwater influence, while Polhena reef is threatened by anthropogenic activities and freshwater influence from Nilwala River. Ten and eighteen random points were selected respectively from Pareiwella and Polhena reefs. Quadrature method was used to survey the reefs. Survey was conducted from 22/12/2018 to 28/02/2019. Mann-Whitney U test was performed for the comparisons using asymptotic significant p using the significant level α 0.05. There were significant differences in the median percentage of HC ($p = 0.022$, $N = 28$), dead corals ($p = 0.001$, $N = 28$), and sea grass ($p = 0.045$, $N = 28$) between two coral reefs. The dominant benthic categories at Pareiwella reef were bare reef, HC, coral rubble, all algae (MA + TA) and dead corals. The dominant benthic categories at Polhena reef were coral rubble, bare reef, all algae (MA + TA), sand and HC. Pareiwella reef is comparatively healthier than Polhena reef as it possess of comparatively higher live coral cover. Being the presence of comparatively higher algae cover at Polhena reef denote that it would need effective management strategies for restorations to stop phase shift to algae dominated reef in the future.

Keywords: Coral Cover, Benthic Categories, Polhena, Pareiwella, Restoration

*Corresponding author-email: pathummadushanka38@gmail.com

TEMPERATURE DYNAMICS OF PIGEON ISLAND AND PARAVIWELLA CORAL REEFS, SRI LANKA

Fairoz M. F. M. and *Sajith K.N.M

Faculty of Fisheries and Marine Science, Ocean University of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka

Abstract

Coral reefs are one of the temperature sensitive ecosystems threatened by the present changes in global oceanographic processes mainly temperature increase. Higher temperatures have a direct impact on coral organisms resulting in coral bleaching and leading to reduce live coral cover on national to global scales. Previous studies conducted on coral reefs in Sri Lanka not continuously measured temperature variation within 24 hours. This temperature variation over reef during 24 hours provides the dynamics of heat within the reef to compare and contrast coral cover and health of coral reef. As a first step this study logged temperature measurements along two coral reefs of Sri Lanka. The locations studied represent living corals and associated organisms such as algae and reef fish. Two coral reefs selected were namely, Pigeon Island national park, Trincomalee (PI) and Paraviwella near shore reef, Tangalle (PV). Temperature data were obtained from reef sites (02 August–17 August 2018) by temperature sensors (HOBO, Onset UA-001-08) programmed for 4 days with a sampling frequency of 1 minute ($n = 5760$). Temperature sensors were deployed among live coral in the reef sites approximately at 1.5 m average depth for 96 hours. Two sites were compared by temperature data using Two sample t-test at $p=0.05$ using Minteb 16.0. Average mean water temperature of the PV ($29.08 \pm 0.820^{\circ}C$) was significantly lower than that of the PI ($30.79 \pm 0.44^{\circ}C$) in 2018 ($n = 24; P < 0.05$). Also the mean water temperature of the Paraviwella reef ($29.16 \pm 0.17^{\circ}C$) in morning (06–12 am) was significantly lower ($n = 04; P < 0.05$) than that of the Pigeon Island reef ($30.94 \pm 0.060^{\circ}C$) in 2018 and mean water temperature fluctuation in the evening (01–06 pm) shows the Paraviwella Reef ($29.94 \pm 0.380^{\circ}C$) was significantly lower than that of the Pigeon Island reef (31.30 ± 0.073) in 2018 ($n = 04; P < 0.05$) and mean water temperature of the Paraviwella Reef ($28.56 \pm 0.290^{\circ}C$) at night (07 pm-05 am) was significantly lower than that of the Pigeon Island reef ($30.41 \pm 0.07^{\circ}C$) in 2018 ($n = 04; P < 0.05$). The diurnal variation of temperature in PV and PI reefs were detected during this study and further studies are required to relate the temperature to the status of coral health of PI and PV reefs.

Keywords: Pigeon Island, Paraviwella, Coral reef, Temperature, Sri Lanka

*Corresponding author–email: ynm.sajith@gmail.com

PRELIMINARY INVESTIGATION OF BENTHIC FAUNA IN A TIDAL POOL AT CINNAMON BAY, BERUWALA, SRI LANKA

Haleema T.F. and *Fairoz M.F.M.

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Tangalle, Sri Lanka

Abstract

Benthic animals are generally being the primary and secondary consumers of the food chain and major food resource for a large number of predators. Also they are good indicators of environmental conditions which allow biomonitoring such as bioassays and biosurveys in an aquatic ecosystem. The present study was undertaken to study the diversity of benthos in a tidal pool at Cinnamon Bay, Beruwala, Sri Lanka. 10 sites were randomly selected to collect sediment samples which contain 400 ± 100 g manually in four replicates from 22nd January to 2nd April 2019. Wet sieving was used to separate sediment samples; fauna were identified by naked eye and estimated the abundance on phyla belongs to Annelida, Euarthropoda, Arthropoda, Mollusca, Sipuncula, Nemertea and Echinodermata using the standard identification guides. Collected samples were recorded and preserved using 5% formalin solution and mounted for microscopic examination. Abundance data for the benthic species were used to calculate Shannon–Wiener diversity index (H'), Species richness (S) and Evenness index (E). The highest relative abundance of Phylum Annelida (48%) was reported followed by Euarthropoda (26%), Mollusca (18%), Nemertea (3%), Arthropoda (2%), Echinodermata (2%) and Sipuncula (0.3%). Also the diversity indices values of Shannon–Wiener diversity index (H') 2.20, Species richness (S) 28 and Evenness index (E) 0.67 were reported during the study. This preliminary investigation concludes that benthic community in tidal pool at Cinnamon Bay, Beruwala has dominated by annelids with higher diversity. The class Polychaeta was the most abundant. Texture of the sediments samples varied within the site. The study should continue with the multiple replicates of the samples and with extended time period which may give a better understanding.

Keywords: Diversity, Richness, Evenness, Benthos and Tidal Pool

*Corresponding author–email: fairoz.mfm@gmail.com

CONCENTRATION OF TRACE ELEMENTS IN SEA CUCUMBER SPECIES HOLUTHURIA ATRA IN SELECTED SITES OF SRI LANKA

*Buddhika H.B.P.H¹, Upasanta-Kumara W.A.A.¹ and Handagiripathira H.M.N.L²

¹Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka

²Life Science Division, Sri Lanka Atomic Energy Board, Wallampitiya, Colombo, Sri Lanka

Abstract

Sea cucumbers belonging to Class Holothuroidea are esteemed seafood having high demand in the export markets. Bioaccumulation of trace and heavy metals in these organisms has adverse health effects for human by consuming them. The present study was carried out, 1) to determine the mean concentrations of trace elements (K, Ca, Mn, Fe, Cu, Zn, Ga, As, Se, Pb, Br, Rb and Sr) of *Holothuria atra* at four sites (Dikwella, Mannar, Kalpitiya and Jaffna) and 2) to evaluate concentrations of target compounds between sites and finding the elevated sites for each target compound. Samples were collected at each site from December 2018 to January 2019 and were pre-processed to obtain only the body muscle. The muscles were then dried at 65 – 80°C for 6 hours and were stored in liquid nitrogen for 24 hours. Pellets were prepared using powdered samples and analyzed for trace elements by Energy dispersive X-ray Fluorescence (XRF) (SPECTRO2000, Germany). The mean ($\pm SD$) concentration (ppm) of K, Ca, Mn, Fe, Cu, Zn, Ga, As, Se, Pb, Br, Rb and Sr were 6775 ± 2327.15 , 48225 ± 37914.57 , 20.17 ± 29.58 , 631.67 ± 289.53 , 6.08 ± 4.11 , 72.08 ± 14.44 , 0.32 ± 1.10 , 23.37 ± 13.29 , 11.63 ± 5.49 , 28.34 ± 27.69 , 245 ± 87.07 , 4.59 ± 4.29 , and 344.75 ± 230.31 respectively. There was a significant difference in the mean trace element concentrations of *H. atra* between sites (One-way ANOVA; $P < 0.05$) for target compounds apart from Ga and Rb. The highest concentrations of K, Mn, Fe, Cu and Rb were recorded at Dikwella sampling site for Ga, As, Se, Pb at Kalpitiya sampling site, for Ca at Jaffna sampling site, and for Zn, Br, and Sr at Mannar sampling site. The reported concentrations (ppm) of Zn, Pb and Cu from this study exceeded the acceptable levels of Sri Lankan export regulations indicating high environmental pollutions in recent years.

Keywords: Sea cucumber, *Holothuria atra*, Trace elements, X-ray Fluorescence, Sri Lanka

*Corresponding author-email: pramohb1234@gmail.com

MICROPLASTICS CONTAMINATION IN SELECTED BEACHES OF SRI LANKA

V.L. Rathnayaka ¹, *A.A.D. Amarathunga ², H.B. Jayasiri ¹ and H.D. Liyanage ¹

¹Department of Coastal and Marine Resources Management, Ocean University of Sri Lanka, Colombo 15

²National Aquatic Resources Research and Development Agency (NARA), Colombo 15, Sri Lanka

Abstract

Microplastics (MPs) commonly define as plastic particles less than 5 mm in size. They can be categorized as primary and secondary MPs. Primary MPs are small plastic particles that are directly released to the environment and secondary MPs are originated from large plastic particles already present in the environment due to weathering and fragmentation. MPs contamination in beach has negative impact to the coastal environment and users both human and other species. This study was conducted at ten beaches which are selected based on population and activities such as fishing, recreational and tourism to quantify and characterize MPs in beach sand compare with pristine site. Beach sand samples were collected laying a quadrat of $0.5 \times 0.5 m^2$ in size at 12 sites (randomly selected) in each beach during July and August 2019 in western and southern coasts of Sri Lanka. Sand samples were analyzed for two size classes (1–5 mm and 0.3–1 mm). Total of 120 sand samples were analyzed and found that mean ($\pm SE$) total MPs abundance is 444.67 ± 116.56 items m^{-2} with 369.60 ± 96.86 items m^{-2} (83%) of small MPs (0.3–1 mm). Large MPs are not varied significantly among beaches and small MPs varied significantly among the studied beaches (One-way ANOVA $p < 0.05$). Significantly high abundance of total MPs (1718.67 ± 496.04 items m^{-2}) with small MPs (1485.33 ± 275.24 items m^{-2}) were reported in Panadura Beach and significantly low abundance was observed with total MPs (49.33 ± 10.67 item m^{-2}) in Mirijawila Beach than that of other beaches. Significantly high abundance of large MPs were found in high water strandline while small MPs were low water level at $p = 0.05$. Composition analysis of seven types of shape categories in MPs revealed that studied beaches are dominated by foams (51%) followed by fragments (21%). Composition analysis of color categories in large MPs (1-5 mm) revealed that studied beaches are dominated by white (61%) followed blue (15%) and green (12%). The major contributing factors for MPs pollution are beach usage for different activities such as recreational and fishing which suggest that the land-based sources provide major inputs in these beaches.

Keywords: microplastics, beaches, Panadura, fragments, foams

*Corresponding author–email: deeptha.amarathunga@gmail.com

THE EFFECTIVENESS OF LOW-COAST TREATMENT SYSTEM INTEGRATED WITH HERBAL PLANT MATERIALS TO TREAT WELL-WATER IN SELECTED COASTAL REGIONS OF SRI LANKA

R.M.C.Y. Rathnayaka ¹, *A.A.D. Amarathunga ², B.K.A. Bellanthudawa ¹, S. Rathnasri ¹ and C. Amarasiri ¹

¹Department of Marine Engineering and Management, Ocean University of Sri Lanka.

²National Aquatic Resources Research and Development Agency, Colombo 15, Sri Lanka

Abstract

Water scarcity, inappropriate sanitation and wastewater pollution are critically important issues in most of the coastal regions in Sri Lanka. Both shallow and deep groundwater is frequently brackish, and fresh water wells have been increasingly salinized by tidal fluctuation and seepage mostly in dry seasons. Sandy soil increase the contamination of the ground water in coastal areas. Thus, it is essential to provide low cost, feasible, and efficient household low cost water treatments system (LCWTS) to purify the water. The aim of the study is to identify the herbal plant material for efficient treatment of wastewater in coastal regions. A Laboratory experiment was performed to assess the efficiency of LCWTS integrated with three plant materials such as *Terminalia arjuna* roots, *Strychnos potatorum* seeds and *Phyllanthus emblica* leaves for treating contaminated well water in the domestic wells in coastal areas of Dikowita and Jaffna. Well water samples were collected from randomly selected well in Jaffna peninsula and Dikowita. The pH, conductivity, salinity, total suspended solids (TSS), total hardness (TH), nitrate-N, ammonia-N and phosphate-P were measured in raw water samples as well as treated water. All the water quality parameters were measured using standard analytical methods. Water quality parameter of both sampling sites exceeded the drinking water quality standards established by Sri Lanka Standards Institution. The water quality in raw water samples collected from Jaffna showed perform t-test, significantly higher water quality levels than that of samples collected from Dikowita. The significant difference of water quality parameters was tested by One-Way ANOVA for different experimental set-ups. The removal efficiency of conductivity was observed 38.79%, 42.99% and ammonia 73.1%, 32.33% from *Terminalia arjuna* and removal TH were observed 38.47% and 44.09% by *Phyllanthus emblica* in samples collected from Jaffna and Dikowita respectively. Sand has been found to be good filtration to remove TSS in drinking water. The optimum efficiency was observed for *Strychnos potatorum* seeds for most of the water quality parameters. The treated water through the three media showed the significantly difference for all the measured water quality parameters which suggest that plant material affects significantly on water treatment. Therefore, results of the present study showed that *Terminalia arjuna* and *Phyllanthus emblicacan* be used as an effective low-cost household water treatment method to improve the water quality in terms of TH, conductivity, ammonia and TSS.

Keywords: Coastal region, well water, water quality, herbal plant materials, lowcost treatment system

*Corresponding author-email: deeptha.amarathunga@gmail.com

PHYTOPLANKTON COMMUNITY STRUCTURE IN RELATION TO PHYSICO-CHEMICAL PARAMETERS IN COASTAL WATERS FROM COLOMBO FORT TO PANADURA

H.D. Liyanage¹, *A.A.D. Amarathunga², H.B. Jayasiri¹, V.L. Rathnayaka¹, H.K.R.Thushara¹, and B.R.C. Mendis²

¹ Department of Coastal and Marine Resources Management, Ocean University of Sri Lanka, Colombo 15

² National Aquatic Resources Research and Development Agency (NARA), Colombo 15, Sri Lanka

Abstract

Phytoplankton are photosynthetic, single celled and drifting or floating organism size ranging 0.2 μm to 200 μm . They play a major role in the global carbon cycle. Some phytoplankton are toxic for the human and animal and release toxins into marine water called marine biotoxin. These toxic-chemicals accumulate in the animal bodies and transfer to the human body through food chain. The present study was conducted to investigate the diversity, abundance and composition of phytoplankton in relation to some water quality parameters. The sampling was carried out at six sites from Galle Face to Panadura during May, 2019. Ongoing large-scale development activities in this area are recreational activities, construction activities, fishing, sewage pipe lines and runoff water line. The phytoplankton samples were collected using plankton net with mesh size 15 μm and water samples were collected using Ruttner sampler for analysis of physico-chemical parameters. The phytoplankton abundance did not vary significantly among the six sites at $p = 0.05$ and mean ($\pm SE$) phytoplankton abundance of the area is 1202 ± 398 cells l^{-1} . The significantly high abundance (3378 ± 2175 cells l^{-1}) was reported at the Galle Face while significantly low abundance (450 ± 124 cells l^{-1}) is at Bambalapitiya. However, there is no any indication of phytoplankton blooms during the sampling. The composition of four phytoplankton groups were documented; diatoms (50%), dinoflagellates (23%), cyanobacteria (19%) and green algae (5%). Most dominant species was *Spirulina sp.* (cyanobacteria) followed by *Eucampia sp.*, *Ceratoceros sp.*, *Thalassiosira sp.*, (diatom) and *Dinophysis sp.*, (dinoflagellate). Further harmful species of *Pseudo-nitzschia sp.*, *Prorocentrum micanus* and *Ceratium fusus* were also reported. The Shannon-wiener index was ranged from 1.85 to 2.96 and evenness index ranged from 0.63 to 0.91 in the study area. The nitrate, turbidity, chlorophyll, TSS and other nutrients were significantly varied among the study sites at $p = 0.05$. Highest chlorophyll value was recorded at Dehiwala. The significant correlation was reported between turbidity and phytoplankton abundance at $p = 0.05$. This study provides the baseline information on phytoplankton community structure and related physico-chemical parameters of the area.

Keywords: phytoplankton, abundance, Galle Face, diatoms, water quality

*Corresponding author-email: deeptha.amarathunga@gmail.com

SPECIES COMPOSITION AND CHECKLIST OF FRESHWATER ICHTHYOFAUNA OF COLOMBO URBAN WETLANDS

A.G.G.C. Bandara ¹ and P.H.M.G.C. Priyadarshana ² *W.A.A.D.L. Wickramasinghe ¹

¹Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Mahawela Road, Tangalle

²Faculty of Science, Horizon Campus, Malabe, Sri Lanka

Abstract

Sri Lanka is a biodiversity hotspot, harboring a rich ichthyofaunal diversity consists of 101 indigenous freshwater fishes. Colombo which is the economic capital of Sri Lanka, has been identified as an urban wetland complex because of the heart of Kelani river delta. Development of Colombo city has seen as a major threat for the ichthyofaunal community. This study was conducted for a period of eight months from November 2017 to June 2018 to identify the indigenous and exotic fish species living in the urban wetlands. River bank observation method was conducted in six wetlands (Diyasaru park, Beddagana Wetland park, Thalangama lake, Diyatha uyana, Nawala weli park and the Heen canal) using 5m line intercept transects. Results showed that there are at least 25 species of fish belongs to 13 families inhabiting Colombo urban wetlands. Highest percentage of fish species were recorded in less polluted Thalangama lake (29.09%) followed by Heen canal (20.00%), Diyasaru park (16.36%), Beddagana wetland park (12.72%), Diyatha uyana (12.72) and Nawala weli park (9.09%). Nawala weli park which was highly polluted with algae and waste water had the lowest record of fish species. At family level, the Cichlidae had the greatest number of species (6) followed by Cyprinidae (4). Family Channidae consist of 3 species while families Osphronemidae and Gobiidae consist of 2 species each. Families Aplocheilidae, Notopteridae, Anguillidae, Bagridae, Claridae, Heteropneustidae, Anabantidae and Helostomatidae counted only 1 species each. 8 nonnative fish species were recorded out of 25. A new record of rare Rhino-horn Goby (*Redigobius balteatus*) was recorded from the Heen canal. This study highlighted the important of urban wetlands for ichthyofaunal conservation and potential threat for the native fish from the nonnative fish & pollution. Therefore protection of wetlands are vital for the conservation of freshwater fish. Further studies with more replicates (temporal and spatial) are necessary to evaluate the status of freshwater ichthyofauna of urban wetlands.

Keywords: ichthyofauna, Colombo wetlands, Sri Lanka, Rhino-horn Goby, checklist

**Corresponding author–email: lankadimuthu@yahoo.com*

ASSESSMENT OF TOURISTSTHEIR PERFORMANCE FOR ACCOMMODATION CLOSER TO POLHENA CORAL REEF, SOUTH OF SRI LANKA

*Liyana Thanthri Gamage W.K. and Fairoz M.F.M.

Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka, Tangalle, Sri Lanka

Abstract

Coral reef related tourism is a potential source of income to alternative livelihood of coastal communities. There are income earning opportunities for the surrounding communities in Polhena Coral reef ($5^{\circ}6'10'' N$ and $80^{\circ}31'33'' E$) closer to Matara city in Southern, Sri Lanka. There were limited studies on reef related tourism in Polhena. The lack of sufficient previous studies on Polhena coral reef and its socio-economic importance is badly affected for the management and conservation of as sustainable utilization. Therefore, the aim of current study was to reduce the prevailing research gap. Objectives include assessing tourist preference for accommodation facilities and grading of tourist hotels using a ranking system. Two separate questionnaires were prepared for tourists and tourist hotels, and distributed allowed to answer. Data collection was done on 02nd, 03rd and 16th of March 2019 from hundred tourists randomly and 24th on March 2019 from eleven tourist hotels. Data extracted from questionnaires were analyzed to percentage values and summarized using Microsoft Excel. Among the tourists stayed in Polhena most preferred guest house (24%) followed by tourist hotels (11%), while villa was the least (7%) ($Mean \pm SD; 25 \pm 23.17$). According to ranking system, a similarity between low (C; score ranges 5-11) and medium grade (B; score ranges 11-17) tourist hotels can be observed (36.36%), while 27.27% were under high grade (A; score ranges 17-23) category ($Mean \pm SD; 33.33 \pm 5.25$). Ranking system was based on room facilities, category and extra facilities provided with. As elaboration of the study, this can be continued further combining advanced statistical tests to view of reef related tourism in Polhena comprehensively.

Keywords: Infrastructure, Polhena, Ranking system, Sri Lanka, Tourism

*Corresponding author-email: wipunikaushalee@gmail.com

THE HUMAN–CROCODILE CONFLICT IN NILWALA RIVER, MATARA

*T.R.V. Palliyaguru

Faculty of Engineering & Management, Ocean University of Sri Lanka, Crow Island , Colombo 15 , Sri Lanka

Abstract

Human crocodile conflict (HCC) occur varying degrees around the world, and with a number of crocodilian species. Two species of crocodile occur in Sri Lanka, namely the marsh crocodile (*Crocodylus palustris*) and the estuarine crocodile (*Crocodylus porosus*). Salt water crocodile had a wider distribution in Sri Lanka than marsh species. Human crocodile conflict is recognized as one of the major human–animal conflict in Sri Lanka. The crocodile attacks are common in Nilwala River area. The Nilwala River located in Matara district and 72 km in length is inhabited by salt water crocodiles. The saltwater crocodile (*Crocodylus porosus*) is a highly threatened reptile in Sri Lanka. It is categorized as endangered in the 2012 National red list based on its limited distribution within the island. Human and crocodile have been living in coexistence for many years in this area. This paper describes the HCC occurring in various parts of Matara district from June to August in 2019. The Study utilized a pre–tested structured questionnaire including 26 questions. Sample size was consisted of 55 respondents. During the past years 100 attacked are known to have occurred in Nilwala River. Attacked occurred when people were bathing, face washing, clothes washing, mud washing, pet washing, in unprotected areas . Most attacked reported in the morning from 0600h–0930h and in the evening 1600h– 1700h. During the past decade, the thereat by crocodiles to human has increased. Mainly during the period of 2005–2012. A total of 24 attacks (18 human deaths) by saltwater crocodile have been recorded since the years 2000 in the Nilawala River. During the study period, only one incident was reported. In retaliation to these attacks, people around this area had killed several crocodiles. Destruction of habitat and livestock depredation has gradually developed a conflict between man and crocodile. At present, they do not use the river water for day to day uses. Because the increase of crocodile population by devastation and safety methodologies introduced by the government and other related agencies .Prevention plans should try to mitigate the following negative results of the interaction between crocodile and humans. Deaths of people, Death of crocodiles, Destruction of habitat, Livestock depredation. The continuous monitoring is required to evaluate human-crocodile conflict in detail to make a strong recommendation.

Keyword: Conflict, Nilwala River, Crocodile, Human

*Corresponding author–email: thilinpalliyaguru07@gmail.com

EVALUATION OF VISITOR CHARACTERISTICS AND WILLING TO PAY FOR THE BEACH PARK IN CROW ISLAND

V.S. Gunasinghe ¹, *U.A.D.P. Gunawardena ², D. Rajapaksha ², S. Rathnasri ¹ and C. Amarasiri ¹

¹Department of Coastal and Marine Resource Management, Ocean University of Sri Lanka

²Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka

Abstract

The Crow Island Beach Park is being used as a major recreational site by both nearby residents as well as visitors from considerable distances. The Beach Park has unique ecological features and recreational facilities that are usually limited in the Colombo Metropolitan Area. There have no studies carried out to so far to understand the visitor characteristics or the economic value of the park. Therefore the main objective of this study was to evaluate visitor characteristics and willingness to pay (WTP) towards the Beach Park. This study employed the contingent valuation method to estimate the willingness to pay (WTP) of visitors based on data collected from 50 visitors to the Beach Park. The questionnaire used for the onsite survey was designed to capture socio-economic variables about visitors (such as age, monthly income, level of education, employment status and gender) and travel cost component variables (such as trip travel cost, time spent onsite and onsite expenses). Microsoft Excel and Minitab software were used to analyze the data. According to the results, 80% of visitors have spent their time in the Park by sightseeing. From the sample, there was 54% of the visitors in the sample have no courtyard in their home and live in flats. 40% of visitors to the Park have an income range of Rs. 25000.00 to 75000.00. Average onsite expenses are about Rs. 338 per visit and average travel cost is about Rs.183 per visit. Most of the people visit Beach Park in the evening, as confirmed by 86% of the sample. Also, average willingness to pay proposed by the respondents was Rs. 33 which indicates a significant economic value given the high visitation rates for the Park. Results also indicated that 60% of visitors are not satisfied about the current quality of the park. Municipal authorities may have to consider these values in the management of the Beach Park given the importance of the Park which is located in congested city limits.

Keywords: willingness to pay, visitor characteristics, Crow Island beach Park

**Corresponding author–email: prasanth@sjp.ac.lk*

EXPLORATORY STUDY WHY WOMEN ARE UNDER REPRESENTED IN HIGHER MANAGERIAL POSITIONS IN LOGISTICS INDUSTRY IN SRI LANKA

*Kosgoda, TM and Jayasundara, A.K.C.H

Faculty of Engineering and Management, Ocean University, Colombo 15, Sri Lanka

Abstract

Women's participation in the workforce has been increased in the contemporary business world; women's composition representing a higher managerial position is distorted. This is highlighted frequently in the Logistics industry in Sri Lanka as there is a swayed argument that logistics is a male-dominated industry and the hurdles avert women's upward mobility. The research study is to find out why women are underrepresented in higher managerial positions in Logistics Industry in Sri Lanka. The prime intention of this research is to determine the significant factors that are affecting women in deciding to take up higher managerial positions and explore the significance of those factors to women's upward mobility in the management hierarchy in the Logistics sector. Simultaneously, hypotheses were developed to find out the significant association between Career Motivation, Family Support, Job Pressure and Working Environment with women's decision to take up higher managerial positions. The quantitative approach was used in this study. A structured questionnaire was distributed among the female logistics executives in the study. As the statistical estimation tool, SPSS (Ver 25) was used to analyze data. As the statistical analytical models, Correlation analysis was conducted. Reliability and Validity was checked by using the inbuilt features in SPSS. Results shows; Working Environment (0.067), Career Motivation (0.281), Family Support (0.335) and Job Pressure (0.087) show a positive relationship toward the Women's decision to take up higher managerial positions in the Logistics industry in Sri Lanka. In case of significance, out of all variables, Career Motivation (0.007) and Family Support (0.001) are strongly significant under 5 percent confidence interval. The study found that Family Support and Career Motivation as an impediment factor for women's decision to take up higher managerial positions. The overall significance of this study will give an eye-opening to the logistics companies in Sri Lanka, recruiters, logistics professionals, and university students and the stimulus provided by the study will be beneficial to the women who are aspiring to climb the managerial hierarchy in the Logistics Industry.

Keywords: Women, Management, Family Support, Career Motivation, Working Environment

**Corresponding author-email: trishanimk@gmail.com*

