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Table of Contents

1. Comparative Systematic Analysis of Milankovitch Cycles to Identify Variations of Glaciers and Interglacial Periods of Late Pleistocene in South Asia 1
2. Nature Tourism in India-Red Sander Plant Species of YSR District, Andhra Pradesh..... 13
3. Scientific Investigation of Ancient Sri Lankan Private Labor Room (*Thimbiri Geya*)..... 24
4. Reviewing the Paleo- Biological Remains of Rajagala Mahalena Cave in The Eastern Province of Sri Lanka. 35
5. Effect of Environmental and Socio-Cultural Impacts Caused by Tourism on Residents' Lives with Special Reference to Ancient City of Anuradhapura 48
6. Bamboo Crafts and Associated Knowledge System of The Karbi Tribe of Assam Plains, North- Eastern India: A Cultural Heritage 63
7. New Perception to Proto History Burial Site in Andarawewa An Archaeological and Geochemical Prospection 78
8. Potentials of Underwater Cultural Heritage Towards Tourism in Galle, Sri Lanka: Perspectives of Tourism Service Providers and Maritime Archaeologists. 93
9. A Forensic Anthropological Analysis on The Consumption of Forensic Science Methods Utilized to Detect Homicides Along with Sharp Weapons (With Special Reference to Court Records)..... 105
10. Cultural and Religious Tourism in Majuli With Special Reference to Auniati Sattra And Uttar Kamalabari Sattra 114
11. Apendix 01..... 133

Comparative Systematic Analysis of Milankovitch Cycles to Identify Variations of Glaciers and Interglacial Periods of Late Pleistocene in South Asia

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Abstract

Variations in the first Euler angle known as Earth precession phenomenon which is described as a change in the Earth's orbit; found to have strong impact on the climate of Earth. These observations of climate changes were connected with the behavior of the global ice sheets, including their advancing and retreating movements which have been recorded. In fact, Earth's climate depends essentially on the cycle of glaciers' growth and reduction. The alternative glacial periods and the interglacial periods coincide with the variations in Earth's orbit known as "Milankovitch cycles", which affect the insolation, and the sunlight exposure of different regions of the world and thus ultimately the behavior of ice formation. This paper aims to document the variations of the Earth's axis orientation and to discuss how these changes have affected to the sea-level fluctuation of the South Asian Region during late Pleistocene. Experiment methodology consists of compelling a standardized dataset of the sea-level index (Data SET 01-Radiocarbon Journal, Katupotha. J, Data SET 02- SEAMIS database and selected 35 number of carbon dating values recorded and published in the literature of the South Asian Region) and then compare it with the data of Milankovitch Cycles. The discussed results show that the sea-level variations occurred mainly between 12,500 ± 1,500 $_{YBP}$ to 11,000± 1,500 $_{YBP}$, indicating that $25_m \pm 5_m$ recorded to be the lower sea level documented than the current sea level found around the South Asian region. This has been resulted by a quick glacier transition that happened in the Late Pleistocene.

***Keywords**: Milankovitch cycles, Sri Lanka, Sea Level, Carbon dating, Late Pleistocene.*

Introduction

The glacial-interglacial cycles over the late Pleistocene provide a strong framework for understanding the evolution of the climate events over the Holocene. The main objective is to study factors that effecting to changes of interglacial to glaciers environment and glaciers to the interglacial environment mainly focusing on Milankovitch cycles and sea-level fluctuation. However, 'Milankovitch cycles' are insufficient to explain the full range of late "Quaternary climate change, which is also required to compare with the influence of the greenhouse gas and the albedo variations, but they are a primary forcing that must be accounted (Milankovitch,1930). 'Milankovitch cycles' are classically divided into three components as the earth's precession, the earth's obliquity, and the earth's eccentricity cycles. These cycles modulate the solar insolation or its geographic distribution. Orbital and precession variations are also likely to be a generic feature of the other planets, with significant implications for the fate of planetary atmospheres and tend to help us understand the potential of habitability on the other planets. Especially, considering the partial harbour life environment of quaternary habitats in *Sabaragamuwa basin* observed during the late Pleistocene in Sri Lanka (Sumanarathna,2017). In fact, many proxy's data show that Earth's climate has under process the glacial-interglacial cycle with semiregular periodicity, with phases strongly linked to orbital variations (Hays et al., 1976; Huybers and Curry, 2006; Imbrie, 1984; Imbrie et al., 1992; Lisiecki and Raymo, 2005). For the past ~0.80 Ma, the main periodicity has been described as the eccentricity (~100 kyr) embedded with the precession (~21 kyr) and the obliquity (~40 kyr) signals (El Kibbi et al., 2001). Before ~0.8 Ma, the main signal was obliquity with weak eccentricity and precession signals (Imbrie, 1984; Lisiecki and Raymo, 2005), and this shift has been happened in the late to mid - Pleistocene transition that leads to amplify the initial cooling (Fig. 1).

Due to the predominance of northern hemispheric glaciers, the northern hemispheric insolation is usually the assumed driver of the glacial-interglacial cycle (Milankovitch, 1930). Having the strong signal of eccentricity during the past 0.8

Myr since the present has been puzzled because the effect of eccentricity on seasonal insolation is small (Imbrie et al., 1992), although eccentricity modulates precession (Lisiecki, 2010). However, it has been proposed that the 100 kyr cycle may be a modulation of the obliquity signal because the integrated seasonal insolation at a given location does not change with precession (Huybers, 2003, 2006). While numerous studies link paleo proxies to insolation forcing, there is yet no broadly accepted explanation for how ice ages started as well as why they follow a 100 kyr cycle, and why the pace of the glacial cycle changes in Quaternary.

Materials & Methodology

The methodology that has been applied for this study was to compile standardized datasets (https://github.com/Alerovere/SEAMIS) of the sea-level index and limiting points which meet the criteria recently summarized. It includes Data SET 01-Radio Carbon Journal, Katupotha. J (Ref: 10-14) carbon dating values in the west coast of Sri Lanka. Data SET 02- SEAMIS database, including another random carbon dating from India, Singapore, Malaysia, Maldives, Thailand, Vietnam, and Cambodia (Ref :8). In this paper, these geochronological data have been compared with the data of Milankovitch cycles.

Results

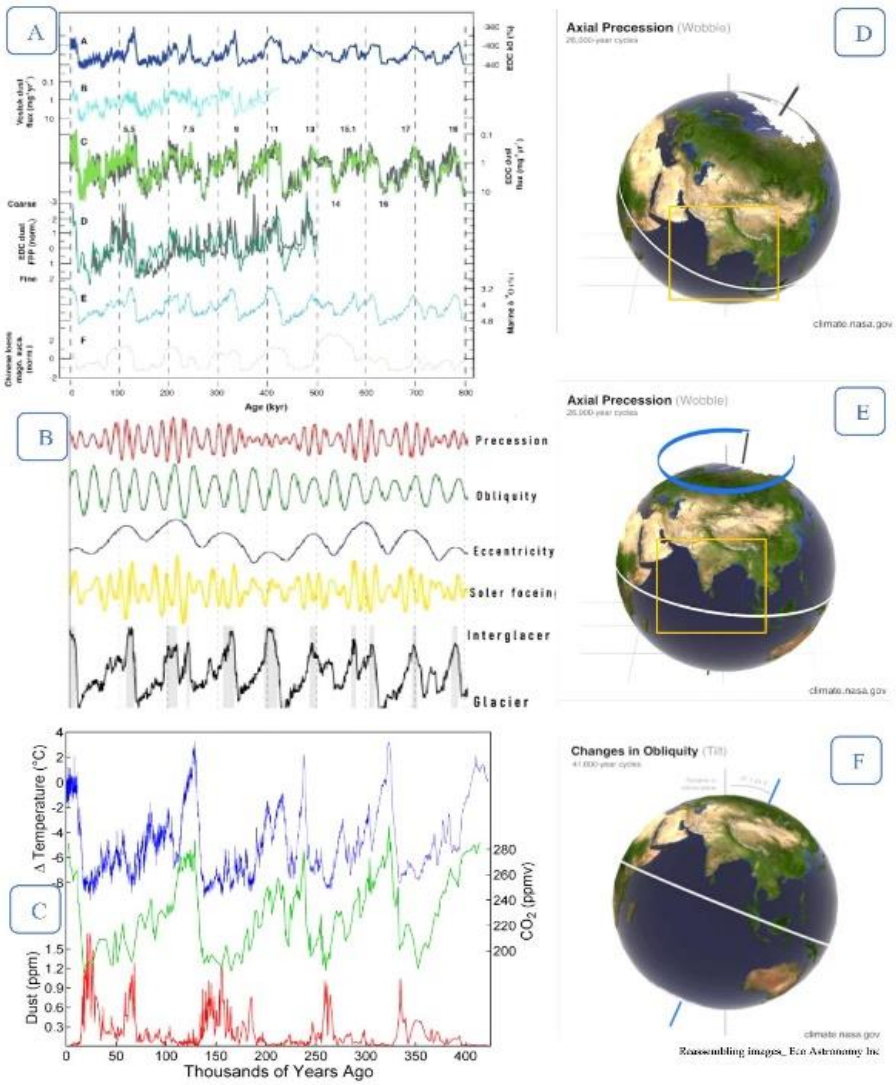

Figure 1. *(A) Variables of proxies in the last 0.8Ma and (B) Graph depicting orbital variations, solar energy changes, and resulting glacial cycles, as a consequence of Milankovitch cycles, demonstrating solar and orbital forcing of climate on 800kyr intervals; Adapted from Quinn et al. (1991) and Lisiecki and Raymo (2005). (C) Temperature Variations (blue), CO 2 (green), and Dust content (red) in an ice core dated 12kyr; Willy and Walter (2012). (D) and (E) Axial precession's stages via one cycle representing the Sun light exposure into the South Asian region; (Buis., 2020). (F) The Earth's axis angle of rotation is tilted as it travels around the Sun which is known as obliquity; (Buis., 2020).*

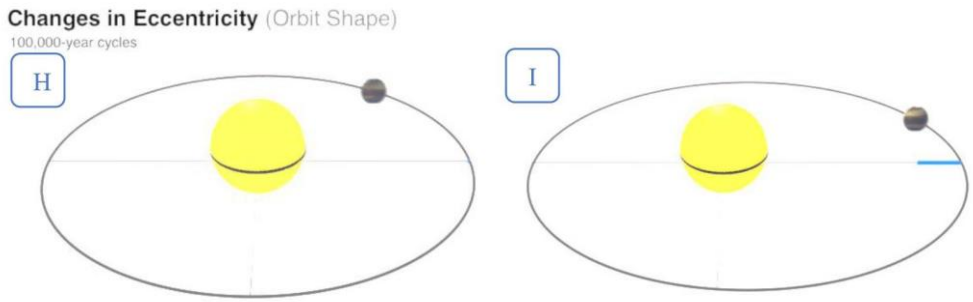

Figure 2: *(H) & (I)The shape of Earth's orbit, known as eccentricity, and its effectivity on surface temperature variation (Buis., 2020).*

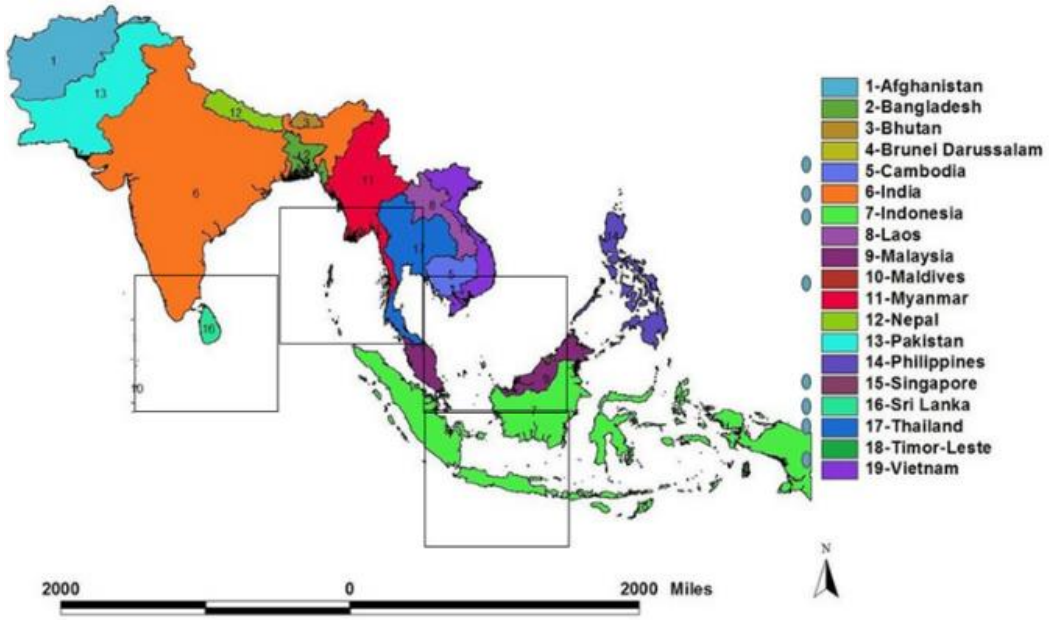

Figure 3: *Map representing region and counties of the sea-level index and limiting points meet the criteria recently summarized (https://github.com/Alerovere/SEAMIS).*

Model short name	Ice model	Earth model parameters
ice5g-vm2-90km.nc	ICE-5G	Upper Mantle = 0.25 × 10^{21} Pa•s Transition Zone = 0.5 × 10^{21} Pa•s Lower Mantle = 5 × 10^{21} Pa•s Lithosphere Thickness = 90 km
ice5g-vm2b-90km.nc	ICE-5G	Upper Mantle = 0.25 × 10^{21} Pa•s Transition Zone = 0.25 × 10^{21} Pa•s Lower Mantle = 5 × 10^{21} Pa•s Lithosphere Thickness = 90 km
ice5g-vm2-120km.nc	ICE-5G	Upper Mantle = 0.25 × 10^{21} Pa•s Transition Zone = 0.5 × 10^{21} Pa•s Lower Mantle = 5 × 10^{21} Pa•s Lithosphere Thickness = 120 km
ice5g-vm3-90km.nc	ICE-5G	Upper Mantle = 0.25 × 10^{21} Pa•s Transition Zone = 0.5 × 10^{21} Pa•s Lower Mantle = 10 × 10^{21} Pa•s Lithosphere Thickness = 90 km
ice5g-vm4-90km.nc	ICE-5G	Upper Mantle = 0.25 × 10^{21} Pa•s Transition Zone = 0.5 × 10^{21} Pa•s Lower Mantle = 100 × 10^{21} Pa•s Lithosphere Thickness = 90 km

Table 1: *Details on the Earth model parameters and different mantle viscosity profiles employed to simulate glacial isostatic adjustment combined with the Ice model ICE-5G in the areas of interest(https://github.com/Alerovere/SEAMIS). Model short names refer to the different model curves in graph A and B*

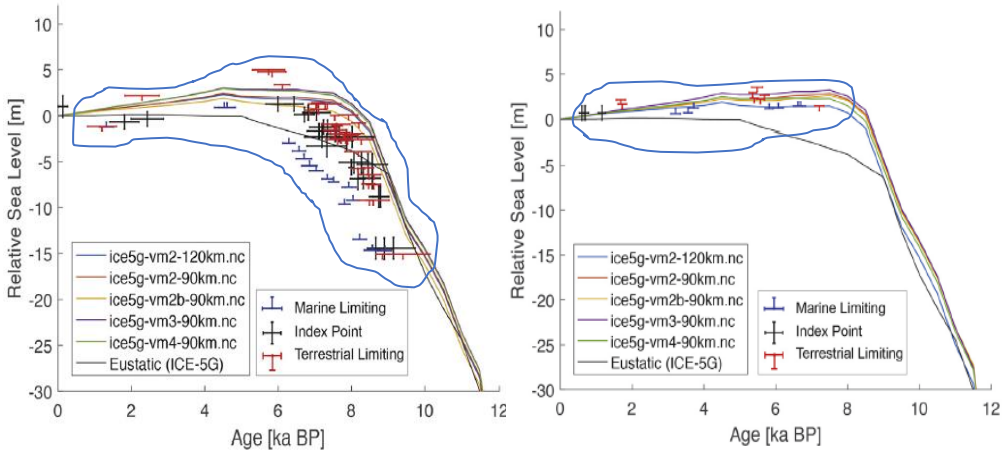

Figure 4: *Graph A (Left) Average values of relative sea-level data index (https://github.com/Alerovere/SEAMIS) relevant to observed countries, as mentioned in fig.3. Graph B (Right) Average values of relative sea-level data index; Katupotha. J (Ref: 10-14) Sri Lanka (Mann et al, 2019 and Sumanarathna et al, 2021)*

Discussion

Interpreting "Fig.1-B" the grey represents the peaks of global variations in temperature that identify interglacial periods of relatively warm climate typical recorded over the past thousands' years; the ice periods are represented by the valleys between peaks of grey areas; the three curves on the top are the Milankovitch cycles of Earth's orbital changes caused by the precession, the obliquity of polar axes, as well as the eccentricity of the orbit these cycles where changes to orbital eccentricity occur at 400,000 and 100,000yr intervals; the variations in axial tilt occur at 40,000yr intervals, and the changes in the axial precession occur at 25,000yrs (Wanner et al., 2008; Bennet, 1990; Imbrie and Imbrie, 1979, Dawson, 1992; Raymo and Nisancioglu, 2003); in addition, the fourth curve is the changes documented for the solar forcing; finally, the bottom curve is the temperature changes which get impacted by these other influences. The orbital variations, solar energy changes and resulting glacial cycles, as a consequence of Milankovitch cycles, demonstrating solar and orbital forcing of climate on 100kyr intervals (Fig.1-B) shows the effects of Precession, Obliquity, Eccentricity, and Solar Forcing which refers to the quantity of solar radiation that reaches the Earth's atmosphere as a result of both solar and astronomical forcing (Berger et al., 2013), which includes axial orientation and positioning relative to the Sun on Glacial Interglacial cycles.

Earth's orbit wobbles shown in "Fig.1-D, E," called Precession cycles, result in a change of the amount of sunlight at middle latitudes by up to 25% and cause the climate to oscillate. Using deep-sea sediment cores found that Milankovitch cycles correspond with periods of major climate change over the past 450,000 years, with Ice Ages occurring when Earth was undergoing different stages of orbital variation (Buis., 2020). When Earth's orbit made northern summers warmer than average, huge pieces of ice were melted through North America, Europe, and Asia; but then when the orbit cooled northern summers, those ice sheets started to advance again. In fact, oceans dissolve less carbon dioxide when it reaches low temperatures, which will lead to a reduction in the atmospheric carbon dioxide levels (Fig.1-C), and this will fall in concert with these orbital wobbles, multiplying their impacts. Also, as

mentioned in Fig .1-C, the amount of dusty particle has been increased around 10.5ka to 12.5 ka. It could be a result of a meteorite impact more specifically; it could take place during the younger dryas condition.

After measuring (Fig. 2 and 3) the centricity of how circular a curve is with e=0 describing a circular orbit, $0 < e < 1$ is an elliptic orbit, e=1 describing a parabolic trajectory, and $e > 1$ is for hyperbolic trajectory; taking in consideration the timescale of Earth's eccentricity variation during the 100,000-year cycle as it is represented in "Fig. 2" the orbital eccentricity characterizes in this case how circular e=0.0034 (Fig. 2-H) or slightly elliptical-shaped e=0.058 (Fig. 2-I) our planet Earth orbit around the Sun. Moreover, this orbital eccentricity could explain and even be considered to have directly impacted the climate change recorded in the Asian region. Due to the variations in the quantity of the solar energy received on Earth, as the northern hemisphere winters become relatively longer and the summers become shorter; which will have effects in the sea-level index represented in "Fig. 3". This case observed in the glacial and the interglacial cycles that have driven immense variation in the mean sea level globally (Lambeck and Chappell 2001). These cycles are controlled by eccentricity, which brings us to assume that Milankovitch orbital cycles are the reason for the Earth's glacial and interglacial cycles and the first-order climatic changes, which have caused sea-level oscillations that were important during the Quaternary (Hays, Imbrie & Shackleton, 1976; Muller & MacDonald, 1997; Wunsch, 2004).

(Table. 1 and fig. 4) Graph A (Left) represent the average values of relative sea-level index relevant to observed countries and Graph B (Right) of "fig.4" created based on data mentioned in "table. 1" indicate the average values of relative sea-level data index in Sri Lanka, after analyzing the curves on both graphs it is obvious that during years the average sea-level has been changed, the driving force behind these large-scale changes is 'orbital forcing'. Considering the past period globally speaking so far in the previous 18,000 years ago, the Earth's temperature has risen approximately 9 °F that results in a risen of sea level by 300 feet. 18,000 years ago, the climate begins to warm up (Smith et al., 2013), then 15,000 years ago advance of glaciers halts and sea levels begin to rise, followed by the ice age megafauna that goes extinct

10,000 years ago, still, 8,000 years ago Bering Strait land bridge becomes drowned, stopping the migration of men and animals (Sumanarathna,2017). Collectively, variations in Earth's orbit which are known as eccentricity, obliquity, and precession, can either reinforce signatures of cooling or warming, much more they can counteract each other and produce less severe or ameliorated climate change.

Conclusion

The above results show that the sea-level variations occurred between 12,500 ± 1,500 $_{YBP}$ to 11,000± 1,500 $_{YBP}$, indicating that $25_m \pm 5_m$ recorded to be the lower sea-level documented compared to the current sea-level found around the South Asian region (https://github.com/Alerovere/SEAMIS). Considering the fundamental data of precession, obliquity, and eccentricity, including the glacier cycles data, represent the gradual temperature drop between 13.5ka to 10.5ka. When Earth's orbit becomes more eccentric, the semi-minor axis shortens. That will result in an increase of the seasonal changes magnitude. The sea ice growth is concluded to be a rapid—ice increased in the South Asian ocean affecting the precession stage with long-lasting low sunlight and albedo. Though the situation of planet Earth indicate that we are approaching again the minimum amount of sunlight, in other words, we are going towards a new ice age within no less than 14,000 years (Fig. 5). More further studies based on statistical data of those selected countries are needed, which will give us a clear understanding on what has happened.

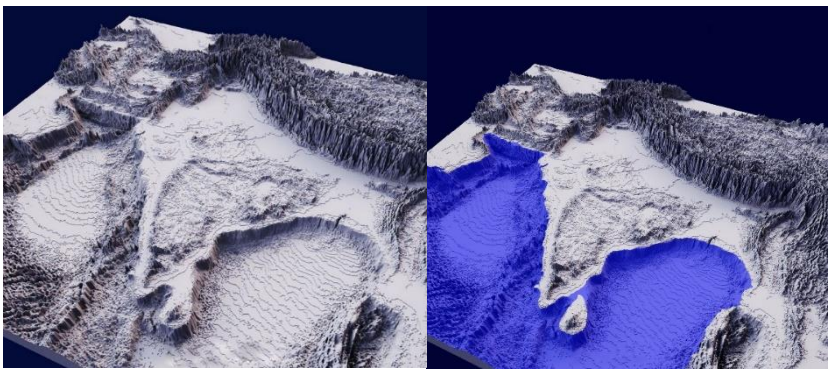

Figure 5: *A simulation model for average sea-level fluctuations in South Asia, around 12,000 yr. BP-12,800yr BP. (Left: Glacier model and Right: Warm and inter glacier model)*

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References

Berger, M.-F. L. and Yin, Q. Z. (2013) 'Glaciation, Causes. Astronomical Theory of Paleoclimates'. In *Encyclopedia of Quaternary Science* (. ed) by S. A. Elias and C. J. Mock. Elsevier: Amsterdam, 136-141.

Elkibbi, M., & Rial, J. A. (2001). An outsider's review of the astronomical theory of the climate: Is the Eccentricity-driven INSOLATION the main driver of the ice ages? *Earth-Science Reviews*, 56(1-4), 161-177. doi:10.1016/s0012-8252(01)00061-7.

Huybers, P., Curry, W. (2006). Links between annual, Milankovitch and continuum temperature variability. *Nature*, 441, 329–332.

Huybers, Peter J. (2006). Early Pleistocene glacial cycles and the integrated summer insolation forcing. *Science*, 313(5786), 508-511.

Lisiecki, L. E., and Raymo, M. E. (2005). A Pliocene-Pleistocene stack of 57 globally distributed benthic d 18O records. *Paleoceanography*, 1-17.

Lisiecki, L. E. (2010). A benthic δ13 C-based proxy for atmospheric pCO 2 over the last 1.5 Myr, *Geophysical Research Letters*,1-5

Lambeck, K. and J. Chappell. (2001). 'Sea Level Change Through the Last Glacial Cycle'. *Science*, 292, 679 – 686.

Mann, T., Bender, M., Lorscheid, T., Stocchi, P., Vacchi, M., Switzer, A. A. (2019). Rovere, Holocene sea levels in Southeast Asia, Maldives, India and Sri Lanka: the SEAMIS database. *Quat. Sci. Rev*.112: 125.

Milankovitch, M. (1930). Mathematische Klimalehre und Astronomische Theorie der Klimaschwankungen. *Handbuch der Klimatologie. 1 Teil A. von Gebrüder Borntraeger*

Katupotha, J. (2019). Holocene sea-level changes of the southern coast of Sri Lanka. *Bulletin of the Sri Lanka Association of Geographers,* Volume 1. No.1 2019, 1-31.

Katupotha, J. Evolution and Geological Significance of Holocene Emerged Shell Beds on the Southern Coastal Zone of Sri Lanka. *Journal of Coastal Research,* Vol. 11, No.4, Fall 1995, 1042-1061.

Katupotha, J. (1989). "Coastal landforms during the Holocene Epoch in Sri Lanka: are they comparable to those in Brazil and Venezuela, Ext. Abs." *International Symposium on Global changes in South America during the Quaternary,* Sao Paulo (Brazil), 188-191.

Katupotha, J. (1988a). "Hiroshima University Radiocarbon Dates l: West and South Coasts of Sri Lanka." 30(1), 125-128.

Katupotha, J. (1988b). "Hiroshima University Radiocarbon Dates ll: West and South Coasts of Sri Lanka." 30 (3), 341-346.

Sumanarathna, A.R., Katupotha, J., El Haouari Aouititen, M. (2019). Comparative Systematic Analysis of Proxy to Indicate Younger Dryas Cooling in Late Pleistocene in Sri Lanka. Conference: *First research conference - Ocean University of Sri Lanka*,01.8.

Sumanarathna, A.R., Katupotha, J., Abeywardhana, K., and Madurapperuma, B. (2017). Extinction of Quaternary mammalian habitats of megafauna in Sabaragamu Basin, Sri Lanka. *Journal of Eco Astronomy*, 01,16-31

Smith, D. E., Harrison, S., and Jordan, J. T. (2013). 'Sea level rise and submarine mass failures on open continental margins. *Quaternary Science Reviews* 82, 93-103.

Wanner, H., Beer, J., Butikofer, J., Crowley, T. J., Cubasch, U., Fluckiger, J., Goose, H., Grosejean, M., Joos, F., Kaplan, J. O., Kuttel, M., Muller, S. A., Prentice, I. C., Solomina, O., Sotcker, T. F., Tarasov, P., Wagen, M., and Widmann, M. (2008). 'Mid-to Late Holocene Climate Change: an overview'. *Quaternary Science Reviews* 27 (19-20), 1791-1828

Buis, A. (2020, May 05). Milankovitch (Orbital) cycles and their role in Earth's Climate – climate Change: Vital signs of the planet. Retrieved February 25, 2021, from https://climate.nasa.gov/news/2948/milankovitch-orbital-cycles-and-their-role-in-earths-climate

Sumanarathna, A. R. (2021, February 02). (PDF) comparative systematic analysis of proxy to INDICATE ... Retrieved February 02, 2021, from https://www.researchgate.net/publication/338073575_Comparative_Systematic_Analysis_of_Proxy_to_Indicate_Younger_Dryas_Cooling_in_Late_Pleistocene_in_Sri_Lanka

Nature Tourism in India-Red Sander Plant Species of YSR District, Andhra Pradesh

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Abstract

The Medical tourism studies report for the year 2015 indicates that more than 2,000,000 patients from abroad travelled to India. Ayurveda has attracted the attention of global population especially the developed countries since ages for the promotion of medical tourism encompassing modern medical sciences and the ancient Indian medical systems Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH). Foreign travellers were coming to India since centuries in search of knowledge. Medical tourism in India is a multibillion-dollar provider industry and attracting millions of foreigners and domestic to visit incredible heritage of country and enjoy the medicinal blessings of traditional Vedas and Upanishads. India is full of well trained, qualified and experienced professionals and doctors. India 's medical tourism sector is expected to experience an annual growth rate of 30%, making it Rs. 9,500-crore industry by 2015. Estimates of the value of medical tourism to India go as high as $2 billion a year by 2012. Currently, India is second only to Thailand in the number of medical tourists it has attracted since the early 1990s. Red sandalwood grown on the shale subsoil, at altitudes around 750 meters (2,460 ft), and in semi-arid climatic conditions gives a distinctive wavy grain margin. Lumber pieces with the wavy grain margin are graded as "A" grade. Red sandalwood with wavy grain margins sells at higher prices than the standard wood in market. Red sandalwood is used for treating digestive tract problems, fluid retention, and coughs and for "blood purification." Red sandalwood might increase the loss of body water through the urine (diuretic effect). Red sanders are used for Cosmetic remedies face pack for dry skin. Many of the Indian hospitals have a holistic center in its premise with more ancient forms of treatments such as yoga and meditation programs, and herbal medicine, naturopathy, homoeopathy, and acupuncture departments.

Keywords: *Cosmetics, Health, India, Medical tourism, Plant species***.**

Introduction

India has a very old civilization of more than 5000 years and is known for her cultural and religious diversities with diverse geographical landmarks. In India, in addition to the existence of modern medicine, indigenous or traditional medical practitioners continue to practice throughout the country. Popular indigenous healthcare traditions include Ayurveda, Siddha, Unani, Naturopathy, and Yoga. Ayurveda provides a complete system of preventive medicine and healthcare, which has been proven as its effectiveness over a long period in India. The science of Ayurveda is based on the knowledge of the human constitution. The five great elements, viz., ether, air, fire, water and earth are manifested into the three biological organizations known as Vata, Pitta and Kapha (Suman kumar Dawn et al., 2011).

Ayurveda is conventional, time-honoured traditional Indian system of medicine native to the Indian subcontinent. In Sanskrit language ***Ayu*** means 'life' and/or 'long life'; ***Veda*** means 'knowledge'. Ayurveda (the knowledge of long life or energetic life) is an integral part of the Indian heritage. The number of studies on the history of Ayurveda is relatively lesser than the studies on other traditional disciplines like music, architecture. Sculpture and philosophy of India. Ayurveda is now redefining its role in India's healthcare industry as modem medicine, popularly known as English medicine, is dominating the Indian medical establishment.

Ayurveda is a mosaic of folk and tribal healing practices and beliefs of people living and migrated into the Indian subcontinent. The approaches to understanding health and longevity, disease and death in the pre and proto historic Indian sub-continent underwent a sea-change with the entry of new tribes with new perspectives and experiences. A wave of urbanization and Sanskritization that swept the Indian subcontinent during the last 3000 years has helped to fuse the pluralistic medical beliefs and practices into an apparently 'complete' medical system, Ayurveda (Ranganayakulu, 2008).

The important treatises of Ayurveda, the *Charaka Samhita* and the *Susruta Samhita* claim the origins of Ayurveda to the god Brahma. Who revealed this knowledge to

Indra? The duo Asvini gods have learned Ayurveda from Indra and transmitted to Atreya, who had six students: among them, Agnivesa and Bhela are well known because their treatises are available today. The *Agnivesa Samhita* is now known as the *Charaka Samhita*. Major portion of the *Bhela Samhita* is also available now. On the one hand, *Charaka* mostly deals with internal medicine (treating diseases with medicines), on the other, the school of Surgery has another proponent, Dhanvantari, the king of Kasi, Susruta was the student of' Dhanvantari, who later compiled the *Susruta Samhita* treatise on surgery.

Ayurveda is an ancient health care tradition that has been practised in India for at least 5,000 years. Though Ayurveda (or) Ayurvedic medicine was documented in the sacred historical texts known as the Vedas many centuries ago, Ayurveda has evolved over the years and is now integrated with other traditional practices, including yoga. National as well as international acceptance of Ayurvedic healing has definitely widened up the bounds and prospects of Ayurveda tourism (or) Medical tourism, with its systematic means of detoxification as enshrined in the process of 'Panchakarma', it proves to be a better option if the affected individuals try to avail of its beneficial methodologies by participating in one of its curative centres.

Ayurveda has attracted the attention of the global population especially the developed countries since ages. Foreign travellers were coming to India for centuries in search of knowledge. They were studying Ayurveda along with religion and philosophy at premier Universities like Nalanda, Taxila and Kashi. This is evident from the amalgamation of various Ayurvedic principles and procedures in other traditional systems of medicine world over. Religious persons also played a major role in propagating Ayurveda in foreign countries. Especially Buddhist religious persons had carried Ayurveda to the Asian countries particularly East Asian countries like Malaysia, Cambodia, Thailand, Myanmar, Japan, Singapore, Korea and Tibet. After the revival of Ayurveda in India with the independence of the country again Ayurveda started to attract the attention of the general public and medical fraternity world over.

The reasons behind the resurgence of interest in Ayurveda in foreign countries can be listed as below: ·

i. Holistic approach as opposed to over specialization.
ii. Importance of individual, its constitution (Prakruti) in the planning of individual diet plan. Concept of homeostasis as a basis of health in Ayurveda.
iii. Importance of sensible lifestyle in harmony with nature, climate and customs. Use of natural resources as medicine to which our body system is geared through predisposition.
iv. Hazardous effect of modern chemical therapeutic agents.
v. Deep spiritual thinking of Ayurveda resulting a respectful attitude towards nature and its ecological balance (Muralidhar, 2016).

Materials and Methodology

The Nature tourism industry in India is currently growing at an immense rate. The Medical tourism report for the year 2015, more than 2,000,000 patients from abroad travelled to India. For the promotion of medical tourism, the Government of India coined a term AYUSH encompassing modern medical sciences and the ancient Indian medical systems viz., Ayurveda, Yoga, Unani, Siddha and Homeopathy. Medical tourism in India is a multibillion-dollar provider industry and attracting millions of foreigners and domestic to visit the incredible heritage of the country and enjoy the medicinal blessings of traditional Vedas and Upanishads. India is full of well trained, qualified and experienced professionals and doctors. India ranks second for medical tourism in the world. Though it spends less than 1.2% of its GDP on medical services but makes extra efforts to provide extra care and services to the foreign tourist while dealing with them. Medical treatment in India is very cost-effective as it charges 20% less than any other foreign country for providing health facilities.

Figure 1: *some of the major countries that promote Medical tourism*
Source: CBC News, 2004

Nature tourism is a growing sector in India. India's medical tourism sector is expected to experience an annual growth rate of 30%, making it a Rs. 9,500-crore industry by 2015. Estimates of the value of medical tourism to India go as high as $2 billion a year by 2012 **(**Anupama Sharma, 2013). Currently, India is second only to Thailand in the number of medical tourists it has attracted since the early 1990s. Also, starting in 2002, India was one of the first countries to promote medical tourism as an export industry by offering special tax incentives to medical tourists' care providers (Connell, 2011), the country's diverse medical-care offerings further enhance India as a good case study. These offerings include advanced, hi-tech medical care such as heart surgeries, dental procedures, and hip resurfacing as well as more holistic forms of treatment such as Ayurveda, yoga, and spa therapy. This range provides abundant research opportunities.

Results and Discussion

It is a light-demanding moderate sized tree growing up to 8 m tall with a trunk 50–150 cm diameter. It is fast-growing when young, reaching 5 m tall in three years even on degraded soils. It is not frost tolerant, being killed by temperatures of -1 °C but stays well at semi-arid climatic conditions. The leaves are alternate, 3–9 cm long, trifoliate with three leaflets. The flowers are produced in short racemes. In Hinduism, this wood has been traditionally used as a sacred wood. The priests and higher-class

casts such as Brahmin extensively use this wood on many of their rituals. It is found mainly in South India, Sri Lanka, and some parts of Nepal and Pakistan.

It is observed that the red sanders grew on the shale type of subsoil, at an altitude of 750 meters above sea level. Red sanders with a wavy grain margin fetch a higher price than non-wavy wood. This species is listed as Endangered by the IUCN, because of overexploitation for its timber. Red sandalwood is grown on the shale subsoil, at altitudes around 750 meters (2,460 ft), and in semi-arid climatic conditions gives a distinctive wavy grain margin. Lumber pieces with the wavy grain margin are graded as "A" grade. Red sandalwood with wavy grain margins sells at higher prices than the standard wood (Ramabrahmam, 2016).

The wood at the center of the trunk (heartwood) is used as medicine. Red sandalwood is used for treating digestive tract problems, fluid retention, and coughs and for "blood purification." Red sandalwood might increase the loss of body water through the urine (diuretic effect). It might also have drying effects that may help reduce diarrhoea and break up mucus to make it easier to cough up. It is used in diseases like cough, vomiting, fever, hyperpiesia, helminthiasis, diseases of the blood and eye, wounds etc. The heartwood and fruits of Rakta Chandana have great medicinal value. It reduces the burning sensation, arrests bleeding, alleviates oedema and ameliorates various skin disorders, hence, is an effective external application as a paste, in burning sensation, headache, dermatomes and ophthalcopathies been extensively used in Ayurveda to treat fever, digestive problem, treating high blood pressure and lowering the Sugar level of diabetic patients.

The heartwood has various uses in traditional medicines and is popular for the treatment of diabetes apart from other ailments. The wood paste is applied externally especially for healing various skin diseases and blemishes. Yerukula and Irula tribes of Chittoor district in Andhra Pradesh use the whole plant of *P. santalinus* for ulcer treatment (Vedavathy, 1997). For treating acute jaundice, about one hundred grams of powdered stem bark is boiled in 500 ml of water for 3-4 hours till the volume is reduced to half the original content. The solution is cooled and then ten grams of

jaggery is added and made into pills, two to three pills are administered every day for ten days (Manjunatha, 2006). Malamalasar tribe of Perambikulam wildlife sanctuary in Kerala considers wood paste as a blood purifier, for curing skin diseases and poisonous affections **(**Bhandari, 2011). Various tribes in coastal Karnataka use Red Sanders as an anti-inflammatory for the treatment of Herpes **(**Reddy, 2010). Also known as *Rakta Chandana Powder/ Pterocarpus santalinus* is a variety of sandalwood powder. It is a dark maroon and has no fragrance to it. It is different from sandalwood powder.

i. It is an antiseptic, wound healing agent.
ii. It is an age-old effective remedy to fight acne, skin rashes, sunburn, blemishes and premature Ageing.
iii. It works equally well for skin and health care.
iv. Use sandalwood powder and green tea mask to ***get rid of wrinkles*** and sun-induced ageing.
v. ***Get rid of scars and pigmentation*** by using a paste of dried lemon peel powder, sandalwood powder, a pinch of turmeric, curd and lemon juice. Excellent for ***removing tan*** too.
vi. Make a paste of red sandalwood powder and rose water. Work well to ***calm down skin rashes*** and angry ripe pimples. Works well with cystic acne too.

Dried out skinned men and women can mix red sandalwood using milk and honey to be able to pack that over confront? Spread this kind of cream in excess of your confront and fret board and wash off using cold mineral water after 20 minutes. The multiple cosmetic uses of Red Sanders are given in the below table.

Regular face pack	Add two three pinches of red sandalwood powder to any regular homemade/store acquired face pack. There you are done adding some sensational ingredient to improve your face pack results!
Acne & black spots	Sandalwood powder should be mixed with tomato juice and used as a face pack to take out tan and lighten skin tone naturally. This particular face pack also helps in getting rid of acne and dark spots effectively, if used regularly.
Blackheads remover	Mix this red sandal lumber powder using rice powdered with required water to use as a facial exfoliating clean. After making use of the stick over your epidermis gently clean in spherical motion using finger guidelines. It allows clearing out there even those stubborn blackheads you could have.
Improve skin tone	Red sandalwood powder can be mixed with your bath therapeutic massage oil to improve the firmness and texture of your skin.
Body spray	Dilute red sandalwood with water and spray this all over your body to minimize excess body heat. This process not just helps in balancing the body's heat, but also stops skin transmissions.

Table 1: *Uses of Red Sanders*

Conclusion and Recommendations

Soukya Holistic Health Center (Fig.2) is located just outside the city of Bangalore in a rural setting. It combines modern medicine with ancient techniques and complementary therapies. Soukya's goal is to treat patients in mind, body, and soul unlike most hospitals, which deal only with the body (soukya.com). The concept of the therapeutic landscape plays a key role at this facility. It is set on a large organic farm that promotes simplicity among nature. Surrounded by gardens, trees, plants and farm animals, this health centre believes in the concept of a therapeutic landscape in promoting healing and good health. Although many Indians frequent the health centre, it is well known for having a large foreign clientele. Over the years, the health centre has attracted notable celebrities from around the world. Most foreign patients at Soukya are from Western Europe and the U.S. The health centre's holistic treatments such as Ayurveda and homoeopathy were the primary draw for medical tourists. The

use of both nature and holistic medicine in the setting forms the therapeutic landscape basis for treatment.

***Figure 2**: Soukya Holistic Health Center, Bangalore (Site 5) Source: Soukya Website*

Certain types of Health & Medical tourism such as massage and yoga therapies and other forms of Holistic treatments may have created a sense of place attachment to particular locations among medical tourists. If these specific locations become therapeutic landscapes, it is likely that medical tourists will frequent them. Indian hospitals that cater to foreign patients use this notion of therapeutic landscape within their hospitals. Many of these hospitals have a holistic centre in its premise with more ancient forms of treatments such as yoga and meditation programs, and herbal medicine, naturopathy, homoeopathy, and acupuncture departments. The hospitals believe that these alternative forms of treatments can be combined with western treatments to enhance the overall health of the patients (Arunkumar, 2014).

The Government agencies must take a lead role to encourage the farmers and entrepreneurs to grow Red Sanders, suggested that, it is imminent to have a sustainable wood trade policy formulated by strongly incorporating stakeholder's perceptions. Therefore, to revive the past glory of this valuable species to mankind, Government agencies, farmers, entrepreneurs and policy makers have to join hands

together in protecting, conserving and sustainably utilizing Red Sanders. Finally, the paper throws much light on not only selling the Red Sanders for commercial value, including the importance of Red sanders in Medical Tourism for future generation to attract the international tourist to the Indian Sub-continent.

References

Anupama Sharma. (2013). Medical tourism: emerging challenges and future prospects. *International Journal of Business and Management Invention, ISSN (Online): (Print): 2319 – 801X* Volume 2 Issue 1. January, 21-29.

Arunkumar, A.N., and Joshi, G. (2014). Pterocarpus santalinus (Red Sanders) an Endemic, Endangered Tree of India: Current Status, Improvement and the Future, *Journal of Tropical Forestry and Environment* Vol. 4. No 02. Tree Improvement and Genetics Division, Institute of Wood Science and Technology, Bangalore. India, 6-7.

Bhandari, M.J. and Chandrashekar, K. R. (2011). Herbal therapy of herpes in the ethno medicine of coastal Karnataka, *Indian Journal of Traditional Knowledge*, (10(3), 528-532.

Connell, J. (2011). A new inequality? Privatization, urban bias, migration, and Medical tourism, *Asia Pacific Viewpoint*, (52(3), 260-271.

Manjunatha, B.K. (2006). Hepato-protective activity of Pterocarpus santalinus L. f. an endangered plant. *Indian Journal of Pharmacology*, 38, 25-28.

Muralidhar & Karthikeyan. (2016). Ayurvedic Tourism in India: Practices and Policies. *Asian Journal of Research in Social Sciences and Humanities, (Vol. 6*, No.6), 1043-1052.

Ramabrahmam, V & Sujatha, C. (2016). *Red Sanders in Rayalaseema Region of Andhra Pradesh: Importance to Commercial & Medicinal Value, IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) e-ISSN: 2278-3008*, (p- Volume 11, Issue 1 Ver. IV), 57-60.

Ranganayakulu, P. (2008). *Ayurveda through the Ages in Andhradesa* [Unpublished doctoral dissertation] Sri Venkateswara University.Tirupati.

Reddy, S and Imrana Qadeer. (2010). Medical tourism in India: Progress or predicament? *Economic and Political Weekly*,14(20).

Suman kumar Dawn, Swati pal. (2011). Medical Tourism in India: Issues, opportunities and Designing Strategies for growth and Development, *International Journal of Multidisciplinary Research*, (Vol.1 Issue 3), 185-202.

Vedavathy, S. Sudhakar, A. and Mrudula, V. (1997). Tribal medicinal plants of Chittoor Ancient, Science of Life, (26), 307-331.

Yeshodharan, K. and Sujana, K.A. (2007). Ethno medical knowledge among Malamalasar tribe of Perambikulam wildlife sanctuary, *Indian Journal of Traditional Knowledge*, 6(3), Kerala, 481-485.

Scientific Investigation of Ancient Sri Lankan Private Labor Room (*Thimbiri Geya*)

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Abstract

Sri Lanka is a proud nation in the world for its ancient architectural and irrigational structures. Unlike today, the hospitals were not served for purpose of natural labor and delivery. Most of the houses have had a private labor room (Thimbiri Geya) for the purpose. However, the architectural plan of the labor room was different from the other bedrooms of the house. The room had provided the better quality of hygienic level and health conditions to the expecting mothers and the newborn babies. The room was sometimes used for other functions including the control of epidemic diseases, control of post childbirth psychosis and for healing wounds. It is interested to understand the scientific concepts behind this labor room and then, to learn and practice them if possible, for today's world. Therefore, experiments were carried out using three sample labor rooms (3×4 square feet sized) under the same environmental conditions to scientifically investigate the ancient architecture. Unit A were constructed similar to the ancient labor room while unit B was constructed similar to the ancient labor room, but the walls were built by cement blocks and unit C was constructed according to the modern-day room with cement floors. These three rooms were monitored for atmospheric temperature, atmospheric humidity, dissolved oxygen (DO) of water samples of well water and pipe born water and microbial actions on some selected food (bread, meat and fish). It was found out that the room temperature and humidity levels of unit A were much lower to the other rooms and the three strata of floor in unit A could be reason for those. In addition, higher DO levels and lower microbial activities were recorded in unit A. The results suggest the usage of ancient system is a way forward approach in the path of sustainability in health care facilities in the modern world. However, it is also advised to have more experiments in a longer time span to reveal more interesting features of the ancient labor room (Thimbiri Geya) in Sri Lanka.

Keywords: *DO levels, microbial activities, relative humidity, room temperature, Thimbiri Geya*

Introduction

Ancient Sri Lankans used their own technology in building storage facilities to store traditional medicine and cultivated harvest. These storage facilities were not only built to a greater technology, but also to a greater success in the architecture. In that era, people did not use the hospitals for natural labor and delivery. It was not because of lack of hospitals (There were many hospitals in ancient Sri Lanka. Each village had a traditional doctor's house (weda gedara) and it was very well equipped for both outdoor and indoor patients), but due to the availability of the labor facilities at homes. Ancient inscriptions (Wickremasinghe, 1994) and Great Chronicle (Mahawamsa, 500 AD) clearly give the evidence of usage of hospitals in ancient Sri Lanka. Eighteen hospitals during the era of King Dutugemunu (161 – 137 BC) and King Parakramabahu I (1153 – 1186 AD) are some of the examples for the high technologies used in ancient Sri Lanka for the health sector. Figure 1 shows the conserved ruins of two ancient hospitals in Sri Lanka.

(a) Mihintale hospital (b) Polonnaruwa hospital

Figure 1: *Ruins of ancient hospitals in Sri Lanka (Prematilleke and Aluvihare, 2011 and 2012)*

Therefore, the hospital culture was not a strange activity to Sri Lanka. Nevertheless, as it was said earlier, the delivery of baby was practiced mostly in lady's parents' house at a specially designed room. This was called *Thimbiri Geya* or *Wedum Geya*

in local language (i.e. in Sinhala). However, if the facility is not available in her parents' house, the expectant mother was taken to the common labor room in the village. This common labor room was well equipped with facilities and many senior ladies used to help the process. One of the national newspapers; Daily Mirror, Sri Lanka had reported (on 15/07/2014) the experience of (probably the last) a senior lady who has voluntarily worked as a midwife in this *Thimbiri Geya.* She has given the helping hand to deliver more than 300 babies in these *Thimbiri Geya* and surprisingly no baby had died during the delivery (Jayarathna, 2014).

There was a separate culture for the newborn and to the mother. The mother and the baby usually stayed in this room for couple of months and people believed, the mother and the newborn baby were protected from common issues like, post-delivery stress and belly button infection (Karunarathna, 2001).

This *Thimbiri Geya* room was not only used as the labor room, but also it was used as the protection area for the patients with Measles, Chickenpox, and other spreading deceases. Consequently, this room had been used as a restroom. Therefore, it is very interested to understand the specific architecture that the ancient people had used. Muddy walls, wooden floors, smaller door, lengthier window, coconut fronds roof or tile roof, thick thread hanging from the roof are common factors in the ancient labor room. In addition, a traditional medicine pack was kept inside the room.

The roof of the labor room was usually covered by Calicut tile (Sinhala tile) or thatched. The walls were constructed by mud or laterite bricks; however, plastered by lime. Front door was smaller compared to the other room doors in the house. The room had one rectangular window or fan light. An important architectural plan was there for the floor of the room. It was covered by timber, mainly by Neem timber (*Margosa* timber). However, underneath the timber layer there were three layers consisting of, 3 – 4 feet sand, mud, and charcoal layers from bottom to top. In between two layers, there was a lime layer.

Therefore, this research presents an experimental investigation of the ancient labor room which was practiced in Sri Lanka. Three rooms were constructed in the same

environment and used to observe and analyze the important architecture of the ancient *Thimbiri Geya*.

Experimental Setups

A model *Thimbiri Geya* (Unit ***A***) was constructed to observe the positive impact of ancient architecture. The dimensions of the room were 4 ft × 3 ft × 4 ft (length × width × height). The room has a front door opening (3 ft height × 1ft width in dimensions) and a side wall window (6 inches × 8 inches in dimensions). The floor of the model *Thimibiri Geya* was structured according to the ancient architecture. A 3 – 4 ft pit was dug and filled it by sand for 3.5 ft. Then, a 3-inch charcoal layer was layered. On top of this charcoal layer a 3-inch limestone layer was placed, and the floor was finished with a 1-inch-thick Neem timber wood on the top (refer Figure 2a). Calicut tiles (Sinhala tiles) were used to cover the structure (refer Figure 2b) as the roof and usual mud compiled with bamboo sticks were used to make the walls (refer Figure 2c).

A – Neem, B – Limestone, C – Charcoal, D - Sand

(a) Floor structure

(b) Bamboo sticks and mud for walls

(c) Side window

*(d) Unit **C***

Figure 2: *Experimental setups*

Two other units ***B*** and ***C*** were constructed to compare the unique architecture of the Unit ***A***. Unit ***B*** and Unit ***C*** were placed at the same environment (Kaluthara district, Sri Lanka) at same size and same dimensions with openings. Cement blocks were used for the walls of Unit ***B***, but the floor architecture was kept as the Unit ***A***. However, the floor in Unit ***C*** was cemented while its walls were constructed by cement blocks.

These three units were tested for several parameters, including the room temperature, relative humidity, dissolved oxygen level (DO), dehydration levels and bacteria growth. Three thermometers (same brand) were used to measure the room temperatures. The room temperature was measured at three times per day (8 am, 2 pm and 8 pm) for 15 days. The readings were recorded at 1ft above the floor level. In addition, three wet and dry humidity meters were kept measuring the humidity of the three units at 8 am, 2 pm and 8 pm for the 15 days. Five well water samples and five tap water samples of similar volumes were kept at each unit to measure the DO levels. Initial and 5 days DO levels were measured using multi-parameter water quality instrument.

Tomatoes, eggplants (brinjals) and bread slices each of 200 g were kept on petri dishes for 5 days to analyze the dehydration levels of the three units. In addition, 100 g of two samples of meat and fish from the same sample were kept in the units for 3 days. However, these meat and fish samples were steamed for 30 minutes before they were kept on sterilized petri dishes. After 3 days, they were observed by magnifying

glasses; however, these were analyzed in detail at National Institute of Health Sciences, Katutara, Sri Lanka.

Results and Discussion

Table 1 shows the average room temperatures of the 15 consecutive days for the three units. The average atmospheric temperatures of the units ***A***, ***B*** and ***C*** were 24.3 ± 1.1 ^{0}C, 26.23 ± 1.13 ^{0}C and 29.65 ± 0.49 ^{0}C, respectively. Therefore, it can be clearly seen that the average temperature of Unit ***C*** is 4 – 6 ^{0}C higher than that of units ***A*** and ***B***. one of the main differences from unit C from other two (A and B) was the floor architecture. Therefore, it can be discussed that the room temperature was controlled to a livable temperature by the special floor arrangement. In addition, Unit A has the lowest average room temperature compared to other two units. Therefore, the special arrangement of the floor and muddy walls have impacted for the room temperature.

Day number	Room temperature (^{0}C)		
	Unit ***A***	Unit ***B***	Unit ***C***
1	26.3	27.7	29.3
2	26.1	28.3	29.3
3	25.1	27.0	30.3
4	25.2	27.1	30.0
5	24.1	27.2	29.3
6	25.4	26.1	30.1
7	23.9	25.3	30.2
8	24.1	25.3	30.3
9	24.1	25.1	30.3
10	24.0	25.3	29.1
11	23.1	24.7	29.2
12	23.0	24.7	29.7
13	22.9	26.3	29.3
14	23.0	27.0	29.0
15	24.2	26.3	29.4
Average	24.3	26.23	29.65

Table 1: *Average room temperatures*

In addition, the average humidity levels of the units showed a similar pattern. Unit ***A*** had a relative humidity level of 68.07% (SD ± 5.71) while the units ***B*** and ***C*** had relative humidity levels of 70.05% (SD ± 10.30) and 89.00% (SD ± 2.01), respectively. Three strata of floor could be the reason for the lower temperatures and lower humidity levels. When the room temperature is at milder, humans feel an un-tired environment. When the relative humidity is at a lowered level (60s and 70s) the sweat of the human body would be easily vaporized and felt a refreshing and pleasantness environment (Tsutsumi et al., 2007). Therefore, these conditions can be expected from the ancient *Thimibiri Geya.*

Table 2 shows the dissolved oxygen levels in two types of water samples after 5 days. The initial DO levels of the water samples of tap water and wet water were 7.4 and

6.9 mg/L, respectively. It can be clearly seen that the DO levels in the Unit ***A*** is and ***B*** are higher than those of the DO values of Unit ***C***. DO levels are a measure of the BOD_5 levels in the water samples (Beck and Young, 1975; Boano *et al.,* 2006; Koivo and Phillips, 1971; Padgett and Papadopoulos, 1979).

Sample	Dissolved oxygen level (mg/L)		
	Unit ***A***	Unit ***B***	Unit ***C***
T_1	7.2	7.2	7.1
T_2	7.3	7.3	7.1
T_3	7.1	7.1	6.9
T_4	7.2	7.1	7.1
T_5	7.2	7.2	6.9
W_1	6.5	6.5	6.4
W_2	6.5	6.4	6.3
W_3	6.4	6.4	6.2
W_4	6.3	6.3	6.2
W_5	6.3	6.3	6.1
T_i	Tab water samples		
W_i	Well water samples		

Table 2: *Dissolved oxygen levels after 5 days*

Furthermore, lower microbial actions were recorded in unit ***A*** and ***B*** compared to unit ***C***. Lower atmospheric temperatures and lower humidity levels could be led to an unfavourable environment to microbial growth. Therefore, the structure of the floor has direct and indirect impact on the living conditions of the *Thimbiri Geya*. The Neem timber has an antiseptic property due to the Azadirachtin. Therefore, that could also be a reason for lower microbial growth.

Unit	Sample number	Bread moisture (g)	Tomato (g)	Eggplant (g)
A	i	1.0	9.9	5.5
	ii	1.8	9.0	5.0
	iii	1.4	8.1	5.5
B	i	1.3	8.4	6.3
	ii	1.8	9.5	5.8
	iii	1.3	8.4	5.7
C	i	2.4	10.5	7.3
	ii	3.2	10	7.8
	iii	2.6	10.03	8.3

Table 3: *Dehydration levels of units*

Table 3 presents the moisture dehydration levels after 5 days. It can be seen that Unit A dehydrates lower amount of moisture compared to other two units. However, the dehydration levels are the highest in Unit C. Therefore, the overall results suggest the usage of ancient *Thimbiri Geya* is a way forward approach in the path of sustainability in health care facilities to the modern world. However, it is also advised to have more experiments in a longer time span to reveal more interesting features of the ancient labor room (*Thimbiri Geya*) in Sri Lanka.

Conclusions

The results revealed that the room temperature in Unit ***A*** has much lowered room temperatures compared to other two units (***B*** and ***C***). In addition, the average room temperatures in Unit ***A*** are usually identified in between the best living temperatures (Speakman, J. and Keijer, J. 2013) in tropical countries, like Sri Lanka. Furthermore, the relative humidity levels of the three units revealed that the humidity in Unit ***A*** is lower than that of other two units. Therefore, there is a clear correlation of the temperature, humidity to the architecture of the units. This was further justified by the bacterial growth of the food items and these analyses conclude that Unit ***A*** has a much better living condition compared to the other two units. Therefore, the special

floor arrangement has good impact. However, it is advisable to conduct more experiment for the sound conclusions.

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Data Availability

The experimental data and the analysis data are available from the corresponding author upon request.

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Conflicts of Interest

The authors declare that there are no conflicts of interest. The first author is a Senior Lecturer in Civil Engineering in the Faculty of Engineering, Sri Lanka Institute of Information Technology, Sri Lanka. The second author is a Senior Museum Curator in Department of Zoology and Environmental Sciences, University of Colombo, Colombo, Sri Lanka.

References

Beck, M., & Young, P. (1975). A dynamic model for DO—BOD relationships in a non-tidal stream. *Water Research*, *9*(9), 769-776. doi: 10.1016/0043-1354(75)90028-7

Boano, F., Revelli, R., & Ridolfi, L. (2006). Stochastic modelling of DO and BOD components in a stream with random inputs. *Advances in Water Resources*, *29*(9), 1341-1350. doi: 10.1016/j.advwatres.2005.10.007

Karunarathna, D. (2001). *Eda Heladiwa (Sinhala translation of An Historical Relation of the Island Ceylon in the East Indies, by Robert Knox)*. 1st edition, Colombo: M D Gunasena Publishers.

Koivo, A., & Phillips, G. (1971). Identification of Mathematical Models for DO and BOD Concentrations in Polluted Streams from Noise Corrupted Measurements. *Water Resources Research*, *7*(4), 853-862. doi: 10.1029/wr007i004p00853

Jayarathna, N. (2014). Valliamma has seen 300 births. *Daily Mirror, Sri Lanka*. [online] Available at: https://www.pressreader.com/sri-lanka/daily-mirror-sri-lanka/20140715/281865821585500 [Accessed 14 Jun. 2019].

Padgett, W., & Papadopoulos, A. (1979). Stochastic models for prediction of bod and do in streams. *Ecological Modelling*, *6*(4), 289-303. doi: 10.1016/0304-3800(79)90042-5

Prematilleke, L. and Aluwihare, A. (2011). *The National Trust – Sri Lanka*.

Prematilleke, L. and Aluwihare, A. (2012). The Archaeology of Buddhist Monastic Hospitals in Ancient Lanka. In: *SAARC International Conference on Archaeology of Buddhism*. Colombo: SAARC Cultural Center, Sri Lanka, pp.84 - 86.

Speakman, J., & Keijer, J. (2013). Not so hot: Optimal housing temperatures for mice to mimic the thermal environment of humans. *Molecular Metabolism*, *2*(1), 5-9. doi: 10.1016/j.molmet.2012.10.002

The Mahavamsa; Great Chronicle. (500 AD). Written by Mahavihara temple, Anuradhapura, Sri Lanka:

Tsutsumi, H., Tanabe, S., Harigaya, J., Iguchi, Y., & Nakamura, G. (2007). Effect of humidity on human comfort and productivity after step changes from warm and humid environment. *Building and Environment*, *42*(12), 4034-4042. doi: 10.1016/j.buildenv.2006.06.037

Wickremasinghe, D. (1994). *Epigraphia Zeylanica being Lithic and other inscriptions of Ceylon Vol 1*. New Delhi, India: Asian Educational Services.

Reviewing the Paleo- Biological Remains of Rajagala Mahalena Cave in The Eastern Province of Sri Lanka.

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ABSTRACT

The Rajagala is the dry lowland of the island, which lies at or below 900m asl, is confined to the north-central and southeastern parts of Sri Lanka. The zone comprises a plain rarely rising above c.40 m asl, but which contains isolated eroded remnants or monadnocks. The site of Rajagala is spread over 1025 acres consisting of more than 700 archaeological remains of prehistoric and historic periods. Preliminary investigations revealed that prehistoric human activity took place in the natural cave of the area before the third century BC. Accordingly, from 2016 to 2019, a selected cave called Maha Lena (ML) was excavated for further investigation. This cave was excavated jointly by Deccan College and the University of Sri Jayawardanepura. Excavations in 2018 and 2019 revealed a large number of prehistoric evidences. Among them are stone tools, bone tools, animal bones, and botanical remains. The main focus of this research paper is to analyze the biological remains found during the excavation of the ML Cave and to assess what the past environment was like through it. We have very limited knowledge of prehistoric research and information in the Eastern Province compared to the Low land Wet Zone of Sri Lanka. Accordingly, the focus was on research questions on the subsistence of prehistoric humans living in the caves of the Eastern Province and how environmental conditions have changed concerning the wet zone. Faunal and botanical remains have been recorded from ML, denoting the prevalence of climatic conditions similar to those of the present.

***Keywords**: Rajagala, Faunal, Botanical, Prehistory, Environment*

Introduction

The present paper is attempted to synthesize the paleo-environment on faunal and botanical remains found during excavations carried out at Rajagala in Ampara District, Eastern Province of Sri Lanka (fig.2). Rajagalatenna, Ampara is famous for being a Buddhist temple complex from the 3rd century BCE. Rajagala monastic complex had been initially named *Girikumhiila Tissa* Pabbatha Viharaya (Paranavithana 1983). The setting of this study spans an area of 4.1 km^2 square kilometres. Rajagala is located at an elevation of 346 m above sea level in the middle part of the mountain. The area in which the site is located in a remarkable zone according to its geological evolution complexity and geomorphologic variability. Rajagala archaeological site could be approached through Ampara - Mahaoya highway near the Rajagalathanne village (Fig.1). The area lies within "N 070 29'42'' and E 810 36'54''. Ampara in the dry zone is surrounded by agricultural province holds. The mean temperature is the 300C. The Highest temperature is 36oC. The lowest temperature is 240C during December and January periods. Annual rainfall is 1400mm and it rains during monsoon time. The dry season from March to September. The rainy period falls from October to February.

This research deals with the study of palaeo- biological remains (faunal and botanical) from excavations at ML season 2018-19. The botanical remains discussed here are segregated from two trenches (Trench No. S8E0 and S8E1) and three pits (Pit No. 1, Pit No. 2, and Pit No. 3). And studied in detail concerning the morphological and anatomical investigation of seeds, fruits, and nuts. These plant remains are likely to have been incorporated in the deposits from certain human activities. However, it is difficult to mention with certainty how and through what sort of activity the material got carbonized and came into the deposits. To define the taxonomic diversity of faunal remains the excavations. To relate these to the environmental setting of the site at various times in the past and to spatial and temporal patterns of past exploitation of animals to integrate zooarchaeological analyses both with other bio archaeological studies and with the archaeology to reconstruct past subsistence systems and paleoenvironment at the site.

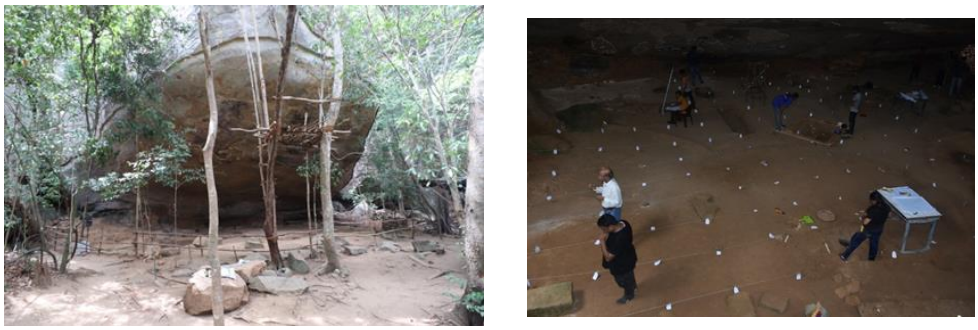

Figure 01: *General overview of the Mahalena cave site*

Materials and Methods

Testing at ML in 2019 was limited to the excavation of test units in the Northeastern corner (Fig.1). Excavation of the Pleistocene rock shelter of ML has yielded a well-sealed and major cultural sequence covering the Mesolithic phase of Sri Lanka (bones, shells, shell fragments, and microliths) (fig. 5).

Biogeographically, the Rajagala area lies within the low country Dry Zone. It supports tropical natural vegetation with grassland, rocky plains, plains, water streams, rough gradients, and man-made tanks. A brief phytogeographical survey of the site in the context of different ecological formations occurring in the Rajagala project area is given herewith for improving understanding of modern and ancient environmental conditions around the site. Botanical remains were segregated from the soil samples by sieving, visual inspection, and classified in Palaeobotany laboratory under low power Stereo-binocular (LEITZ WETZLAR) microscope. It has been found that the plant remains did not actually catch fire during conflagration but burnt slowly, retained their shape and fine morphological details. In most of the remains, the surface is partly eroded and the artefacts of carbonization could be seen. These were critically studied and identified based on external morphological features also, photographed satisfactorily under a research trinocular stereo macroscope (WILD PHOTOMAKROSKOP-M 400 1,25x). The features were then compared with wild and cultivated materials to aid the identification. The measurements were noted with the help of an eyepiece micrometre. To devise sampling strategies for the recovery of various categories of animal remains bones of mammals, reptiles, birds,

fishes, shells crustaceous. ets. The assemblage included faunal remains from Rajagala careful labelling of specimens with exact context data the lifting and packaging of specimens washing and drying of material labelling of all elements recovered storage of material awaiting analysis and card index end catalogue of all samples with full context details. This material was brought from the Rajagala to the University of Jayewardenepura. The identification was made by comparing the reference collection they lived in wet on day zone forest of Sir Lank end also the wild animal lived deer, sambur, buffalos, monkey, mongoose, wild cat, Leopard for which mainly considered in sir lank. The Department of Archeology has a good collection of skeletons of modern animals for comparative studies.

Results and Discussion

The archaeobotanical analysis is exclusively based on twenty samples of well-preserved carbonized plant remains. All the samples were represented by the fragments of wild fruit nuts with charcoal bits (Table 2). These nuts are of Aleurites moluccana (L.) Willd. commonly called candlenut/Indian walnut/Kekuna belong to the family of Euphorbiaceae. Nuts are drupe, subspherical, somewhat laterally compressed, measuring 2.3 cm long and 1.07 cm broad, ovoid, smooth in surface (Fig. 3). These candlenuts are often used cooked called kemiri in Indonesian and buah keras in Malaysian cuisine (Orwa et al. 2009). Nowadays candlenuts are used as food and candlenut oil is in use in South East Asia and the Pacific. By removing the outer hard coat the seeds are pounded and eaten as a thick sauce. 100 gram of seed contains 626 calories energy, 63 gm fat, 19 gm protein, 8 gm total carbohydrate, 7 gm water, 3 gm ash, 200 mg phosphorus, 80 mg calcium, 2 mg iron, and 0.06 mg thiamine. The seed oil is used as a substitute for diesel suitable with its modification and the residue is used for conversion to alcohol or pyrolysis. The Mesolithic habitation at Batadomba Lena (28000 – 11500BP), Belilena Athula (8000BP.), Pothgul Lena Alawala (16000BP.) in the wet zone has yielded large quantities of the edible nut *Canarium Zeylanica* (Kekuna). Remains of *Canarium Zeylanica* were found in prehistoric levels of Rajagala ML excavation. This tree is not found in the dry zone.

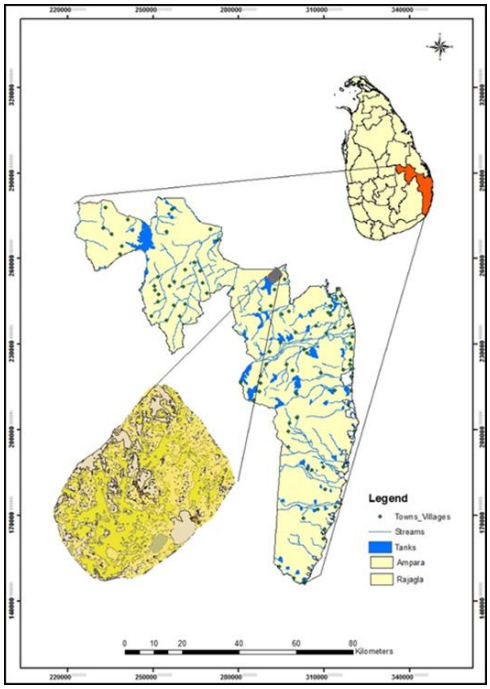

Figure 2: *Rajagala Archaeological Site in Ampara District*

The nut stone was used for cracking nuts of Canarium *Zeylanica*, and the absence of this lithic types in the prehistoric deposits of the dry zone, as opposed to those of the wet zone where it is common, could signify that this tree did not at any time, during the Mesolithic phase of Sri Lanka, grow in the dry zone, which in turn could mean that a wet zone type of rain forest never existed during this period in what is today the dry zone (Deraniyagala 1992).

Faunal assemblages are collected from the Ampara Rajagla ML archaeological research project and have been dealt with separately in the following discussions. More than 32 species of animal belonging to mammals, reptiles, birds, mollusks, crustaceous, and fish were identified from the excavation. The total number of animal bones and shells found out from the Rajagala ML archaeological excavation site is 4935 comprising seven excavation layers. For the analysis maximum number of bones found are 404, shells 197 respectively (fig.4). The identifiable bones element

the considerable number of unidentifiable bones high degree of very small fragmentation of bones this may be due to human and taphonomy activities.

Figure 3: *Nuts of Aleurites moluccanus (L.) Willd. (Candlenut/Indian walnut/Kekuna)*

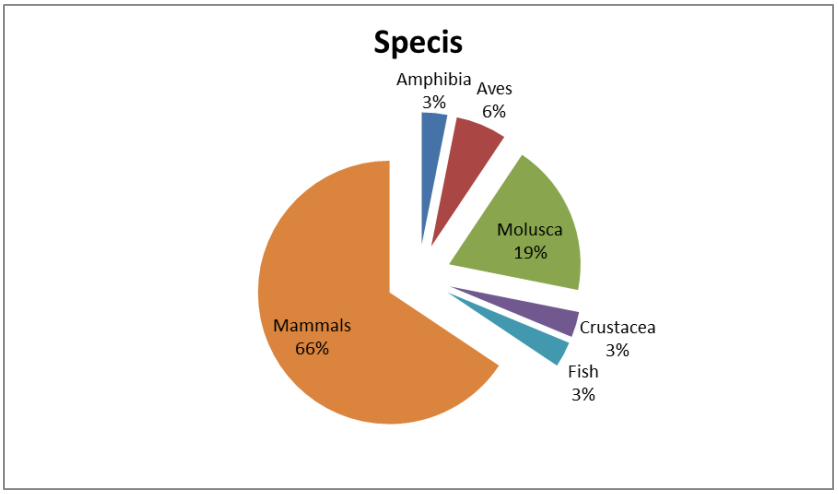

Figure 4: *A chart showing the relative proportion of faunal species*

The excavation in Rajagala habitation yielded a very large quantity of faunal remains from the Mesolithic horizon and the following forms have been identified (Perea 2019): **MAMMALIA**- *Canis aureus lanka*, Ceylon Jackal, *Felis Sp*, Wild Cat, *Panthera Pardus*, Leopard, *Viverricula indika*, Ceylon Small civet – cat, *Pardoxurus*

sp:, Common Indian palm – cat, *Herpestes sp*: , Mongoose , *Lutara lutra,* Otter: **ARTIDACTYLA-** *Bubalus Budalis* Water buffalo, *Axis axis ceylonensis,* Spotted deer, *Cervus unicolor,* Sambur, *Sus Scrofa,* Wild Pig, *Moschiola Meminna,* Mouse Deer: **PRIMATE-** *Semmopithecus Priam,* Tufted Gray Languor, *Trachypithecus vetulu vetlus,* Purple –faced Leaf Monkey, *Macaca sinica sinica,* Toque Monkey: **RODENTIA-** Mouse Rat, *Rattus Sp*:, Rat, *Hystix indica,* Porcupine, *Petinomys fuscocapillus,* Small Cleon Flying –Squirrel, **REPTILES-***Serpentoid Sp*:, Snake, *Varanus Bengalensis,* - Land Monitor, *Melanochelys Triiuga,* Terpin - Hard Shelled, *Lissemys Punctata,* Terpin - Soft Shelled.

Among the molluscs at Rajagala were numerous specimens of the arboreal forms Acavus *sp., bddomea sp. Cyclophorus sp. Tortulosa sp*. and *Lamellidens sp*. (Table 1). The excavation in the caves of Beli Lena, Batadomba Lena, Alu Lena, Kabara galge, Beli galage, Beli Lena, Alawala Potgul Lena has yielded numerous specimens of the arboreal forms *Acavus Prosperus* and *Acavus reseolabiatus* (Deraniyagala 1992; Wejepala 1997; Perera 2010; Adikari 2009). Batadomba Lena has radiocarbon dating from 28500 to 12000BP. have yielded numerous specimens of A. Prosperus and A. Phoenix, which are the same as the species occurring in the vicinity of the cave today (Draniyagala 1992). Acavus has been found in numerous Mesolithic cave habitations in the dry zone, notable instance is Bellan-bandipalassa, Udupiyan galge, Alugalge Telulla, Nilgala cave. Acavus is not live in the dry zone of Sri Lanka. Above snail faunal data suggests that Acavus was brought into the dry zone by a prehistoric man perhaps as an ornament or as an item of exchange.

Class	**Layer**	***Species***	
GATOPODE	3	*Acavus sp*	3
,,	3	*Cyclophorus sp:*	2
,,	3	*Pila sp:*	10
,,	6	*Pila sp:*	3
,,	7	*Acavus sp*	1
,,	7	*Pila sp:*	1
,,	7	*Paludomus sp:*	1
,,	8	*Acavus sp*	6
,,	8	*Cyclophorus sp:*	4
,,	8	*Paludomus sp:*	17
,,	8	*Pila sp:*	34
BIVALIVIA	8	*Lamelliden sp:*	2
,,	8A	*Lamelliden sp:*	2
GATOPODE	8A	*Acavus sp*	4
,,	8A	*Cyclophorus sp:*	3
,,	8A	*Paludomus sp:*	26
,,	8A	*Pila sp:*	66

Table 1: *Detailed Analysis of Major Taxonomy Class Mollusks*

Sr. No.	Trench	Lot	Layer	Depth	Sample
1	S8E0	003			42 fragments of wild fruit nuts with a lot of Charcoal bits Coprolites of some small modern wild animals
2	S8E1	002	4		7 fragments of wild fruit nuts with a lot of Charcoal bits and Coprolites of some small modern wild animals
3	Pit 01		03	80.69 cm	4 small fragments of wild fruit nuts with Charcoal bits
4	Pit 01		16	59.19 cm	13 small fragments of wild fruit nuts with Charcoal bits
5	Pit 01		18	55.99 cm	6 small fragments of wild fruit nuts with Charcoal bits
6	Pit 01		21	57.59 cm	3 small fragments of wild fruit nuts with Charcoal bits
7	Pit 01		22	59.19 cm	13 small fragments of wild fruit nuts with Charcoal bits
8	Pit 01		23	59.69 cm	12 small fragments of wild fruit nuts with Charcoal bits
9	Pit 01	001	24	64.49 cm	22 small fragments of wild fruit nuts with Charcoal bits
10	Pit 01	002	24		Fragments of wild fruit nuts with lot of Charcoal bits
11	Pit 01	002		97.42 cm	11 small fragments of wild fruit nuts with Charcoal bits
12	Pit 01	003	24		27 fragments of wild fruit nuts with lot of Charcoal bits
13	Pit 01	003		S.D.: 97.42 cm E.D.: 97.35 cm	35 fragments of wild fruit nuts with lot of Charcoal bits
14	Pit 01	004	25		2 fragments of wild fruit nuts with Charcoal bits

15	Pit 01	004		80.49 cm	4 fragments of wild fruit nuts with Charcoal bits
16	Pit 01		25	86.69 cm	27 small fragments of wild fruit nuts with Charcoal bits
17	Pit 02	003			5 fragments of wild fruit nuts with Charcoal bits
18	Pit 03	004	03		12 fragments of wild fruit nuts with Charcoal bits
19	Pit 03	004	25		5 fragments of fruit nuts of *Aleurites moluccana* (L.) Willd. (Kekuna) and 6 fragments of wild fruit nuts with Charcoal bits
20	Pit 03	005		98.08 cm	12 fragments of wild fruit nuts with Charcoal bits

Table 2: *Archaeobotanical findings at Rajagala*

Figure 5: *Extent of the Ash pit in Pit 3 and Pit 4*

Conclusion

The 2019 first phase of excavation at ML was very limited but provided quantitative data available are sufficient to understand the Paleoenvironment condition in the prehistoric context. Faunal and botanical remains endemic to the wet zone found among the Rajagala deposits correspond to the ecological pattern of the late Pleistocene wetland. *Canarium Zeylanica* and Acavus sp. endemic to the wetlands may have been brought in by prehistoric man. This implies that there was an exchange between the ecological zones. Palynological evidence gathered from the caves at Beli-lena Kitulgala, Batadomba-lena, and Bellan Bandi Palassa suggests that early Mesolithic groups in the interior and hinterlands exploited a wide range of food plants which included canarium nuts, wild breadfruit, wild bananas, and Dioscorea yams. Faunal evidence from Rajagala suggests a range of animals were eaten that included small vertebrates such as porcupine, mouse-deer, giant squirrel, flying squirrel, civets, pangolin, monkeys, and rats, several species of birds, snakes, molluscs, and several various types of fresh have been documented. There has been no drastic environmental change in the analysis of the present ecological formations around the Rajagala and the botanical remains found during the excavations. palyno-stratigraphic study of two peat swamps in the wet highlands of Sri Lanka's Horton Plains, Premathilake and Risberg (2003) presents a useful summary of generalized climatic trends on the island over the last 25 kya (Premathilake and Risberg 2003). The pollen spectra suggest semi- arid conditions and relatively species-poor plant community 20000- 15500BP. The snail fauna at Batadomba lena , Beli lena from 28500- 11000BP. indicates that moisture conditions during this period of late Pleistocene to early Holocene were scarcely drier than those prevailing today. The above data suggest that the temperature in Sri Lanka had not dropped by more than 6^0C between 28000 and 13000BP. and not over 3^0C between 13000 and 11200BP. (Deraniyagala 1992).

Acknowledgments

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Reference

Abeyratne, Mohan. 1996. "Multi-dating studies of archaeological sites." Australian National University.

Adhikari., G. 2009. Hunting for Hunter-gatherers at Alavala cave. Abstracts volumes, PGIAR publication.

Deraniyagala SU. 1992. The prehistory of Sri Lanka: an ecological perspective, volumes 1 and 2. Colombo: Department of Archaeological Survey.

Deraniyagala, S.U., and K.A.R. Kennedy. 1972. "Bellan-bandi Palassa: a Mesolithic burial site in Ceylon." Ancient Ceylon 2:18-47.

Orwa, C., Mutua, A., Kindt, R., Jamnadass, R., and Anthony, S., 2009. Agroforestree Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, Kenya.

Paranavitana, S. 1983. Inscription of Ceylon Volume II part I, Department of Archaeology, Sri Lanka.

Perera, J. 2019. Analysis of faunal remains at Rajagala mahalena. Unpublished report.

Perera, N. 2010. Prehistoyic Sri Lanka, Late Pleistocene rockshelters and an open –air site. BAR International Series 2142.

Premathilake, R., and J. Risberg. 2003. "Late Quaternary climate history of the Horton Plains, central Sri Lanka." Quaternary Science Reviews 22:1525-1541.

Petraglia, M., Clarkson, C., Boivin, N., Haslam, M., Korisettar, R., Chaubey, G., Ditchfield, P., Fuller, D., James, H., Jones, S., Kivisild, T., Koshy, J., Lahr, M.M., Metspalu, M., Roberts, R., & Arnold, L. (2009). Population increase and environmental deterioration correspond with

microlithic innovations in South Asia ca.35, 000 years ago. Proceedings of the National Academy of Sciences, 106(3), 12261–12266.

Roberts P, Perera N, Wedage O, Deraniyagala S, Perera J, Eregama S, et al. Direct evidence for human reliance on rainforest resources in late Pleistocene Sri Lanka. Science. 2015; 347 (6227):1246–9. https://doi.org/10.1126/science.aaa1230 PMID: 25766234.

Satish S. Naik. 2020. Archaeobotanical Investigations at Rajagala, Sri Lanka. Unpublished report.

Wijepala, W.H. 1997. New light on the prehistory of Sri Lanka in the context of recent investigation at the cave site. Unpublished Ph.D. thesis. Sri Lanka: University of Peradeniya.

Effect of Environmental and Socio-Cultural Impacts Caused by Tourism on Residents' Lives Ancient City of Anuradhapura

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Abstract

Tourism is one of the biggest and fastest-growing sectors in the global economy and has significant environmental, cultural, social, and economic effects, both positive and negative. Yet, relatively few studies have addressed the effect of tourism on residents' lives in Anuradhapura as a major touristic destination in Sri Lanka. Anuradhapura ancient city is one of the UNESCO World Heritage Sites and the first kingdom of Sri Lanka, well known for its ruins depicting early Sri Lankan civilization. The main objective of this study is to investigate whether the impact of tourism makes changes on residents' lives in the ancient city of Anuradhapura. The survey design was quantitative and based on an empirical study. A self-administered questionnaire was used to collect data from the residents of Anuradhapura Ancient city area. A sample of 120 respondents was selected to collect data from the residents. The data was analyzed using SPSS 21 statistical software. Descriptive statistics and Inferential statistics were applied to examine the effect of environmental and socio-cultural impacts caused by tourism on residents' lives. According to the research findings, environmental pollution, social problems, and congestion & crowding out caused by tourism make significant environmental and socio-cultural changes on residents' lives in Anuradhapura ancient city area. The results showed that tourism creates significant environmental and socio-cultural changes in residents' lives in Anuradhapura's ancient city area. Further, this study provides elements for long term benchmark monitoring and observation relating to the resources of the tourism sector.

Keywords – *Ancient City of Anuradhapura, residents' lives, tourism impacts*

Introduction

Tourism is one of the biggest and fastest-growing sectors in the global economy and has significant environmental, cultural, social, and economic positive and negative impacts. Although tourism has an advantage as a contributor to economic development that has a negative impact on the environment and society (Malra, 2012). Those negative impacts can result in declining of tourist destinations (Pratiwi, 2017). According to C. M. Hall and A. A. Lew (2009) tourism brings a substantial amount of social, environmental, economic, and political impacts as the world's largest industries. Tourism creates various impacts on the environment at a number of different scales. (C. M. Hall & A. A. Lew, 2009). Tourism is considered a high-risk economic activity for the environment. Tourism is seen by its operators as an economic phenomenon and not a social one. The spatial and temporal concentration of tourist demand, which is the cause of many of the environmental damages (Romita, 2007). Tourism is a cultural phenomenon and tourism characteristic by social and cultural elements. Also, tourism influences cultures and society. It is often challenging to differentiate cause and effect in the relationship between tourism and society (C. M. Hall & A. A. Lew, 2009).

Anuradhapura is one of the ancient cities in Sri Lanka, well known for its ruins depicting early Sri Lankan civilization. It is very famous among Buddhist pilgrims. Anuradhapura was earlier the capital of the Island (in ancient times) and most of the Kings who ruled Sri Lanka resided in this vast city. The city is now named as a world heritage site by UNESCO. Anuradhapura is well known for pilgrimage tourism worldwide, which is practiced in the forms of visiting The Eight Great Places, organizing religious programmes on Poya days, and performing rituals. It is a centuries-old practice that has become a way of life, as it provides livelihoods to the local people.

Also, thousands of tourists reach Anuradhapura ancient city to visit for its historic value, architecture, river civilization, religious rituals in song, dance forms, literature, ancient lifestyle, traditional foods, restaurants and accommodation facilities, transport facilities, attractive places provide great value for the tourism industry in

Anuradhapura area. Especially most of the people reach Anuradhapura during the May, June and July months because of the Poya days with activities like Sil campaigns, Bodhi Poojas, Dansalas, Poson devotional songs, Poson pandols lanterns. Therefore, the Anuradhapura area has faced economic, environmental and socio-cultural changes because of the touristic activities.

Problem Statement

As observed during the primary survey Anuradhapura ancient city faces the following environmental problems of pilgrims and tourists. Pollution of rivers/lakes or other water bodies, disposal of untreated sewage and absence of sanitation facilities, discriminate disposal of solid waste, contamination of drinking water systems, the risk of spreading water-borne diseases due to the absence of health and sanitation facilities and other problems such as noise pollution, dust pollution, etc. Use of polythene is unavoidable in the present situation, where everything, especially food items, comes in package form in either plastic, polythene or other similar substances. Sometimes pilgrims seem to have forgotten the value of preserving the highly green and bio-diversely rich environment as mounds of polythene and plastics pile up at the end of their travel.

Due to tourism activities, most of the residents in the Anuradhapura area engage with the tourism sector and they give up the agriculture industry. Also, they have to find different occupations from time to time due to the seasonality of tourism. While tourists travel within Anuradhapura area they create a huge demand for local products and services and increase the cost of the goods and services. Currently, demand for land has increased around the Anuradhapura ancient city and this may cause the inflation of land value.

Likewise, socio-cultural changes created by tourism in Anuradhapura ancient city area like, changes in habits, clothing, and lifestyle, school drop off, child labor, crime, prostitution, illegal business, etc. Abandonment of traditional activities, overcrowding of local attractions and amenity, and over-commercialization of the cultural and heritage features increased the socio-cultural changes in the

Anuradhapura area. Tourists' colonization in the area may cause the breakdown of host community values.

Therefore, this study is going to focus on the environmental changes and socio-cultural changes caused by tourism activities in Anuradhapura ancient city area. Even though few studies addressed the tourism impact, very few studies have examined tourism impact cause to make the change on the residents' life in Anuradhapura. So, this study hopes to identify the environmental & socio-cultural changes due to tourism sector development.

Research Objectives

General Objective

- The aim of the study is to investigate whether the environmental & socio-cultural impacts of tourism make changes on the resident's life in Anuradhapura ancient city.

Specific Objectives

- To identify the factors which create hindrance in the sustainable development of tourism in the study area.
- To identify the factors that affect on environmental and socio-cultural changes on the resident's life in Anuradhapura ancient city.
- To suggest recommendations which develop tourism in Anuradhapura ancient city in a more sustainable way.

Literature Review

WTO (1991) defined tourism as the activities of a person travelling outside his or her usual environment for less than a specified period of time whose main purpose of travel is other than for exercise of an activity remunerated from the place visited. Primarily tourism seen as a leisure activity involving travel away from a person's normal place of residence, but tourism is an industry, including a wide range of individual and collective human activity. Also, leisure and tourism are seen as activities engaged in by individual and groups, but also as service industries which involve the public sector, non-profit and commercial organizations. Leisure and

tourism overlap in activities such as attending cultural or sporting events and in visiting natural and cultural heritage sites. Furthermore, as an industry, tourism encompasses non-leisure activities, such as business travel or attending conventions (Veal, 2017).

In present Tourism industry is globally spread and involving millions of people in international as well as domestic travel every year. Millions of dollars are spent every year on marketing and promoting holidays and tourism products. Millions of people globally work directly in the industry and many more are employed indirectly. Hundreds of millions of people are on the getting end of tourism activity as they live in what are termed destination areas, in supposed 'host' populations (Mason, 2015)

Tourism is an industry with enormous economic impacts. It is also an industry that has many environmental and social consequences. A thorough understanding of each component of the tourism phenomenon is essential so that those involved with planning, management, and policy determination have a basis for decision-making (Kim, 2002; Kim , Uysal , & Sirgy 2012). Tourism impacts are multi-faceted and therefore are challenging to plan for and manage. Therefore tourists, host communities and industry members must consider a number of approaches and procedures for managing tourism impacts successfully (Mason, 2015)

Deforestation and effects to wildlife

Destruction and alteration of an ecosystem is a major issue due to the tourism activities including hunting, fishing and collecting activities, the land is cleared or modified to the infrastructure needed for tourism activities and disturb feeding & breeding patterns of animals (Green & Giese, 2004; Rath & Gupta, 2017). The improvement of tourist activities and the intensive land exploitation caused a rapidly declining and reduction of the environmental, cultural and social resources (Pratiwi, 2017).

Solid waste issues

Sewage disposal is a serious problem in areas such as scenic areas, roadsides and near to water bodies. Construction of recreation and other facilities, sewage from hotels

and other accommodation facilities and sewage carried by visitors leads to increased sewage pollution. Sewage causes serious damage to the health of humans and animals, the physical appearance of the tourist attraction, water resources and biodiversity (Aljohani, 2018; Rath & Gupta, 2017).

Environmental pollution

Tourism is regarded as a high-risk economic activity for the environment and tourism generate numerous effects on the environment at a number of different scales (C. Hall & A. Lew, 2009; Romita, 2007). Because of various tourism activities, hidden tourism, high usage of the automobiles and unsuitable development of infrastructure and utilities such as hotels, resorts, and restaurants create a negative impact on the environment.

Social problems

Social problems raised due to transformation and deterioration of values in religion, social and moral. Tourism cause a rise in the use of drugs, illegal business, prostitution, child abuse, child labor and human trafficking. Also increased gambling, drunkenness, prostitution, vice and drugs, theft and petty crimes and other illegal practices and conflict among the tourist and the local people (Nayomi & Gnanapala, 2015; Pratheep, 2017).

Cultural problems

Damages to cultural resources more serious than those to natural resources. Cultural impact base on protecting and preserving the cultural heritage and certain associated issues. Because of expanding tourism industry there can be a severe cultural and ecological damages (Pratheep, 2017). Construction of buildings that clash with the surrounding environment caused to architectural damage and reduce the aesthetic appeal of a destination (Rabbany et al., 2013).

Congestion & crowding out

Traffic congestion occurred when destinations receive a high number of tourists than its carrying capacity. Therefore large areas of agricultural and forest lands have been replaced by infrastructure and buildings including restaurants, hotels, shopping

complexes, recreation areas and access roads for the reduction in traffic congestion (Keson et al., 2017; Prueksakorn et al., 2018).

Materials & Methodology

Population of the Study

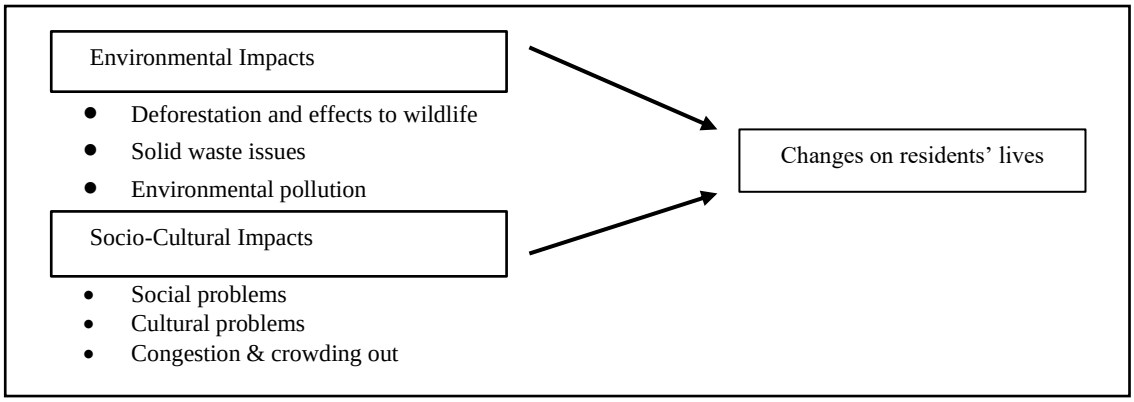
The overall research is conducted by considering all the residents which belong to Anuradhapura ancient city area. According to records of Nuwaragam Palatha Central Divisional Secretariat, currently, 18433 residents are living in Anuradhapura ancient city area.

Sample of the Study

In this study, the researcher selected a sample using non-probability, convenience sampling by considering the time limitation, cost limitation, and convenience of the research requirements. Thereby sample was selected as 120 residents from total population.

The Sources of Data and Data Collection Methods

Preliminary questions are based on demographic questions and others are based on Likert scale questions with five indicating Strongly Agree and one indicating Strongly Disagree. The aim of seeking both responses is to gather a mixture of data from the residents for the ultimate result. Primary data collected by providing a standard questionnaire with the language of English and it translated to Sinhala for distributing among residents in Anuradhapura ancient city. Before conducting the questionnaire survey the researcher had to conduct Pilot Testing to collect feedback about the questionnaire. Accordingly, the questionnaire developed in this study was administered after pre-testing among 20 residents in Anuradhapura ancient city area. The pretesting aimed to clarify the wording of both the questionnaire instructions and questions. No significant issues were raised.



Conceptual Framework

Figure 1: *conceptual framework of the study Developed by the researcher (2019)*

Operationalization of the Variables

Variable	Dimension	Indicator
Independent Variable	Deforestation and effects to the wildlife (Likert Scale)	Damage to the fragile natural environment
		Destroy forests and wildlife by illegal activities
		Wildlife loss their natural habitat
		Plants, animals, rocks, and natural pieces collect
		Forest and agriculture areas use for tourism
	Solid waste issues (Likert Scale)	Garbage build-up in public areas
		People not properly discharge wastes
		No proper awareness for waste management
		Discharging, re-using, or recycling the wastes
		Various health issues due to garbage
	Environment pollution (Likert Scale)	The environment has destroyed by the tourism
		Less environmental interest among tourist
		Increase visual and land pollution
		Increase air and noise pollution
		Not use water sources and water bodies properly.
		Weaker regulation for protecting the environment
	Social problem	People tend to do tourism-related jobs

	(Likert Scale)	Encourages drugs and alcohol consumption
		Encourages crime activities
		Tourism benefits reach only a small group
		Tourists over-use basic facilities
		Misunderstanding and conflicts arise between residents and tourists
	Cultural problem (Likert Scale)	Damage the cultural properties and values
		Changes of historic settlements
		People abandon traditional activities
		Behavioral changes of young people
		Commercialize the cultural artifacts
		Neglect the cultural, religious, historical building and spaces
	Congestion & crowding out (Likert Scale)	Tourism creates crowded public places
		Overloaded infrastructure during peak months
		Level public open spaces for resident use
		Traffic, congestion and parking problems
		Sanitary & health issues
Dependent variable	**Environmental and socio-cultural issues on residents**	Tourism creates a significant environmental issue on resident life
		Tourism creates a significant socio-cultural issue on resident life
		Invites moral degradation
		Tourist colonization and breakdown of host community values
		Environmental hazards and land use conflicts
		Loss of natural beauty, biodiversity, wildlife, and impacts on environmental balance

Table 1: *Operationalization of independent and dependent variables (Source: Developed by Researcher using relevant literature, 2019)*

Data Analysis Techniques.

The five-point Likert scale was used in questionnaires. The degree of agreement or disagreement of the respondents for each variable ranged from strongly disagree to strongly agree with the assigned value from 1 to 5 respectively from negative statements. Data analyzed by using multiple linear regressions and descriptive statistical techniques, graphs, charts, and tables were used for the graphical representation part of the study.

Result and Discussion

Descriptive Analysis

According to Descriptive Statistics, solid waste issues toward the changes on residents' lives are relatively high (M=4.08, SD=0.70). But considering the Skewness, it is -0.542 which means it is negatively skewed. The congestion and crowding out toward the changes on residents' lives is also relatively high (M=3.74, SD=0.696). It also negatively skewed (-0.662). Deforestation and effects to wildlife toward changes on residents' lives is also relatively high (M=3.72, SD=0.72). When considering the Skewness, it is -0.368 which means it is also negatively skewed.

Variable	Mean	Std. Deviation	Skewness
Deforestation and Effects to Wildlife	3.7267	.72503	-.368
Solid Waste Issues	4.0819	.70875	-.542
Environment Pollution	3.4431	.70363	-.976
Social Problem	3.5000	.65144	.089
Cultural Problem	3.4319	.68412	-.109
Congestion and Crowding out	3.7400	.69650	-.662
Changes on Residents' lives	3.5375	.63048	-.469
Valid N (list wise)			

***Table 2**: Descriptive Statistics Source: Survey Data (2019)*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.775[a]	.601	.580	.40852	2.098
a. Predictors: (Constant), Congestion and crowding out, Socio problems, Solid waste, Cultural problems, Environmental pollution, Deforestation and wildlife					

Table 3: *Regression Analysis (Model Summary Table) Source: Survey Data (2019)*

According to table 4.8, the "R" value shows the simple correlation and it was 0.775. The adjusted R square value indicates how much of the total variation in the dependent variable can be explained by the independent variables. According to the above result, 58 % of changes on residents' lives were described by the independent variables taken under model 1, and the remaining 42 % of changes on residents' lives are described by other factors that are beyond in the study. Durbin-Watson is 2.098 and it demonstrates that there is a strong positive relationship between independent and dependent variables.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.445	6	4.741	28.408	.000[b]
	Residual	18.858	113	.167		
	Total	47.303	119			
a. Dependent Variable: Changes on residents' lives						
b. Predictors: (Constant), Congestion and Crowding Out, Socio Problems, Solid Waste, Cultural Problems, Environmental Pollution, Deforestation and Wildlife.						

Table 4: *Regression Analysis (ANOVA Table) Source: Survey Data (2019)*

According to the above ANOVA table, F value is 28.408 and the significant value is 0.000 (P<0.001). It is represented that the significant relationship between independent variables and the dependent variables.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.366	.316		1.157	.250
	Deforestation & effect to wildlife	.025	.060	.029	.422	.674
	Solid Waste	.025	.057	.028	.441	.660
	Environment Pollution	.144	.071	.160	2.010	.047
	Social Problem	.183	.082	.189	2.231	.028
	Cultural Problem	.054	.072	.059	.750	.455
	Congestion Crowding out	.442	.073	.488	6.070	.000
a. Dependent Variable: Changes on residents' lives						

Table 5: *Regression Analysis (Coefficient Table) Source: Survey Data (2019)*

Model		Collinearity Statistics	
		Tolerance	VIF
1	Deforestation effect to wildlife	.749	1.336
	Solid waste	.846	1.182
	Environment pollution	.556	1.799
	Social problem	.490	2.040
	Cultural problem	.575	1.739
	Congestion Crowding out	.545	1.834
a. Dependent Variable: Environmental and sociocultural issues			

Table 6: *Results of Multicollinearity Source: Survey Data (2019)*

Hypothesis		Regression
H1	Deforestation & effects to wildlife due to tourism significantly influence changes in residents' lives in Anuradhapura ancient city	Rejected
H2	Solid waste issues caused by tourism significantly influence changes in residents' lives in Anuradhapura ancient city	Rejected
H3	Environmental pollution caused by tourism significantly influence changes in residents' lives in Anuradhapura ancient city	Supported
H4	Socio problems caused by tourism significantly influence on the changes in residents' lives in Anuradhapura ancient city	Supported
H5	Cultural problems caused by tourism significantly influence changes in residents' lives in Anuradhapura ancient city	Rejected
H6	Congestion & crowding caused by tourism significantly influence changes in residents' lives in Anuradhapura ancient city	Supported

Table 7*: Summary of hypothesis testing Source: Developed by researcher base on survey data (2019)*

Conclusion

The general objective of this research is to identify the environmental and socio-cultural issues caused by tourism on residents' life in Anuradhapura ancient city. Based on the extensive literature survey conducted by the researcher selected six factors as independent variables of the study. Based on the research findings, the

researcher conveys that social problems, environmental pollution, and congestion & crowding out due to the tourism development in Anuradhapura ancient city make significant environmental and socio-cultural issues on residents' life. Also, deforestation and effects to wildlife, solid waste issues and cultural problems may affect the environmental and social-cultural issues on residents' life in Anuradhapura ancient city but according to analysis results, deforestation and effects to wildlife, solid waste issues, and cultural problems are not much strongly affecting the environmental and socio-cultural issues on residents' life in Anuradhapura ancient city.

Recommendations

Tourism activities, especially pilgrimage tourism in ancient cities, cultural & religious places have multiple impacts on the socio-cultural conditions and on the environment. Further, institutional supports and proper policy measures are lagging. Thus, these negative drivers altogether impede the strengthening of tourism activities. Providing proper infrastructural facilities lodging, boarding, transportation, and institutional services, keeping landscape fragility/vulnerability, and carrying capacity of pilgrimage centres in mind, will enhance the socio-cultural development and reduce environmental pollution. Exclusive policy measures should be adopted that should be socially and environmentally sound.

The government should pay attention to area development and infrastructure facilities not only for the tourism but also every land use in a sustainable manner when it is socially and environmentally desired by society, provide the proper planning and management programs for the tourism development activities, should introduce the laws and regulations regarding proper land use planning and tourism policies to avoid the social and environmental problems, provide the manual and guideline about the tourism to the local authorities and people, maintain the quality of the tourism destination.

References

Aljohani, M. (2018). *A Study of the Impact of Tourism on the Environment and Jeddah Citizen's Perceptions toward Tourism in Jeddah, Saudi Arabia.* Electronic Theses & Dissertations Collection for Atlanta University & Clark Atlanta University,

Buckley, R. (2011). Understanding and Managing Tourism Impacts: an Integrated Approach. *Journal of Ecotourism, 10*(2), 177- 178. doi:10.1080/14724049.2011.568754

Bulankulama, S. W. G. K. (2014). Potential of Tourism Industry in Anuradhapura, Sri Lanka. *Journal of Social Science, 1*(1), 58-73

Chandralal, K. P. L. (2010). Impacts of tourism and community attitude towards tourism: a case study in Sri Lanka. *South Asian Journal of Tourism and Heritage, 3*(2). 41-49

Cordero, J. C. M. (2008). Residents' perception of tourism: a critical theoretical and methodological review. *CIENCIA ergo-sum, 15*(1), 35-44.

Dokulil, M. T. (2014). Environmental impacts of tourism on lakes. In *Eutrophication: causes, consequences and control* (pp. 81-88): Springer.

García, F. A., Vázquez, A. B., & Macías, R. C. (2015). Resident's attitudes towards the impacts of tourism. *Tourism Management Perspectives, 13*, 33-40.

Hall, C., & Lew, A. (2009). *Understanding and Managing Tourism Impacts: An Integrated Approach*.

Imon, S. S. (2017). Cultural heritage management under tourism pressure. *Worldwide Hospitality and Tourism Themes, 9*(3), 335-348. doi:10.1108/WHATT-02-2017-0007

Kim , K., Uysal , M., & Sirgy , M. J. (2012). How does tourism in a community impact the quality of life of community residents? *Journal of Tourism Management*, 1-14.

Malra, R. (2012). *Environment Impacts of Tourism.: Case study of selected destinations of Uttarakhand (India)* (9783845472607 ed.): LAP LAMBERT Academic Publishing.

Mason, P. (2015). *Tourism impacts, planning and management*: Routledge.

Mathur, A. (2011). Social Change and the Impacts of Tourism on the Modern Society. *International Journal of Research in Management, Economics and Commerce, 1*(2), 285-290.

Nayomi, G., & Gnanapala, W. K. A. (2015). Socio-Economic Impacts on Local Community through Tourism Development with Special Reference to Heritance Kandalama. *Tourism, Leisure and Global Change, 2*, 57-73.

Pratheep, P. S. (2017). The Impact of Tourism on Indian Culture. *The 4th International Conference on Language, Society and Culture in Asian Contexts, KnE Social Sciences*, 429-437. doi:10.18502/kss.v1i3.765

Rabbany, M. G., Afrin, S., Rahman, A., Islam, F., & Hoque, F. (2013). Environmental Effects of Tourism. *American Journal of Environment, Energy and Power Research, 1*(7), 117-130.

Rath, N., & Gupta, R. (2017). Environmental Impact of Tourism. *2*(3), 50-53.

Reid, D. G. (2002). Development of cultural tourism in Africa: A community based approach. *Cultural tourism in Africa: Strategies for the new millennium*, 25-44.

Romita, T. (2007). Sustainable Tourism: The Environmental Impact of "Undetected" Tourism. *An International Multidisciplinary Journal of Tourism, 2*(1), 47-62.

Salazar, N. B. (2012). Community-based cultural tourism: Issues, threats and opportunities. *Journal of Sustainable Tourism, 20*(1), 9-22.

Semenova, O. (2013). *Environmental Impacts of Tourism. Case: Pyynikki Outdoor Recreation Area.* (Degree Programme in Tourism Bachelor's thesis), Tampere University of Applied Sciences.

Shahzalal, M. (2016). Positive and Negative Impacts of Tourism on Culture: A Critical Review of Examples from the Contemporary Literature. *Journal of Tourism, Hospitality and Sports, 20*, 30-34.

Sharma, B., & Dyer, P. (2009). Residents' involvement in tourism and their perceptions of tourism impacts. *Benchmarking: An International Journal*, *16*(3), 351–371.https://doi.org/10.1108/14635770910961371

Simão, J., & Môsso, A. (2013). Residents' perceptions towards tourism development: the case of Sal Island. *International Journal of Development Issues, 12*(2), 140-157.

Simkova, E., & Kasal, J. (2012). Impact of Tourism on the Environment of a Destination. *Recent Advances in Energy, Environment and Economic Development, 23*, 439-444.

Stefănica, M., & Butnaru, G. I. (2015). Research on tourists' perception of the relationship between tourism and environment. *Procedia Economics and Finance, 20*, 595-600.

Wimalaratana, W. (2013). Cultural tourism potential in the north Central Province of Sri Lanka. *Journal of Economic Development, 217*(15-40). https://doi.org/10.24311/jed/2013.217.01

Bamboo Crafts and Associated Knowledge System of The Karbi Tribe of Assam Plains, North- Eastern India: A Cultural Heritage

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Abstract

Bamboo, one of the precious plant resources of the earth, plays a cardinal role in influencing civilised life patterns in Southern and Eastern Asian countries, where they are found in abundance. It has a long history in people's lives as cultural material. India is the second richest country in the generic bamboo resources after China. In India, bamboo is one of the most important forest species and has a wide distribution throughout the country and contributes to the rural economy. The North-Eastern region of India has a rich diversity of bamboo. It is integral to the life and culture of the ethnic communities of this region. In this area, the usage of bamboo made it an indispensable commodity for the rural people. The Karbi tribe of the Assam State of India has a rich cultural heritage of arts and crafts. They are masters in the skilful tradition of bamboo craft. Bamboo is an indispensable part of their livelihood mostly in food, shelter, household items, basketry, fishing gear, musical instrument, medicine, furniture and other various ethno-religious purposes. Various bamboo craft traditions of the community get the most creative expression through skill and the traditional knowledge of craftsmanship. This knowledge is essentially community-specific and restricted to the community and is accumulated through long interaction with the environment. Nowadays, this craft tradition is on the verge of extinction due to many reasons. Therefore, it is a timely requirement to document this craft tradition associated with the traditional knowledge system and wisdom. The present study has been designed in this context. During the study, standard anthropological methods have been applied. The present paper is based on the authors' empirical findings, and it probes into the cultural heritage of bamboo crafts of the Karbi community, which is governed by traditional knowledge and skills through empiricism. The paper also focuses on the importance and cultural significance of bamboo within the said community. The study also highlights this craft tradition's present scenario and provides recommendations to revive this heritage tradition.

Keywords: *Karbi, Traditional bamboo craft, Myth and Taboo, Craftsmen, Knowledge system, Cultural heritage*

Introduction

Bamboo (sub-family *Bambusoideae*, family *Poaceae*) is intricately connected with people from time immemorial, satisfying every human need, especially in East and South-East Asian regions. It has a long history in people's lives as cultural material. The utilization of bamboo goes back to 5000 years ago and found from China. The pictographic image for "bamboo" was found on the earthenware unearthed in the *Yangshao* cultural relics of Banpo Village, Xi'an in 1954. The symbol was likewise found in oracle bone inscriptions on old bronze articles. From the Warring States Period (475-221 BC) to the Jin Dynasty (265-420 AD), individuals wrote on "bamboo slips" (Bain, 2019). It is worth mentioning that bamboos are intermixed profoundly with the rural populace's everyday existence and are vital to their cultural, traditional, social, and economic necessities (Tewari, 1988; Madhab, 2003; Liese and Kohl, 2015). Bamboo also gives significant natural advantages. It has been seen that it is utilized for ecological purposes in numerous nations, for example, soil stabilization and erosion prevention on slope inclines and skirts. Bamboo is a multipurpose plant with a horde of applications such as human culture that uses construction material, furniture, walls, handicrafts, pulp and paper, edible shoots, and animal fodder. In India, bamboo products are of two sorts: articles needed for everyday use and of mid-range quality, which fit local necessities. Another category is articles of more refined quality, both decorative and useful, to meet more sophisticated business sectors' needs and tastes. It has been the companion of the majority of ethnic craftsmen In India. The bamboo plant plays a role in the tribal folklore of India. It is a typical belief in a few ethnic societies that humankind arose out of a bamboo stem. In certain parts of India, bamboo is additionally called *Kalpavriksha* (a sacred tree in Indian mythology satisfying all the requirements and desires) because of its various uses in everyday life in physical as well as in spiritual form. First immediate reference to bamboo in Indian literature is in *Rig Veda* (5000 BC). The plant also got a special mentioning in the great Indian epic, where Lord Krishna's flute was made of bamboo. The prologue to *Mahabharata* specifies about groves of bamboo. It is said that the Buddhist monks who went to Japan from

India to spread Buddhism had carried seeds of bamboo with them (Ghosh, 2014). These accounts propose that bamboo was fulfilling numerous needs in those days and that it was an essential part of individuals' lives. As a benevolent 'wood', bamboo offers itself a range of uses. Strips of bamboo are utilized by craftsmen in almost every state of the country. It has been seen that in India, Mongoloid people are principally engaged in bamboo crafts. They are specialized and inhabited in the North-Eastern part of the nation (spread over an area of 262179 km^2 representing around 8% of the nation's total geographical area) where they have access to a broad range of bamboo forests. This racial group links itself culturally and genetically to the people of Myanmar, Thailand, Tibet, Indonesia, and Vietnam where bamboo craft displays the absolute best hand skills on the planet (Bain, 2019). The North-Eastern locale houses about two-thirds of the nation's bamboo resources spreading over a territory of about 3.10 million hectares where 89 types of bamboo species are available. This substantial endowment of nature to the locale is indispensable to life and culture of all the ethnic groups of North-Eastern India. Its multipurpose uses have made it an imperative resource for rural people. As it is an inseparable and intrinsic part of the ethnic communities' everyday lives, it has also been incorporated in their social and cultural events (Acharya et al., 2015). Studies on the crafts work of the Karbi community began during the British colonial rule. The earlier work was done by the British officers who gathered certain data on crafts other than their official obligations. Elwin (1959) and Alemchiba (1968) have made special reports on Arunachal Pradesh and Nagaland's art, respectively. A few monographs on the tribes of North-Eastern India written by British administrators and contemporary anthropologists also have made plentiful references about the rich artistic accomplishments of the region's people. These reports, however, are quiet about the rich aesthetic crafts of the Karbis. Therefore, subsequently, the current study has been designed to do the needful.

Material and Method

The current study had been done within the Karbi tribal community in the Sonapur Tehsil of Kamrup Metropolitan District, Assam. Altogether twelve villages have been

chosen for the fieldwork, such as Khetri, Sholoibari Gaon Bargog N C, Nakuchi, Tegheria Gaon, Ulubam, Bhogpur, Barua Bari Gaon, Lomati, Maloibari, Pub Maloibari and Hahara Gaon. These villages were selected with the help of aged persons in the villages, based on the availability of craftsmen.

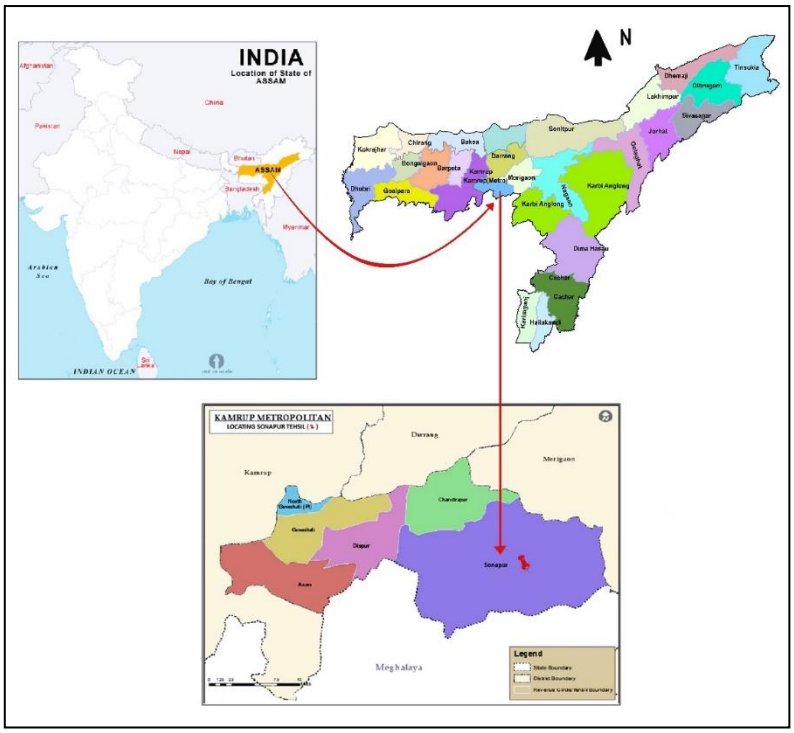

Figure 1: *Locational map of the study area (Sonapur Tehsil)*

The researchers selected eleven Karbi people as key informants. Most of the informants belong to an age between 45 to 65 years. Before the interview, Prior Informed Consent (PIC) was taken from each informant. The survey sample is comprised of twelve villages of the study area. All 457 people of the sample population of the Karbi community were selected for the present study. A review of the existing literature has been done from different secondary sources to briefly discuss the study area and the community living there. It is trailed by anthropological field investigation. Standard anthropological methods have been utilised for data collection, such as schedule survey method, interview method, case study method,

observation method, informal conversations, and audio-visual and photographic documentation. Interviews were conducted at three levels: individual level, group discussion and thorough discussion with the villagers. Key informants helped enormously to gain insight into the Karbi tradition and their belief system and understand the causes and implications of the changing social scenario. Every single Karbi household of the studied area has been visited for information assortment. Visual and audio-visual documentation has been done to record the intangible aspects associated with bamboo crafts.

Results and Discussion

I. The Karbi Community

The Karbi, formerly known as the *Mikirs* until 1976 in the Indian Constitutional Order (Sangma, 2020), is a 'Scheduled Tribe' of Tibeto-Burman lineage inhabiting the province of Assam, both in the hill and plain. The Karbis repudiate to identify themselves as *Mikirs* as they find the word is derogatory and imposed by outsiders. In Karbi Anglong hill district, the most predominant group of their population reside. Besides this, they are scattered in the plain areas of Kamrup and Nagaon districts of Assam, and to some extent Khasi and Jayantia Hills of Meghalaya. Phangsho (1989) divides the Karbis into four spatial groups, viz- *Amri, Ronghang, Chingthong* and *Domralis,* covering different parts of Assam and Meghalaya.

II. Bamboo and its myths in Karbi Culture

Karbi livelihood is subject to their natural surroundings. They live in nature with amicability and oblige themselves by utilising and safeguarding it. This makes a two-route interconnectedness between the Karbis and nature. The material culture of the Karbis is nature-based. Bamboo is profoundly established in its way of life and tradition. The plentiful availability of bamboo has made them vigorously reliant on it for their endurance. Bamboo is an essential resource for them. The connection between bamboo and the Karbi is strong. It will not be amiss to affirm that bamboo is an integral part of the Karbi people's salvation in the Northeast. Its versatility makes it the community's primary preference, considering its strength and endurance while

being a multipurpose plant. It is overwhelming to assume livelihood without bamboo because of bamboo's intrinsic attachment in all of the tribal community's traditions. The entire occupational pursuit has been intimately associated with different bamboo-made implements. The Karbis utilise the shoots of bamboo in their daily diet. A specific portion of the bamboo is utilised as therapeutic assets in a few minor cases. It is accepted that diseases like stomachache, headache, and vomiting are supposed to be curable from *arjang aphelo* (a juice prepared from young bamboo stems). Bamboo shoots are additionally used as a remedy for relieving measles. Bamboo is immensely associated with the religious and social aspects of the Karbi people. There is a well-known axiom common among the Karbi individuals, as "*Karbi aso ke jintak cheripdongse pirthe kevang lapen jintak cherip pondongse chomarong kedam*" (a Karbi is brought into the world with *jintak* (bamboo split) in his grasp and leaves the world holding *jintak*) (Teron & Borthakur, 2012). This expression talks a volume about the reliance of the Karbis on bamboo. For the duration of their lives, bamboo assumes a significant role. The Karbis have been utilising Bamboo for a long time. The origin myth of bamboo known as *Chek keplang* is found in the Karbi community's folk song called *Chek keplang alun*. There is likewise a belief that *Songsar Richo-* sent *Sairikpo* to mother earth to cultivate bamboo so that human beings could utilise this sacred plant for rituals and other material purposes. It is accepted that *Hemphu* (legendary person) first taught the use of bamboo as a custom in the Karbi society. The Karbis believed that a mythical person known as *Thireng-vangreng* was the first person to introduce the readiness of bamboo-made crafts. In the economic status of the Karbi society, bamboo is an essential and valuable resource. The historical backdrop of the utilisation of bamboo, for at all purpose depends on legends that likewise incorporate the conventional conviction of the origin of bamboo. A famous dance called *Hacha Kekan* is performed to celebrate the harvesting season of *Han-up* (bamboo shoots). At the event, seniors portray bamboo's origin and its utilisation among the Karbis through folk song while little youngsters dance to the tune's rhythm. Certain taboos are likewise seen on bamboo – bamboo once utilised in funeral rituals, different bamboos from the same groove are not used for household purposes, and bamboo shoots of the new season are not

devoured until *Rongker*, a yearly community celebration is performed. A variety of bamboo known as *Kaipho* cannot be planted in the household, as it is a cultural taboo. It is believed that if bamboo is used for any impure purpose like the dead, then the whole clumps of bamboo cannot be used for rituals and other household requirements. Moreover, bamboo removed during its early stage, which attain full maturity in the latter part, also cannot be used for ritual and household purposes. Further, the clumps of bamboo covered entirely with creepers, cannot be used for ceremonial and household purposes (Singha and Timung, 2015).

III. Bamboo craft and its usage in the Karbi community

Karbi people have a rich social legacy of craftsmanship and artworks. Bamboo is a crucial piece of their livelihood in food, shelter, household items, medicine, furniture, craftwork, and various ethnoreligious purposes. Bamboo is utilized from multiple perspectives to make several articles needed in their day-by-day life.

Figure 2: *Usage of Bamboo crafts among the Karbi community*

Bamboo craft traditions of the community get the most imaginative articulation through craftsmanship. The people make only those things from bamboos which are needed in their everyday life. One cannot envision the cultural life of these people

without bamboo and its products. There can be no end to the utilisations and utility of bamboo. In their society, the utility of bamboo stretches over a much more comprehensive range. Among them, bamboo-made items are intimately associated with house construction, household articles, agricultural implements, utensils, fishing gear, musical instruments and several other aspects. They primarily use such products through their method of crafting. Bamboo-made products have immense importance in the different religious and cultural festivals. In the study region, the Karbi people utilise different bamboo species such as *Kaipho* (*Dendrocalamus hamiltonii Nees & Arn. ex Munro*), *Bambusa tulda*, *Bambusa balcooa*, *Bambusa affinis Munro*, *Melocanna baccifera* and *Schizostachyum dullooa* (Gamble) R.B.Majumdar. Bamboo is generally utilised in house construction, as well as for fences, bridges and toilets. A typical Karbi house is built on a bamboo stage using both wood and bamboo post. The stage is a few feet over the ground, and for roofing purpose thatch is used. The walls are made of bamboo split. The Karbis more or less abandon traditional housing pattern. The Karbis use many household articles made of bamboo such as, *Lankpong*, *Bolongchir*, *Bilup*, *Pachi*, *Haak*, *Kotha*, *Dhari*, *Beleng*, *Khorahi*, *Khongra*, *Murha*, *Vo-um*, *Ingkrung* (*Chaloni*) etc.

Figure 3: *Different Types of Bamboo craft of Karbi community (a.* Khongra, b. Kotha, c. Hororu, d. Bolongchir, e. Pachi, *f. Juluki, g. Kotha, h. Khaloi, i.* Bilup, *j. Jakoi)*

Lankpong is an elongated bamboo container used for drinking water, rice beer and also for cooking food. Bolongchir is a kind of strainer used for purifying banana Khar (alkali) which is used for cooking and washing clothes. Ash of the dried banana plant is put in the bolongchir followed by pouring water. Water and bamboo ash get mixed up and release straw or a slightly brown filtrate, which is the required product. Bilup is used for carrying dust particles during cleaning and sweeping. After sweeping the area with a broom, dust particles are carried in the bilup and thrown away. Pachi is a bamboo basket used for storing grains, and it prevents insects from entering. This product has a range of purposes and is extensively used in every household. Two varieties of the product are found, one is square-shaped, and the other has a rounded mouth with a quadrilateral bottom. Apart from storing the square-shaped pachi is also used for measuring grains. It carries roughly 5 kilograms of grain at a time. Khongra is a large-sized bamboo basket generally used for carrying firewood, dry leaves, vegetables etc. The upper part of the basket is wider than the lower part. The mouthpart of the basket is round while the base is round or rectangular. The upper part of the basket is tightly woven, but the lower part is loosely woven. A cane strip is wrapped around the mouth to make it stronger. In the middle part, there are two-three tightly weaved lines given to make a strong basket belt which is also fixed to the basket for carrying purposes. In the middle of the belt, soft padding made of the bamboo strip is fixed so that the person carrying it does not feel pain on the brow. Haak is another big basket used for storing unhusked paddy and sometimes it is also used to carry firewood and vegetables. It is long and rectangular. The basket base is a fixed rectangular wooden stand, and after the weaving of the basket, the mouth portion is made stronger by using a wide portion of bamboo piece wrapped up in a flexible cane strip. A belt is also attached to it for carrying. The body is made tightly with weft and wrap bamboo without any holes in between. It is woven in the twilled pattern. Four bamboo splits are fixed around the edges of the basket to keep it strong. They prepare their country liquor (Hor), and for its preparation, they use Antar, which is made from bamboo strips for this purpose only. They also use different fishing gears made out of bamboo such as Lahoni, Juluki, Khaloi, Jakoi, Soroha etc. Lahoni is an elongated implement with a pan-shaped head for carrying

water attached to a long bamboo handle. It is used for removing water from the fishing site. Juluki is a fishing gear which is dome-shaped on the top with a short stem of about 6-inch measurement open. The breadth at the base shifts from 2-3 feet, while the height ranges from 2-3 feet. It is set up out of little bamboo strips secured with fine and flexible stick slips. It is utilised for fishing in shallow water. The fisherman holds it from the top and rubs its edge in the mud. At whatever point any fish is trapped, he gets his hand inside through the stem to grasp the fish. The Khaloi prepared with bamboo strip is used for the temporary keeping of fishes during hand-net fishing. The Khaloi is woven in the shape of an earthen Kalasi or pitcher. The Jakoi is a wickerwork shovel species either dragged along the bottom or placed on the water bed to catch the fishes that take refuge in it when the weed is trampled. It is made of bamboo slips, which are locally known as Dai. Jati bamboo is specially used for making this particular implement. Soroha is made of a single bamboo piece. One end of the bamboo is symmetrically split into continuous vertical sections and those sections are tied with strings, which makes the article hollow in shape. It is placed in agricultural fields submerged in shallow water to catch the fish. It works like a single ended fish trap. They practice light fishing with the help of Bhota (a traditional hurricane lamp) made of split bamboo. During monsoon nights, fishers take Bhota and search for fish in shallow water, particularly in paddy fields. They also use Bana during fishing. It is made of fine bamboo strips with jute coir. It is fixed with the help of bamboo and rope. Their musical instruments are also made of bamboo, and among the musical instruments, they use the flute to a large extent. It is locally known as Pongse. There are eight holes made on it. Pongse is played as an accompaniment to songs, and musical rhythms produced by different kinds of Karbi musical instruments. Some of their hunting implements are also made of bamboo. They make different bird traps from bamboo strips. The weaving pattern of the bamboo traps is unique to the Karbis. Like other tribal communities, Karbis also make rain shades for their heads mostly when they work in the agricultural field in the rainy season. These shades are made of bamboo strips. The whole structure is neatly woven out of bamboo. The inner portion of the shade is covered with leaves. Since it is to be placed on the head, it does not have any handle like an umbrella. Bamboo has an

important role in various textile operations in Assam. Among the Karbis, many of the parts of their handloom are made of bamboo. During weaving for design purpose, they use bamboo-made sticks of different sizes. Their spinning wheel is made of bamboo along with wood. In the Karbi society, religion and nature are linked very closely. They worship almost all-natural objects of the region. Worship of nature is an integral part of their society. They perform various ceremonial and ritual occasions such as Chojun, Rongker, Peng, Chinthong Arnam, Rit Anglong etc. Their traditional priests perform these ceremonies and rituals. In these ceremonies, bamboo plays an important role. Many small bamboo baskets (Arnam-hotton), and sitting and drinking arrangements (Anghoi-Alankpong) for the deities are used on these occasions. During Chojun ritual bamboo is used to construct Kuntiri and Hamren (temporary huts erected for female and male in the open field during the ritual). They also use Micham (bamboo made basket used to keep the meat) during this ritual. The death ritual of the Karbi known as Chomangkan is associated with bamboo. In this ritual, they use bamboo post, which is locally known as Banjar.

Figure 4: *Making of Bamboo basketry by the Karbi people*

It is richly decorated. The top of the post is covered with many green leaves and three bamboo sticks projected on three sides. Small flags and bamboo baskets are attached

to these sticks (Zaman, 2003). The Karbi community depends on two designing patterns, locally known as Biban and Bijon, for preparing several bamboo crafts. Sometimes they make baskets by combining these two patterns.

IV. Traditional Knowledge

The spectacular variety and different bamboo craft types unmistakably show the aptitude just as the skilled workers' traditional knowledge. This knowledge is basically exclusive and restricted to the community and is accumulated through long interaction with the environment. Such a knowledge system has been safeguarded, maintained and transmitted over generations. It forms the cultural heritage of the Karbi people. Locally available bamboo is the raw material for their craftwork. They believe that the creator god blesses the bamboo craftsmen, and she has given this unique ability to them. As indicated by one key informant (one of the craftsmen of the Khetri), "I get information from my dad. He was an expert craftsman. He knew to make each kind of bamboo basket. It requires a special talent, and my dad had that". According to one community member, "It is male-dominated craft work. Male learns how to make baskets from their father, grandfather". However, from the field investigation, it has been found that it is not fundamental that in a craftsman family where the father is an expert artisan, his son should also be a specialist. Any male can learn. The young and interested people gather knowledge on bamboo weaving for bamboo basketry through learning. The older generation and specialised artisans show them the best ways to make baskets and to prepare the strips with the accurate thickness and length - all the things they are required to learn. They likewise learn how to choose and cut the bamboo. Through observation and perception, they know which sorts of bamboo are to be selected, and in this manner, the traditional knowledge gets transferred from one generation to another, orally. The association of bamboo and bamboo-based traditional knowledge system can be visualised in every material appearance of the Karbis. Here, the materialistic expression supports the non-material background as a form of cultural heritage.

Conclusion

The Karbis of Assam planes has a rich cultural heritage in bamboo crafts. They have mastered the art of bamboo weaving to make different articles. Their bamboo craft portrays the artistic calibre and creative imagination of the local craftsmen. The bamboo craft of the Karbis reflects not only their traditional knowledge system but also their beliefs and practices, their myths and legends, and their emotions and ethics. Karbis take pride in their tradition of basket weaving. The best part is that basket weaving is considered an intrinsic part of their lives. Keeping pace with Indian society as a whole, Karbi society is also changing. Even the once-remote villages are now exposed to globalization, modernity and education. The Assam plane is no exception to this. As obvious consequences, Karbi community is gradually losing many of their traditional practices. Their dependency on nature is decreasing gradually. This bamboo craft tradition is also facing a receding curve. The major reasons behind it are the global market economy, easy availability of luxury and utility items, less interest in their traditional knowledge etc. It is almost losing its real meaning to the new generation. They are heavily dependent on modern items. Most of the Karbi households now use utensils made of aluminium and stainless steel and Chinese crockery instead of using their ethnic items. According to the local people, "The modern things are more comfortable in cleaning and washing and thus hygienic too. Bamboo items cannot be cleaned properly; say the bamboo cup, it bears the stain of tea even after washing, and due to regular use, there will be a visible black coating which is not hygienic at all. However, in the case of Chinese crockery, you will not find such things". Another point is that modern utensils are easy to use and cheap for buying. According to one craftsman, "Basketry making is time-consuming; these things are purely need-based. These are not for consumerism. So, the craftsmen get little money from their neighbourhood when they are requested to make basketry for them. Nevertheless, they are to invest a lot of time and energy. If they use this time and energy in other work, they can earn some money." This kind of information easily describes the reason for the decline of this craft tradition. Therefore, it is high time to protect this traditional knowledge system. There is an urgent need to properly

preserve this knowledge system and integrate it with modern scientific values before it is lost forever. The preservation of vast knowledge-reservoirs demands an essential belief in indigenous people's lifestyles and cultures. There needs a plan to revive their cultural heritage, and they also need government support to protect it. If they want to promote their handicrafts, then heritage tourism can play an important role. The local people will get the economic benefit, and for that, there needs to be infrastructure. If the government does the needful in these villages, then only this craftwork can survive. The government or other agencies can make special efforts to encourage the folk arts and frame special programmers to preserve and strengthen this vanishing art form.

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References

Acharya, S.K., Gupta, M., Biswas, A. and Mishra, G.C. (2015). *Bamboo in North – East India: The Ecology, Economy and Culture*, New Delhi: Krishi Sanskriti Publications, pp. 62-63

Alemchiba, M. (1968). *A Brief Historical Account of Nagaland,* Kohima: Naga Institute of Culture, pp. 45-61

Bain, W.K. (2019). Bamboo Craft and Associated Knowledge System of Lepcha Community of North Sikkim: An Endangered Cultural Heritage, *Journal of Kolkata Society for Asian Studies*, 5(1), pp. 80-107

Elwin, V. (1959). *India's North East Frontier in the 19th century,* Second Edition, Calcutta: Oxford University Press, Indian Branch, pp. 17-29

Ghosh, G.K. (2014). *Bamboo: The Wonderful Grass*. New Delhi: APH Publishing Corporation, pp. 89-156

Liese, W. and Kohl, M. (2015). *Bamboo- The Plant and its Uses*, Springer, pp. 118-129

Madhab, J. (2003). The Green Gold: Under Exploitation Wealth of the North- East India, *Dialogue*, 5(2), pp. 45-52

Phangsho, P.C. (1989). *The Karbis: A Spatio Temporal Analysis in Tribal Geography* (Unpublished PhD thesis), Gauhati University.

Sangma, R.D. (2020). *Rediscovering the Significance of Totems among the Karbis of Assam* (Unpublished MPhil dissertation) Sikkim University.

Singha, K.N., & Timung, L. (2015). Significance of Bamboo in Karbi Culture: A Case Study among the Karbi Tribes of Assam (India). *International Journal of Advanced Research in Biology and Biotechnology*, 1(1), 1-9.

Teron, R. and Borthakur, S.K. (2012). Traditional uses of bamboos among the Karbis, a hill tribe of India, *The Journal of the American Bamboo Society*, 25(1), pp. 1-8

Tewari, D.N. (1988). Bamboo as poverty alleviator, *Indian Forestry*, 114, pp. 610-612

Zaman, R. (2003). Chomangkan: Death Ritual of Karbi, *Indian Anthropologist*, 33(1), pp. 41-53

New Perception to Proto History Burial Site in Andarawewa An Archaeological and Geochemical Prospection

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Abstract

The megalithic burial site at Galgamuwa Andarawewa is situated at Anamaduwa Secretariat Division in the North Western Province, Sri Lanka. It is evident that 2500 years ago the proto history people had settled in this region. For burying of bodies, they have constructed different types of burials in several places in this region. Thus, to examine the geochemical prospection soil samples from the context (n=12), the glass bead samples from the furnace (n=3) and slag (n=2) were analyzed using X-Ray Fluorescence (XRF) for 22 major and trace elements. For the archaeological prospection, new findings of proto-history burials were found in the excavation carried out at Andarawewa and also many archaeological evidences were found through the field survey and excavations such as beads, inscriptions, pots and shard and chisels. The elemental values of the slag show that, Pb (470-483 mg/Kg) and Cu (855-1083 mg/Kg) are very much higher than Upper Continental Crustal Values. The white part contains higher Pb and Cu than the dark part of the slag. The concentrations of halides F, Br and I are almost similar in the white (glass) part and dark (slag) part. The Pb, Cu and as in the glass beads of the Andrawewa furnace shows that they range between 390-2920, 275-1411 and 12-127 mg/Kg respectively. However, the Fe and Ti concentrations are much lower than in the contexts though P_2O_5 is higher in the bead samples. The soil samples from the contexts of the area does not show high values for almost all the measured elements. Thus, indicating that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

Key words: *Burial, Soil, Geochemical, Slag, Glass bead*

Introduction

Middle Daduru Oya basin and Middle Mee Oya Basin are the most important river basins in the proto historic period. Proto historic people had settled in these river basins before the 6th century B.C (Figure 1). They have introduced Iron and Copper Technology, Village Settlement, Paddy Cultivation, Tank and Irrigation System, Animal and Plant Domestication, Black and Red Ware, Red Ware, Black Ware Pottery making Methods, Beads Production Methods within this river basin (Seneviratne, 1984) and have been recorded in the current study as well as previous excavations. The middle Daduru Oya Basin in the North-Western regain of Sri Lanka is believed that it was first colonized by hunter-gatherers during the microlithic period (Mesolithic; Deraniyagala, 1992). The excavated Galgamuwa Andarawewa megalithic burial site is situated at Anamaduwa Secretariat Division in the North Western Province, Sri Lanka (Figure 1).

The western peripheral area of Anuradhapura is very important in identifying ancient human behavioural patterns. In the proto history period, proto-historic human has been settled in this region mainly to obtain minerals and due to favourable physical factors or topographic features and cultural or socio-economic factors. Velagedara Panirendawa is one of the valuable places of ancient time. Ancient People have identified a copper magnetite deposit in Panirendawa. Sri Lankan Geology Department has later identified a copper magnetite deposit that consists of 6 million tons in Panirendawa (Senaviratne 1995). However, this deposit has been identified before 2500 BP by people who lived in the proto historic period (Figure 1). They have mined copper from the surface level and transported the mined copper magnetite to be used in the production of iron and copper objects. This evidence is highly valuable for constructing ancient metal recourse pattern between these two basins. After the proto history period, specialized people established trade and metal production in this area (Seneviratne, 1985). According to evidence found in inscriptions, it was identified that they are Kabara (Iron smith) (Paranavitane, 1970), Chuda and Manikara (Paranavitane, 1970). These people produced metal objects and beads.

They distributed these items throughout Sri Lanka, distributors are a merchant and were named as Vanika or Vaniga (Paranavitane, 1970).

Objectives

To determine the historical events and technology that existed at a Proto History Burial Site at Andarawewa based on analysis of archaeological and geochemical context, using soil samples from the context and the glass bead samples of the furnace and slag.

Materials & Methodology

The archaeological excavation was carried out in Galgamuwa, Andarawewa Megalithic burial site during the end of 2017 after surveying where a natural hollow ('pathaha'), bead production site (Furnace) and monastery complex surrounding the burial site was identified. The burial site is extended to 14 acres and 34 cist burials were identified on surface level. Among these 34 burials, a new form of cist burial within the area of 14 hectares was found while two cist burials were selected for excavations. During the exploration, many places which had been used for iron or copper production has been identified. Two radiocarbon dates were taken, which was secured on charcoal and it was dated by Beta Analytic, USA; (Beta – 482665).

Soil samples (n=12) from the context, glass bead samples (n=3) from the furnace and two slag samples were transported in double-sealed bags to Shimane University Japan, after drying for 120 ^{0}C in an oven. Each sample was dried in an oven at 160 ^{0}C for 48 h and ground for 20 min in an automatic agate mortar and pestle grinder. Powdered samples (<63 μm) were compressed into briquettes under a force of 200 KN for 60s. The briquettes were then analyzed for selected major and trace elements using powder diffraction method as for Kimura and Yamada, 1996 using an XRF. Average errors for all elements are less than ±10% relatively. Analytical results for GSJ (Geological Survey of Japan) standard JSl-1 were acceptable compared to the proposed values of Imai et al. (1996).

Result and Discussion

Archaeological evidence

The protohistoric people sometimes had used a natural hollow (Sihala meaning 'pathaha') for their small-scale paddy cultivations in the protohistoric period (Senaviratne, 1996). Subsequently, developing this culture, they had converted the hollow into a small tank.

These burials were very rich in endeared metered in particular Black and Red Ware, Red Ware and beads made of glass, iron chisels and most of the cultured material were placed as offering in the pot. The two radiocarbons were dated using the cremated bone from the burial site dated to Cal BP. 2490 (507-500 Cal B.C), cal BP, 2378 (429 Cal B.C).

Glass chips in the slag samples are not inside the material, they are attached to the outer surface. Glass chips may be artificial, considering melt feature and small cavities. Iron concretion of hematite/limonite may have been easily procured using the Brown Earth and the Red Earth in northwest Sri Lanka (Senavirathne., 2007; Cooray., 1984).

Pottery

In this excavation, pottery collection have been found that dates to 500BC (Figure 2). The untitled pottery classification was conducted on the basis of predominate Color, Rim, Shape and Body shape. Subsequently, the results as per the classification system introduced nine pottery forms. These pottery forms were classified and categorized types (form) and based on a comparison with the Anuradhapura, Pomparippu (Begly, 1981), Kok-ebe and Pinwewa Galsohon Kannaththa pottery types (Table 1). According to the pottery conservation program, three early Brahmic letters were identified on the pot shard (Sinhala Tha, Tha and Sha, Figure 3). Previous Sri Lankan researchers have not found early Brahmi letters inside the proto history burial of their excavations (Paranavitane, 1970). Thus, this is very important as this is the earliest dating regarding of early Brahmi letters in Sri Lanka. Further, Beta analytic U.S.A

has dated this burial from 500- 507 B.C. Thus, this is very important as this is the earliest recorded date regarding for early Brahmic letters in Sri Lanka.

Geochemical Evidence

The XRF results of glass bead (Table 2) show that Pb and Cu are having very high values which are very much higher than UCC. The white part contains higher Pb and Cu than the dark parts. Also, iodine has been detected in the slag samples. The halides F, Br and I are almost similar in the white (glass) part and dark (slag) part.

If these are remains of glass production, the sands used for glass production should contain high contents of Pd, Cu and low Fe content (1.54-2.55 wt%). (Pb, Cu and Fe Upper Continental Crustal (UCC) values are 20, 25mg/kg and 5.04 wt%). The white part has higher Ca content and lower Fe content while the dark part has the opposite composition (Table 2). Arsenic is also high (18-34) compared to UCC of 4.8 mg/kg and the Zircon content is almost two times higher (337-391) than UCC (190mg/kg).

The glass beads of the Andrawewa furnace slag shows that Pb, Cu and As range between 390-2920, 275-1411 and 12-127 mg/Kg respectively (Table 3). However, the Fe and Ti concentrations are much lower than in the contexts though P_2O_5 is higher in the bead samples. The soil samples from the contexts of the area do not show high values for almost all the measured elements (Table 3). Thus, indicating that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

According to comparison studies, Girbawa and Andarawewa furnace (Figure 4) can be dated as 3rd Century B.C. to 1st Century A.D. From the comparison studies using PCA and cluster analysis, it was evident that the Giribawa glass was very different from the South Indian glass. Surprisingly, given the geographic proximity, there was little overlap between the glass found at Mantai (Lankton, 2014; Wijepala 2019) and the Giribawa glasses, raising the possibility that the two sites were independent glass producers, or, possibly, were most active during different periods.

Iron Object

In the Andarawewa excavation, two iron chisels were discovered inside the burial pot and were dated to 500 B.C (Mendis, 2017) which may have been used by carpenters (Figure 5). The typological range and a number of metal object were found within the megalithic burials in Sri Lanka. The objects may be listed as knife, arrow- blade, nail (Senavirathne 2007). Most of these were used in hunting or as weapons (Senavirathne 2007). In Andarawewa excavation two iron chisels have been discovered inside the burial pot. These two iron chisels are dated to 500 B.C. It may have been used by a carpenter and not as a weapon. The raw material required for the production of iron implements may have been obtained from the locality itself. Iron concretion of hematite/limonite may be easily procured from Brown Earth and the Red Earth in North West Sri Lanka (Senavirathne 2007; Dahanayake 1979; Cooray, 1984). Such iron concretions can be used for smelting, and also as evidence Iron slag has been found near the Andarawewa burial site. According to Seneviratne, 2007 limonitic nodules has been in direct association with iron slag. Geological investigation has also established the vast deposit of magnetite at Vilagedara Panirendawa. This deposit can be the source used for production.

Beads

In this excavation, over 50 beads had been found by the excavation team (Figure 6). All beads are made by glass. During the exploration bead production site (Furnace) beyond north side of the burial site was identified. During the survey, a large amount of glass has been revealed as well as beehive-shaped furnaces were discovered, possibly for the primary production of raw glass.

Mineral and glass beads production had been introduced by proto-historic people to this basin. The furnaces were situated near the bank of the stream and by the canal constructed by Irrigation Department had destroyed it. According to previous survey at the site of Giribawa a large amount of glass as well as beehive-shaped furnaces, possibly for the primary production of raw glass were revealed. These two furnaces are of the same type and these two-furnace areas appear to be waste from primary glass production.

According to Lankton (2014), Giribawa samples were made from mineral soda glass with high alumina, variable potassia and lime, low cesium and low to moderate uranium. Comparing the chemical compositions of the new samples with those from previous analyses by Dussubieux (2001) and ourselves, there appears to be no significant difference in the range of values for individual oxides. In addition, there was no significant difference in composition between the beads and fragments at the site and the furnace samples, providing additional evidence that all or almost all of the glass found at the site was most likely made there (Lankton 2014)

In order to answer the important questions of dates for glass production plus possible mechanisms for exchange of the finished products, the glass from Giribawa was compared with similar glass from other sites in Sri Lanka, including Mantai, Godavaya and Kuchchaveli, as well as with glass from Manikollai, a bead making centre in Tamil Nadu most likely importing glass from a variety of South Indian sources, using the multivariate statistical techniques of PCA and cluster analysis (ibid). As expected, the Giribawa glass was very different from the South Indian glass. Surprisingly, given the geographic proximity, there was little overlap between the glass found at Mantai and the Giribawa glasses, raising the possibility that the two sites were independent glass producers, or, possibly, were most active during different periods. There was one Sri Lankan site, Kuchchaveli on the eastern coast, where glass, in the form of drawn beads, was sufficiently similar to Giribawa glass to strongly suggest an exchange relationship (ibid). Twenty out of twenty-two Kuchchaveli samples overlapped with Giribawa, with only two more similar to glass from Mantai or possibly Manikollai. This similarity to Giribawa glass is quite remarkable since most sites thought to be trading or consumption sites, such as Kuchchaveli, usually, glass beads are from a variety of sources. The significance of this strong apparent relationship will no doubt be important for the interpretation of both Giribawa and Kuchchaveli. One immediate result is that now at least some evidence for dating the Giribawa production is available. The glass beads from Kuchchaveli came mainly from two layers; the first dated to the 1st to 3rd c. CE and the second from the 7th to 8th c. CE. There was Giribawa glass in both of these layers,

suggesting that glass production at Giribawa at least spanned the two periods (ibid). Whether Giribawa production began earlier or extended later we still do not know, but the Kuchchaveli dates are a very important step to interpret glass production at Giribawa and in Sri Lanka in general (ibid). According to comparison studies of Girbawa and Andarawewa furnaces, we could identify as same type and believe Andarawewa furnaces can be dated as 3rd Century B.C or before 3rd Century B, C

Conclusions

Glass chips in the slag samples are not inside the material, they are attached to the outer surface. Glass chips may be artificial, considering melt feature and small cavities. The iron concretion of hematite/limonite may have been easily procured using the Brown Earth and the Red Earth in northwest Sri Lanka. Thus, the materials for iron production may have been obtained from the locality itself. However, due to the very high extreme values of Pb, Cu, As and also Zn the sands to produce glass should have been brought from elsewhere since the contexts soils do not show very high concentrations for the same elements.

Brahmi letters have been identified on the pot shard. This is very important as this is the earliest dating regarding early Brahmi letters in Sri Lanka and the South Asian region. Based on the archaeological and geochemical evidence, it can be decided that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

The distribution pattern and the Chrono - culture context of the Megalithic site in Middle Daduru Oya and Middle Mee Oya basin reveal the following features. They have introduced Iron for productions for developing their culture found by the excavation evidence and three iron chisels were found inside the megalithic burial and they were not used as weapons but as tools.

References

Begly, V. (1981). Excavation of Iron Age burials at Pomparippu, 1970, *Ancient Ceylon* 4: 49-142.

Cooray, P.G. (1984). *An Introduction to the Geology of Sri Lanka (Ceylon*), Colombo, National Museums of Sri Lanka.

Dahanayake, (1979). Study of Red and Brown Earth deposite of north-west Sri Lanka, *Jrn Geological Society of India* Vol.20443-440

Deraniyagala, S. U, (1992). *The Prehistory of Sri Lanka; An Ecological Perspective*, Archaeological Survey Department, Colombo

Dussubieux, L. (2001). *L'Apport de l'ablation laser couplée à l'ICP-MS à l'étude du verre archéologique de l'Océan Indien*, Unpublished PhD Dissertation, Université d'Orléans, France.

Imai, N., Terashima, S., Itoh, S., &Ando, A. (1996). Compilation of analytical data on nine GSJ geochemical reference samples, "Sedimentary rock series". *Geostandards Newsletter,* 20, 165-216.

Kimura, J.I., & Yamada, Y. (1996) Evaluation of major and trace element analyses using a flux to sample ratio of two to one glass beads. J. Mineral. Petrol. *Econ. Geol*. 91, 62–72.

Lankton, J. (2014). Glass from Sri Lanka: Preliminary Report of 2014 Analyses, Institut de Recherche surlesArchéomatériaux, Centre Ernest Babelon, C.N.R.S., 3D rues de la Férollerie, F-45071 *Orléans cedex* 2.

Mendis, D.T. (2017). *Settlement Archaeology of Middle Daduru Oya and Mee Oya Basin*, Research and Publication Fund, Rajarata University of Sri Lanka.

Paranavitane, S. (1970). *Inscription of Ceylon*, Vol. I, Department of Archaeology. Colombo.

Seneviratne, S. (1984). The Archaeology of the Megalithic - Black and Red Ware Complex in Sri Lanka, *Ancient Ceylon*, Archaeological Survey Department, Colombo, No.5: 237-305.

Seneviratne, S. (1985). Iron Technology in Sri Lanka: A Preliminary Study of Resource Use and Production Technique during the Early Iron Age, *The Sri Lanka Journal of the Humanities*, vol.XI, no.1 & 2, pp.129-178

Seneviratne, S. (1995). The Ecology and Archaeology of the Seruwila: Copper Magnetite prospect North- East Sri Lanka in *Sri Lanka Journal of Humanities*. Vol xxi (1&2):114-146

Senaviratne, S. (1996). Peripheral Regions and Marginal Communities: Towards an Alternative Explanation of Early Iron age Maternal and social Organization in Sri Lanka Tradition Dissent and Ideology: *Essay in Honor of Romila Thapar*, ed. K. Campakalakshmi and S. Gopal, Oxford University Press. Delhi: 265-312

Senavirathne, (2007). *The Archaeology of the Megalithic - Black and Red Ware Complex in Sri Lanka, the Art and Archaeology of Sri Lanka*. 135-202, Central Cultural Fund, Ministry of Cultural Affairs, Colombo.

Wijepala, W.M.T.B., Ishiga, H & Young, S.M. (2019). Early glass productions of Anuradhapura period: special reference to Yodhawewa archaeological investigation in Mannar, Sri Lanka, *Annual Research Symposium*, University of Colombo.

Tables

Form	Description
A	Haliya or Muttiya - Pot with Restricted and Inverted Upper Body with Everted and Flared Rim Zone
B	Attiliya or Halliya - Large Bowl with Wide Orifice
C	Deep Globular Bowl with Restricted Upper Body and Mostly Triangular Thickened Rim Halliya
D	Barani/Muttiya - Small Storage or Water Jug with Narrow and Short Neck and Globular Body
E	Baraniya - Huge Storage Vessel with Thick Walls and no Neck
F	Small Jug with Mostly lenticular Built Body a Narrow Orifice and High and Funnel Shaped Neck
G	Pattaraya - Begging Bowl with Narrow Neck and Globular Body
H	Conical Dish
K	Lid/Lid-cum-bowel

Table 1: *Pottery form Details*

Sample	Element	1	2
Remarks		Dark part	White part
Trace elements (ppm)			
As	Arsenic	18	34
Pb	Lead	483	740
Zn	Zinc	40	30
Cu	Copper	855	1083
Ni	Nickel	21	20
Cr	Chromium	47	32
V	Vanadium	58	38
Sr	Strontium	313	359
Y	Yettrium	24	17
Nb	Niobium	11	9
Zr	Zirconium	391	337
Th	Thorium	2	ND
Sc	Scandium	ND	ND
TS	Total Sulpher	ND	ND
F	Fluoride	167	120
Br	Bromine	2	2
I	Iodine	73	96
Cl	Chlorine	ND	ND
Major elements (wt%)			
TiO_2	Titanium dixide	0.57	0.36
Fe_2O_3	Ferrous Oxide	2.55	1.54
MnO	Mangonous Oxide	0.08	0.05
CaO	Calsium Oxide	1.65	2.52
P_2O_5	Phosperous Pentoxide	0.06	0.11

Table 2: *Trace element and Major oxide concentrations of glass bead*

Table 3 Trace element and Major oxide concentrations of Slag and Context soils

Sample	As	Pb	Zn	Cu	Ni	Cr	V	Sr	Y	Nb	Zr	Th	Sc	TS	F	Br	I	Cl	TiO_2	Fe_2O_3	MnO	CaO	P_2O_5
Slag																							
SLAB 01-A	127	2920	77	1411	58	25	57	424	22	8	273			780	56	8	252	1052	0.44	1.87	0.11	2.43	0.15
SLAB 01-C	12	390	66	275	17	57	93	305	22	10	240	2	7	832	226	2	2		0.87	4.71	0.19	1.93	0.13
SLAB 01-D	43	1281	57	886	19	52	66	495	19	8	172		7	899	182	4	66		0.58	3.56	0.16	3.40	0.30
Average	61	1531	67	857	31	45	72	408	21	9	228	2	7	837	155	5	107	1052	1	3	0	3	0
RUSL/AW																							
01 CON 01	3	25	39	25	32	100	130	276	18	8	219	4	15	1020	152	4	19		0.93	5.41	0.17	1.86	0.10
01 CON 03	3	23	39	27	36	93	130	270	20	10	221	5	15	893		4	13		0.90	5.64	0.16	1.72	0.05
01 CON 04	4	23	44	30	41	119	155	255	19	9	228	5	18	911	104	3	18		1.09	6.82	0.15	1.65	0.06
01 CON 4(B)	4	23	42	33	39	94	139	254	20	10	228	6	16	890	89	3	10		1.00	6.37	0.17	1.60	0.05
01 CON 15	4	24	41	29	36	95	133	240	20	10	213	5	16	890	253	3	14		0.98	6.16	0.10	1.55	0.05
02 CON 01	3	21	42	28	31	117	134	285	17	8	197	4	20	1194	121	5	18		0.96	5.42	0.19	2.11	0.13
02 CON 02	3	20	43	29	33	89	129	259	18	8	187	4	16	904	72	4	7		0.87	5.47	0.15	1.80	0.05
02 CON 04	3	19	44	33	34	100	122	850	20	8	8	9	18	1031		4	16		0.79	5.28	0.24	7.35	0.04
02 CON 06	3	21	39	27	34	133	147	260	14	8	167	2	18	867		3	23		0.99	6.45	0.28	1.73	0.04
02 CON 07	4	19	41	27	30	75	108	391	18	8	159	4	15	962	123	5	6		0.73	4.83	0.16	3.79	0.05
02 CON 11	4	18	31	22	21	145	144	187	12	7	178	4	13	844		3	22		0.88	6.17	0.24	1.48	0.04
Average	3	22	40	28	33	105	134	321	18	8	182	5	16	946	131	4	15		1	6	0	2	0.06
UCC	4.8	20.0	71.0	25.0	20.0	35.0	60.0	350.0	22.0	25.0	190.0	10.7	11.0	NA	557.0	1.6	1.4	0.0	0.5	5.04	0.100	4.2	0.150

Table 3: *Trace element and Major Oxide concentrations of Slag and Context soils*

Figures

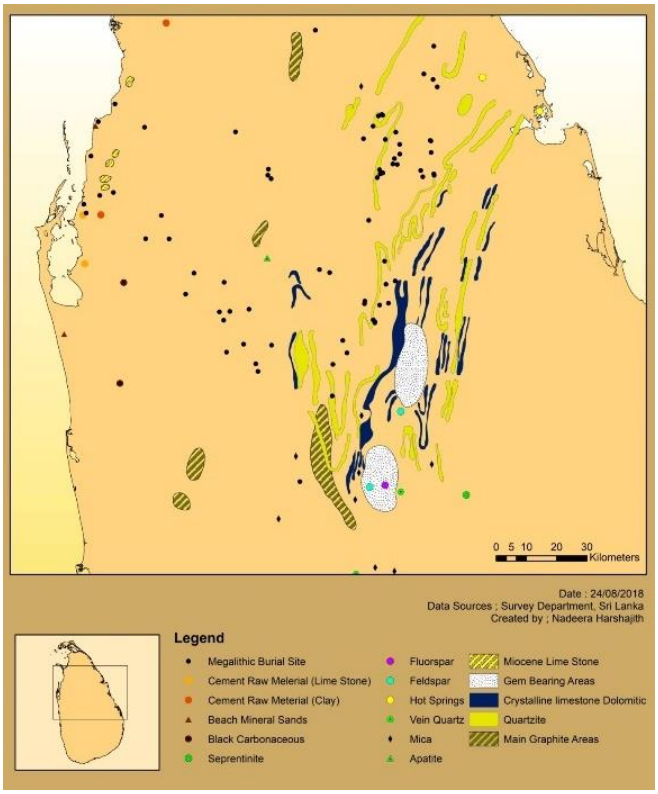
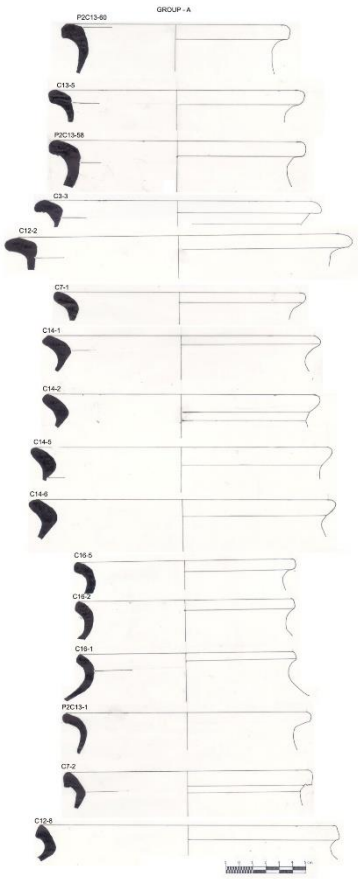
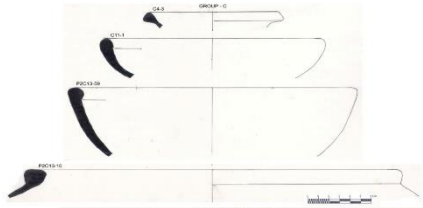
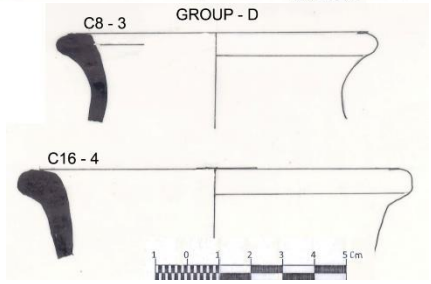


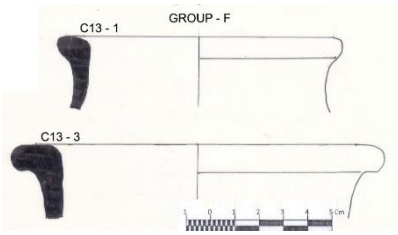
Figure 1: *Mineral Resources established surrounding the Megalithic Burial site*

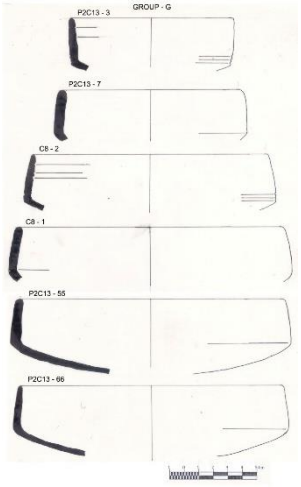
Figure 2: *Brown and Red Ware Pottery Andarawewa*

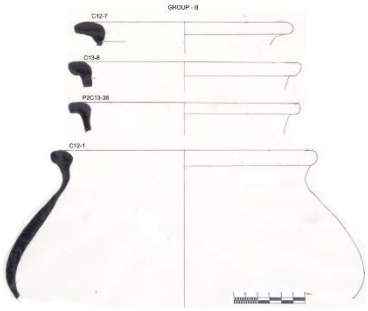

GROUP - A
P2C13-60
C13-5
P2C13-58
C3-3
C12-2
C7-1
C14-1
C14-2
C14-5
C14-6
C16-5
C16-2
C19-1
P2C13-1
C7-2
C12-5




GROUP - D
C8 - 3
C16 - 4
1 0 1 2 3 4 5 Cm


GROUP - F
C13 - 1
C13 - 3


GROUP - G
P2C13 - 3
P2C13 - 7
C8 - 2
C8 - 1
P2C13 - 55
P2C13 - 66


GROUP - B
C12-7
C13-8
P2C13-36
C12-1

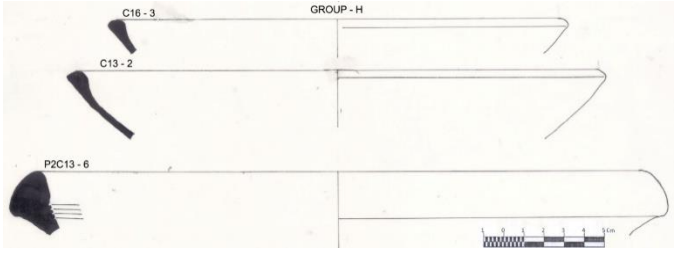

GROUP - H
C16 - 3
C13 - 2
P2C13 - 6

Figure 3: *Brhamic Letters on potshard*

Figure 4: *Part of furnace Andarawewa*

Figure 5: *Iron Chisels Andarawewa*

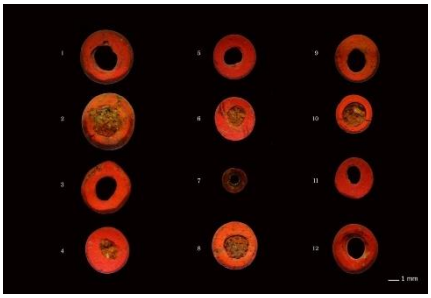


Figure 6: *Glass Beads Andarawewa*

Potentials of Underwater Cultural Heritage Towards Tourism in Galle, Sri Lanka: Perspectives of Tourism Service Providers and Maritime Archaeologists.

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Abstract

Travelling to visit places with Underwater Cultural Heritage is becoming a significant niche tourism type worldwide. Because of its remarkable position in the Indian Ocean, Sri Lanka has always been a hub for sea trade. This makes Sri Lanka possess an abundant of Underwater Cultural Heritage. There lies a great amount of underwater cultural artefacts beneath the sea near Galle as the city has served as a harbour for a long time. This study was conducted to identify the contribution of Underwater Cultural Heritage towards tourism in Galle. The objectives of the study were, to identify the role that Underwater Cultural Heritage plays in tourism in Galle, to identify the destination capabilities of Galle to fulfil those requirements and to understand the ways that Underwater Cultural Heritage can be benefitted from tourism. The qualitative approach was adopted in this study. Data were collected from tourism service providers around Galle, maritime archaeologists and museum officers through semi-structured interviews. The collected data were analyzed using the content analysis method. Major findings of this research include the strengths of the Galle area in terms of underwater cultural heritage, the great interest of tourists towards underwater cultural heritage and current weaknesses in the management of these values in the field of tourism. It was revealed that both tourism and underwater heritage could be mutually benefitted because of each phenomena's presence through an integrated approach.

Keywords: *Underwater Cultural Heritage, Tourism, Maritime Archaeology*

Introduction

Background of the study

Unlike the tourists of previous generations who travelled with the purpose of seeking mere pleasure, their counterparts are more into worthwhile experiences from which they can explore new things. The tourist of the new age is a knowledge and experience seeker. As a result of this change, more attention is given to niche tourism rather than mass tourism. Various niche tourism types can be seen nowadays and travelling to visit places with underwater cultural heritage is an emerging one among them. This niche tourism type goes hand in hand with the maritime archaeological excavations as maritime archaeologists are the people who refer to the written records and thereby engage in archaeological studies to find the sunken cultural heritage values which represent past human cultures.

Among the many ports and harbours situated around the coast of Sri Lanka, Galle; one phenomenal natural harbour had gained attention during the time of middle of the 13th Century. It had been a significant port for Chinese and Arabian ships which navigated the Indian Ocean. Galle appears to have been a point of embarkation for sailors of China and the countries of the East (Perera, 1951). Therefore, it is highly likely to find underwater cultural heritage values lying beneath the waters near Galle as the seabed itself can be referred to as the biggest museum in the world (UNESCO, 2017).

The Majority of the international tourists rarely miss paying a visit to Galle during their stay in Sri Lanka. The travellers who would travel to visit the places with the value of underwater cultural heritage are highly likely to consider Galle as a paradise to fulfil their travel needs.

Research Problem

Given the background as mentioned earlier, the contribution of underwater cultural heritage towards tourism in Galle should be identified so that underwater cultural heritage values would be given with more attention for conservation while tourism operators would be able to plan well in packaging this as a worthwhile product.

Nevertheless, only a minimal number of researches have been done in the Sri Lankan context to study the link between underwater cultural heritage and tourism creating a research gap. Research is needed to understand Galle's potentiality in terms of underwater heritage and how it can be managed well to maximize benefits to both heritage and tourism. Previous researches are done either only focusing on heritage or tourism. This creates a need for multidisciplinary research. Therefore, this study was conducted to fill that research gap by examining the role of underwater cultural heritage in Galle tourism from the perspectives of both maritime archaeologists and tourism industry operators.

Research Objectives

The Main aim of this research was to understand the potential of Underwater Cultural Heritage towards tourism in Galle. More specifically, the following secondary objectives were generated to fulfil the aforementioned primary objective. Those secondary objectives were to identify the role that Underwater Cultural Heritage plays in tourism in Galle, to recognize the requirements of tourists who are interested in Underwater Cultural Heritage in Galle, to identify the destination capabilities of Galle to fulfil those requirements and to understand the ways that Underwater Cultural Heritage can be benefitted from tourism.

Significance of the Study

By fulfilling the objectives, this research will contribute to the knowledge base as a multidisciplinary study that focuses both on tourism and underwater cultural heritage aspects. The role underwater cultural heritage plays in Galle will be identified highlighting its importance for the survival of Galle tourism. Hence, this research will help create programs benefiting both tourism and underwater cultural heritage.

Methodology

The qualitative approach was used in this study. To collect primary data from the tourism service providers and maritime archaeologists, semi-structured interviews were conducted via telephone calls considering barriers in conducting face-to-face

interviews. Secondary Data were collected from reliable textbooks, journal articles, reliable web sites and newspapers. The sample consisted of ten participants including five tourism service providers in Galle and five maritime archaeologists and Galle maritime museum's officials. The Sampling technique used was the convenient sampling method while collected data were analyzed using the content analysis technique.

Results & Discussion

Tourism Demand for Galle and its tourism facilities

Galle is considered one of the major tourism regions in Sri Lanka and widely known among tourists for its breathtaking beaches and Old Dutch Fort, which was declared a world heritage site. Even during the most challenging times of Ethnic war, this region was able to attract tourists because of its resource availability. The tourists who visit Galle and the nearby area are drawn to this place to engage in beach tourism, heritage tourism and water-based activities like diving and snorkelling.

This region encompasses a strong tourism network with sound facilities to cater for its tourists. Among them are the accommodation facilities from boutique hotels, five-star hotel to homestays, food and beverage facilities from fine dining restaurants to budget restaurants, proper transportation facilities including public transportation and other ancillary services.

Availability of Underwater Cultural Heritage around Galle

Galle harbour is the area in which the highest number of archaeological studies have been carried out. According to the maritime archaeological findings, Galle harbour possesses a very high density for shipwrecks. Nearly 26 sites were discovered by the archaeological work carried out since the 90s around the Galle area. Nearly about ten shipwrecks can be reached within ten to fifteen minutes from the land. Some of those ships can be considered as quite old while some are very glamorous ships. Significantly, the outer harbour wrecks are abundant with marine life making them a paradise for tourists who are interested in underwater archaeology and marine life.

The main shipwrecks that were explored during maritime archaeological studies after referring to the Dutch historical records were the 'Geinwens' (1776), The 'Dolfijn', The 'Barbesteijn' (1735) the 'Hercules', (1661) and the 'Avondster' (1659). These ships are a great source to reconstruct past life. Apart from the shipwrecks located in the harbour itself, the shipwrecks can be found from the outer harbour area, Unawatuna and Hikkaduwa as well.

Figure 1: 2: *Archaeological sites in the Galle Harbor. Source: ICOMOS*

Modes of providing underwater cultural heritage experience to tourists

According to El Kady (2017), there are four main ways that the underwater cultural heritage can be interpreted for tourists. Those are namely, museums on land, underwater museums, underwater archaeological parks and virtual underwater museums. Therefore, the methods of heritage interpretations available around Galle and tourists' behavior in those places were taken into consideration below.

Maritime Archaeological Museum on Land and Tourist Behavior

These museums usually store and exhibit the material culture which was recovered from sunken ships. The artefacts that were found from the vessels mentioned above sunken near Galle are quite higher in number. These prominent artefacts are now displayed at the Galle Maritime Archaeological Museum to be visited by the people interested in learning about past sailing life so that this museum is an attraction that is not being missed by tourists who visit Galle. Maritime Museum is a significant museum currently in Sri Lanka that engages in the act of making the public aware of the marine biological and anthropological aspects of the Southern coastal area.

When considering the exhibits available for the tourists to visit, some of those artefacts encompass a large number of copper alloy nails and a few wooden frame parts that were found from the 'Geinwens', the bell of the vessel of 'Hercules' which was wrecked near the Galle harbour on 22nd May 1661. The following Latin inscription is found on the outer surface of the bell: 'AMOR VINCIT OMANIA ANNO 1625', which means 'love conquers everything – year 1625' (Mandawala, 2017; Galle Maritime Archaeological Museum).

Moreover, some stone anchors were found on the sea bed. Among these anchors, one of the most special facts that were found is two wooden flukes that were fixed to the Arabian type stone anchor. Other than the aforementioned artefacts, during various studies, the structure - Bala Oruwa was also found from the Southern coast. This is a traditional type of fishing boat, used for fishing in the deep seas. It is made of strong timber such as wild breadfruit (Artocarpus sp. Nobilis), mango (Mangifera indica), and domba (Calophyllum inophyllum). Normally, this boat is about 32 feet in length (Galle Maritime Archaeological Museum).

Old Chinese Porcelain pottery was also found in various parts of Sri Lanka are now displayed in several galleries. They depict evidence to the relations which had been existed between China and Sri Lanka over many centuries. Some of the artefacts including traces of sailing life back then including maps, naval craft, ropes, earthenware, beer mugs, smoking pipes, barrels, vast numbers of articles including artillery guns and sailor shoes are also displayed for the visitors.

According to the museum officials, a large number of local and foreign tourists visit this museum annually. In 2017, the museum has received 2942 foreign tourist arrivals and 45,196 domestic tourist arrivals, resulting in around 1,288,265 LKR of total earnings. It was revealed that the majority of the visitors both local and foreigners focus on the location of the actual site of the shipwrecks, how they have been salvaged and the historical stories related with them. And it is the foreign tourists the most who look for in detailed interpretation about the material culture displayed. These foreign tourists normally come from worldwide especially regions like Europe, India and East

Asia etc. It was revealed that tourists are interested in purchasing souvenirs which would remind them of the visit. The income earned by selling tickets for the tourists is again used by conservation and manage these underwater heritage values. This shows a way that the tourism activities are supporting underwater cultural heritage. Furthermore, the museum officials' interpretations also help educate both locals and foreigners, which leads to increased awareness of these inherent values. This awareness thereby ultimately encourages people in conserving heritage values.

Underwater Museum and Tourist Behaviour

An underwater museum is a construction that is made, designated or put underwater, particularly in a natural body of water. These museums can be visited by glass-bottomed boats, snorkelling, or scuba diving, depending on the site. Therefore, the artefacts found from the nearby shipwrecks can be placed in a submerged way closer to the coast, stable and solid enough to resist the destructive waves and currents. In the Sri Lankan context, even though we find an underwater museum in Galle, the exhibited artefacts do not belong to the shipwrecks around the areas. Hence, it is hard to consider this museum as a mode of interpreting underwater cultural heritage. According to the tourism service providers, given the travel restrictions due to COVID-19, it is hard to conclude the tourists' engagement in this underwater museum. They also stated that if this model can be practised while placing artefacts and monuments salvaged from the sunken ships, it has the potential of reaping positive benefits. Maritime archaeologists' perspective also supported this idea of tourism service providers.

Underwater Archaeological Trails – In Situ and Tourist Behaviour

Another method of giving experience and knowledge on underwater cultural heritage is in-situ. In Sri Lanka, tourism service providers such as diving centres provide the experience mainly. When it comes to the areas in which the diving trails are provided, even though the harbour itself has a high density of shipwrecks, those have accessibility restrictions because of the harbour and nave base's security concerns. Given this reason, tourists are not able to engage much with the shipwrecks located

in the harbour. But tourists can take diving trails in other parts such as outer harbour, Unawatuna and Hikkaduwa.

According to the operators of diving centres, many tourists come to their centres requesting for diving trails during the period of November to April which is considered the tourism peak in Sri Lanka. Among them are local tourists who travel majorly from Colombo and urban areas and international tourists from countries like India, the UK, Russia, Netherlands, Germany and China etc. Some of the tourists visit Galle for the sole purpose of witnessing and learning about shipwrecks and repeat tourists can be seen in a higher number. These are generally willing to spend a higher amount of money for the diving trails to shipwrecks. Typically, these tourists spend 2-3 days engaging with the diving activities. According to the operators of diving centres, tourists provide nearly 90% of positive feedback regarding the experience gained and this positive experience had led to the previously mentioned repeat visits.

Even though, tourists highly demand souvenirs related to the shipwrecks they have visited, there are no particular outlets to sell. Moreover, tourism service providers provided remarks on a lack of shipwrecks accessible despite the fact that there is huge demand from the tourists. This is mainly because the shipwrecks in the harbour are not reachable for outsiders.

Since every phenomenon has both pros and cons, archaeologists revealed that the main problem linked with diving trails to shipwrecks is looting and vandalism. Some people, mainly local divers fetch artefacts from shipwrecks and sell them for antiques. Moreover, breaking iron wreck parts to obtain iron are behaviours that can be seen from the local divers. However, these behaviours are now less intense compared to the previous generations.

On the contrary, foreign tourists unlike local visitors are highly concerned about protecting these artefacts and shipwrecks. Even though the tour guides and divers of previous generations encouraged their clients to fetch artefacts from shipwrecks as souvenirs, maritime archaeologists revealed that the tourism operators in the area are

now concerned in protecting shipwrecks. This is because these resources help tour guides in attracting tourists and earn an income from the same.

In that way, many archaeologists agreed that when the tourist service providers are well aware of the underwater heritage values, they try to preserve those values and thereby communicate the same message to their clients.

In general, maritime archaeologists look at present tourism activities to strengthen and preserve underwater cultural heritage rather than a destructive thing.

However, it was also revealed from both the perspectives of tourism service providers and maritime archaeologists that government officials' attention should be given to the protection of these sites.

Conclusions

It can be concluded that Galle and nearby territory has a high density of shipwrecks which are ultimately considered as underwater cultural heritage. A large number of shipwrecks can be seen inside the harbour while a lesser number of wrecks can be found from the out harbour area, Unawatuna and Hikkaduwa according to the archaeological studies that have been conducted up to now. There is a huge demand and enthusiasm generated from the tourists mainly from the foreigners to learn about the underwater cultural heritage around Galle. Some foreign tourists visit Galle for the sole purpose of visiting shipwrecks and the majority of these tourists are willing to pay a large sum for diving and related activities and products. There are two main ways that tourists could engage with the underwater cultural heritage in Galle. The first way is to pay a visit to the maritime museum while the second way is to dive into and see the shipwrecks in situ. The service providers of these centres usually get positive feedbacks from tourists which also causes repeat visits. All these facts indicate strengths in terms of underwater cultural heritage availability and demand of potential tourists.

Despite that fact, there are specific issues when the management of underwater cultural heritage in tourism is concerned. Those challenges include the illegal looting

and vandalism in underwater archaeological sites, limited access to shipwrecks, some weaknesses in the usage of advanced technology in terms of interpretation and poor selection of interpretation techniques and lack of souvenirs and related products to be carried away by the tourists etc.

When these limitations are considered against the strengths Galle possesses, it can be said that there is an unexploited high potential of underwater cultural heritage towards tourism in Galle.

Recommendations

According to the findings of this research, the following recommendations can be made to the proper utilization of underwater cultural heritage in tourism.

Even though the UCH in Sri Lanka is considered under the Archaeology Act, the monitoring procedures to examine the activities such as diving happening in the ocean is quite weakened due to lack of personnel. This can be solved by raising awareness of UCH law and identifying UCH among officers of Sri Lanka Navy and guards of the department of coast. Moreover, enough personnel can be allocated for monitoring and field operations.

Local visitors and general public should be given proper knowledge about the importance of underwater cultural heritage and the local communities' support for the conservation of these heritage values. This awareness can be raised from a formal education system by introducing new subjects in primary, secondary and tertiary education and awareness programmes.

Moreover, heritage interpretation can be enhanced by adopting new technologies such as virtual museums in which tourists are able to gain experience of the sailing life of ancestors with the usage of 3D reconstructions, augmented reality and virtual reality, Remotely Operated Vehicles and interactive mobile applications. Virtual museums can perform well in situations when underwater heritage is located in quite deep waters with poor visibility far away from the coast (Kady, 2017).

More income can be generated by introducing tourism products related to underwater cultural heritage such as souvenirs that can be carried away by the tourists.

Furthermore, replicas of glamourous ships such as Avondstar can be developed to be visited by tourists to get experience of a Dutch environment, like the replica of Cutty Sark in UK. This replica can be developed in shallow waters and a whole tour package can be created to sell a wholesome experience. A higher-income can be earned this way and the amount earned can be used to further archaeological studies and conservation of underwater cultural heritage.

The stories of each shipwreck can be told to the visitors by using more visual marketing techniques. This would lead to enhanced awareness, satisfy the visitors' requirements and help us earn an income. The knowledge of maritime archaeologists and the local community can be used in this process.

It would also be a great initiative if artefacts found from the shipwrecks nearby Galle could be placed in the underwater museum so that it will add more value to the visitor experience.

Sustainable principles should be adapted to promote underwater cultural heritage in tourism so that these heritage values can be preserved for a long period of time while generating an income for the participants. Therefore, proper plans should be implemented in order to utilize these underwater cultural resources to provide a worthwhile experience for the tourists who are interested and thereby reap benefits from them and inject those benefits again for the conservation of underwater cultural heritage.

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References

Kady, E. (2017). Potentials of Underwater Cultural Heritage in Tourism from the Perspective of Tour Guiding in Alexandria, Egypt. *Journal of Tourism Research*, Volume 17, 222-237.

Mandawala, P. (2017). Protection of the underwater cultural heritage of Sri Lanka through international cooperation - ICOMOS Open Archive: *E Prints on Cultural Heritage*. Retrieved 14 June 2020, from http://openarchive.icomos.org/2191/

Maritime Archaeological Museum – Galle Heritage. (2020). Retrieved 15 November 2020, from http://www.galleheritage.gov.lk/en/the-marine-archaeological-museum

Perera, B. (1951). The Foreign Trade and Commerce of Ancient Ceylon - The Ports of Ancient Ceylon. *The Ceylon Historical Journal*, Volume. I(No. 2), 109-119.

Sudharmawathie, J. (2017). Foreign Trade Relations in Sri Lanka in The Ancient Period: With Special Reference to the Period From 6th Century BC to 16th Century AD. *Humanities and Social Sciences Review*, 191-199.

Underwater Cultural Heritage | United Nations Educational, Scientific and Cultural Organization. (2020). Retrieved 12 November 2020, from http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/

A Forensic Anthropological Analysis on The Consumption of Forensic Science Methods Utilized to Detect Homicides Along with Sharp Weapons (With Special Reference to Court Records)

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Abstract

Crime is a common phenomenon in an organized society. Among the crimes, we identify as homicide is the unlawful premeditated murder of a person. Today, the criminal and the crime are meticulous. As a result, finding the culprit has become a complex issue. Undisclosed information about a crime is revealed through a criminal investigation. The methods used to uncover criminal information in criminal investigations are called forensic tactics. Methods in forensic science are used to uncover murder crimes. This research focuses on homicide crimes with sharp weapons. Accordingly, how can forensic techniques be used to examine murders committed with sharp weapons and to uncover information such as the weapon used in the murder? how the murder was committed? and the person who committed the murder? can be mentioned as the problem(s) of the research. The Monaragala High Court is the study institute used to compile the case reports related to the study. This research is a detailed study based on secondary data. Out of these case reports, from 2008 to 2016, 13 investigated murder reports were applied to accomplish the objectives. Case studies were used as a data collecting tool to detect the records. The interview method was also used partly in collecting data relevant to this study. Although many methods such as DNA technology, pollen analysis, and microscopic testing are utilized to detect homicides at an advanced level around the world, research reveals that traditional methods are still used in Sri Lanka. Accordingly, it is important to use the latest technology in Sri Lanka to bring criminals to justice and eradicate them from the criminal community.

Keywords: *forensic, scientific methods, sharp weapons, crime, murder*

Introduction

Forensic anthropology can be categorized as a subfield of physical anthropology which was emerged in the 1940s. During that period, law enforcement agencies extended an open invitation to physical anthropologists. That is, they come to identify the skeletal remains found in the criminal cases that they encounter. Thus, forensic anthropology is the process of scientifically analyzing the physical evidence obtained from one's observations of crime and providing it for the resolution of crimes. This physical evidence is obtained from the crime scene, the perpetrator, and the suspects. Based on this evidence, the focus will be on identifying the person who died, identifying the person who committed the crime, finding out the cause of death, as well as the time of death. Able to explain the crime is not just a case of a dead body found, although evidence of the crime is uncovered when bone without soft parts is found.

Weapons can be classified according to the nature of the weapon and the force exerted on it. There are reports of all kinds of weapons being used to kill people, as well as instances where they have been used. This research report focuses on how forensic scientific methods, which are theoretically studied under forensic anthropology, a subfield of such valuable physical anthropology, can be used to diagnose homicides with sharp weapons.

This research focuses on the crimes committed by sharp weapons. It examines how such forensic techniques are used to observe such crimes and find out the evidence in them, and based on that evidence, all the information related to the crime, such as the weapon used in the murder, how the murder was committed, and the person who committed the murder.

The main purpose of this is to study the practical application of forensic methods studied theoretically under forensic anthropology. Specific objectives of this study are injuries are a major cause of homicide. To gain an understanding of the injuries that sharp weapons can inflict on a person's death and their nature, To study how an

injury caused by a sharp weapon can affect a person's demise, and recognize the responsibilities of the forensic pathologist as well as the study of weapons.

The theoretical significance of this research is that it will be possible to examine the need for forensic methods to detect murders, to identify certified weapons, and to study extensively the nature of the injuries that can result from such weapons. It is of practical importance for a researcher who hopes to do further research on this to be able to use this study. This research will be important in the formulation of policies on the development of forensic science under criminal investigation.

Material & Methodology

The Monaragala High Court in the Monaragala District of the Uva Province was used as the study area for this research. The population of Monaragala District was 448,194. The case reports obtained from the High Court for carrying out this research have been analyzed from a scientific point of view. This research is a detailed study based on secondary data. Accordingly, the cases related to the murders committed with weapons in the Monaragala High Court were used for this purpose. Considering the contents of those case reports, much attention was paid here to the doctor's testimony. This is because all the information in the doctor's testimony is scientifically very accurate. Out of these case reports, all the final case reports examined from 2008 to 2016 were used for fulfilling the data collection. Accordingly, the number of research samples had to be limited to the 13 cases only. The main reasons for this were the inconvenience of obtaining the information as the case records of the years before 2008 and also it is difficult to obtain pending case records, due to the legal impossibility of court rules.

The interview method was also used partly in collecting data relevant to this study. Further, several officials who have the knowledge and understand of the field were also interviewed, namely, as the Chief Registrar, Attorney-at-Law, and the record keeper. A structured questionnaire was not used, and unstructured interviews were conducted.

Case studies were utilized during this research as a tool to fulfil the research obejctives. Accordingly, to examine the contents of each case record and make a clear and simple analysis or description of it. Accordingly, in analyzing these data, data tables, diagrams, charts were used for a clear demonstration.

Result and Discussion

The study was conducted using the testimony of the Judicial Medical Officer in the murder cases reported at the Monaragala Uva Provincial High Court. Accordingly, 07 cases of homicide with sharp weapons were selected from 13 cases and the data were analyzed by a case study report with full information on the injuries, and cause of death. These cases were analyzed using a classification presented by Au and Beck (2011).

1. Classification according to the number of injuries of the person killed
2. Classification according to the severity of the victim's injury
3. Classification according to the type of injury of the murdered person
4. Classification according to the place of injury of the murdered person

Event number	Gender	Number of injuries	The severity of the injury	Type of injury	The place of injury						
					Head	Face	Neck	Trunk	Lap	Upper Limb	Lower Limb
1	Male	1	Critical	Strikes				■			
2	Male	2	Critical	Strikes				■			
3	Female	6	Critical if not treated	Cuts		■					
4	Male	11	Critical and minor injury	Cuts/ Abrasions	■		■	■			
5	Male	18	Critical and minor injury	Strikes/ Abrasions				■		■	■
6	Male	03	Critical and minor injury	Strikes/ Abrasions				■			■
7	Female	03	Critical	Shots/ Bites (Ant)				■		■	

Table 01: *Classification according to the number of injuries of the person killed*

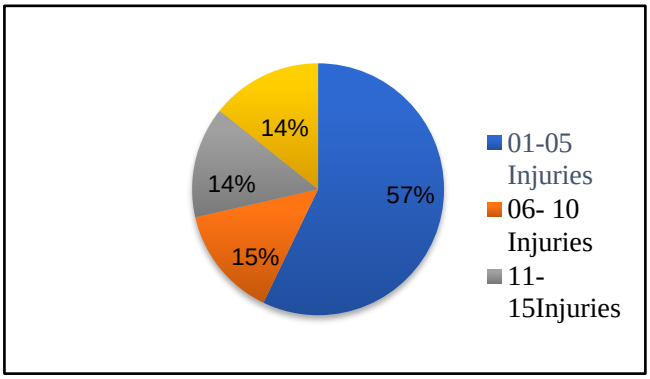

Figure 01: *Numbers of injuries identified from each homicide*

The above chart presents an outline of the total number of casualties identified in this study. Accordingly, it is clear from the above data that the number of deaths due to less than 5 injuries is higher.

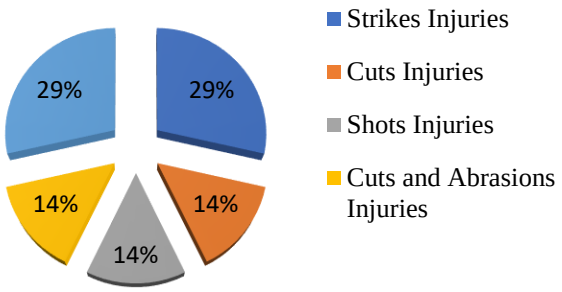

Figure 02: *Classification according to the type of injury of the murdered person*

It is clear from the above chart percentages that the stab wounds were mostly used for these murders.

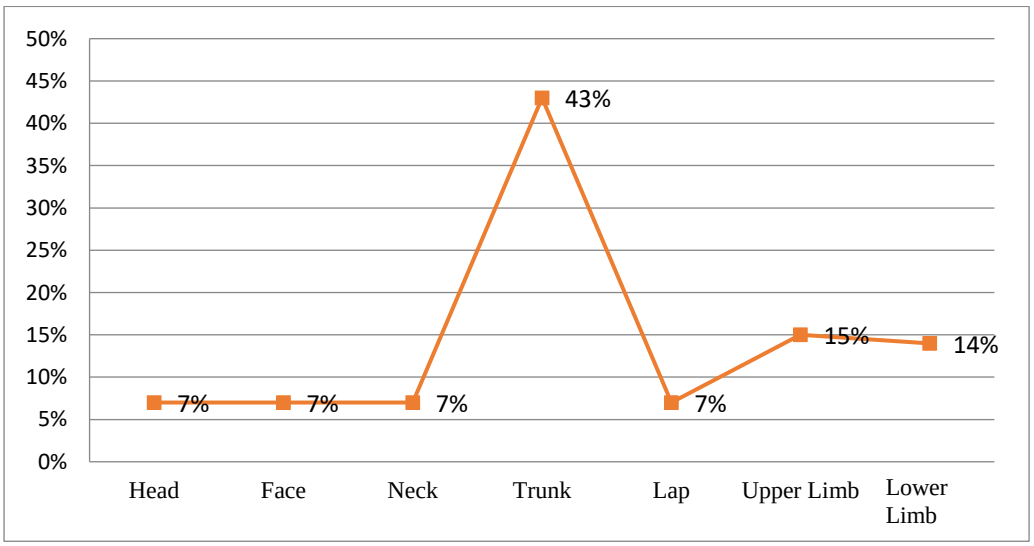

Figure 03: *Classification according to the place of injury*

Above chart demonstrated that the injuries to the trunk were in high range comparing to the head, face, and neck.

This information shows that the killer often inflicted stab wounds in the majority of the stab wounds, most of which were cuts on the head and neck. This is because the trunk contains vital organs such as the lungs, heart, and kidneys, and damage to these organs is often severe. Similarly, the neck and head are the most important organs and damage to the brain or spinal cord can be fatal. Although one of the incidents identified in this study resulted in the deaths of people who had suffered injuries as a result of the injuries sustained in the incident.

More than one injury, which is usually the hallmark of a homicide, is found in all but one of these cases, except in cases 01 and 7. Incident No. 07 here is a shooting, and although the injuries inflicted by the animals after the death were seen, only one of the injuries which led to the murder was found. The wounds that caused all these murders can be described as deep as well as wounds that can be seen anywhere on the body.

Similarly, the presence of corresponding wounds on the clothes worn is another feature of a homicide wound. According to the case records, it was clear in these cases that similar injuries had been identified in the clothes. It was clear from the case records that there were corresponding injuries on the clothes worn, especially in cases 05 and seven.

The presence of stab wounds in hidden areas is a common feature of a homicide, but no injuries were reported in such hidden areas. Also, the location of the assailant can be identified by the direction of attachment, with the forensic medical officer reporting that in cases 3 and 5, he was attacked from the front, and in all other cases, he was attacked from behind. Thus, the study revealed the methods used by the forensic pathologist to identify the murders committed by the sharp weapons that the study was trying to establish.

1. Identify the body first to perform the post mortem
2. Recording the appearance of the corpse
3. Identify and report the external features of the body involved in the murder

4. Identify lesions on the surface of the body and record the nature and the extent of the lesion using numbers
5. Identify and report injuries before and after death
6. Obtaining internal injuries through techniques such as X-rays
7. Distinguish between injuries sustained during surgery and injuries stained by the killer to provide medical assistance.
8. Identify the internal injuries of the body and assess the damage caused to the internal organs by those injuries.
9. Determining the severity of the injury
10. Present an idea of the weapon used to inflict the injury according to the nature of the injury
11. Provide an idea of the force exerted on the wound by the nature of the injury and the location of the injured person and the injured person.
12. Present an idea of how the injury occurred according to the size and shape of the wound

Conclusion

Through this study, we revealed that forensic medicine in Sri Lanka is still using a wide range of ancient techniques. Although many techniques such as DNA technology, pollen analysis, and microscopic testing are used to detect homicides at an advanced level around the world. Accordingly, it can be suggested that the use of modern technology in Sri Lanka is also important if criminals are to be brought to justice and eradicate crimes from the community.

References

Annual Reviews. (2019). Ancient DNA Studies in Physical Anthropology. [online] Available at: https://www.annualreviews.org/doi/abs/10.1146/annurev.anthro.29.1.21[Accessed 10 Feb. 2019].

Anon, (2019). [online] Available at: http://www.dinamina.lk/2018/03/16 [Accessed 3 Jan. 2019].

Au, K. and Beh, S. (2011). Injury patterns of sharp instrument homicides in Hong Kong. *Forensic Science International*, 204(1-3), pp.201-204.

Crime Museum. (2018). Forensic Anthropology - Crime Museum.[online] Available at https://www.crimemuseum.org/crimelibrary/forensicinvestigation/forensic-anthropology/ [Accessed 2 Jul.2018].

Encyclopedia Britannica. (2019). Physical anthropology. [online] Available at: https://www.britannica.com/science/physical-anthropology
[Accessed 9 Feb. 2019].

Cultural and Religious Tourism in Majuli With Special Reference to Auniati Sattra And Uttar Kamalabari Sattra

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Abstract

The paper attempts to study the potential of cultural and religious tourism industry in Majuli as a whole and Auniati Sattra and Uttar Kamalabari Sattra of the island in particular. The scope of tourism in Majuli, be it eco-tourism or religious tourism and cultural tourism is tremendous with nature's opulence in full display here. Majuli, renowned as one of the world's largest freshwater river island is a conglomeration of Vaishnavite religion, natural beauty, art and craft, ethnic culture and traditions which needs to be explored and showcased to the world. The Sattras (Vaishnava monasteries) and their rich heritage and cultures have given Majuli the status and pride of being the "Cultural Capital of Assam". Today people have shifted from the traditional ways of touring in the form of going to hill stations, historical places etc. to more adventurous and unexplored destinations. Adding to the other attractions of northeast India, Majuli stands out as a jewel in the crown with its total package of natural beauty, religious monasteries, eco-tourism etc. An attempt has been made to present the uniqueness of Majuli's Sattras, its different congregational prayer services, a distinct dance form called Sattriya and an about to be an extinct art form mask making as a potential tool to put Majuli in the tourist map of India and the world.

Keywords: *Bhakat, Bhaona, Shrimanta Sankaradeva, Sattra, Sattriya*

Introduction

The north eastern part of India is known as the treasure trove of nature's divine beauty. It is bestowed with picturesque landscapes, crystalline waterfalls, undulating hills, green valleys, blue lakes, dense forests and rich culture. The serene ambience of this part of the country has long been a traveller's paradise. With colourful costumes, traditional villages, an amazing array of flora and fauna, mighty rivers, great cultural diversity it has the potential to do wonders in the tourism sector. Assam is the gateway to the entire North East and is a true representation of the same. It is a meeting place of diverse cultures. Its breathtaking landscapes, lush green tea gardens, pilgrim centres, carefully preserved history and untouched aura allures the visitors. The prominent among the tourist places in Assam are Kaziranga and Manas National Parks, both of which are UNESCO world heritage sites, Kamakhya temple, Vaishnavite monasteries in Majuli, Barpeta etc.

Tourism is traditionally defined or rather perceived as people travelling to and staying in places outside their usual environment either for leisure, business and other purposes. However, it has been observed that there has been a paradigm shift in the way people want to spend their leisure time. A certain section of the people particularly domestic tourists is getting inclined to adventure tourism or eco-tourism or a mix of adventure, eco and religious visits with the international tourist already in this circuit. In the 'Paradise Unexplored i.e. northeast India, there stands a jewel in the crown which has the potential of catering to what a neo tourist wants today. This riverine island occupies a very important place in the tourist map of India and the world as well because it is the embodiment of natural beauty, ethnic composition and the unique *Vaishnavite* religion and cultures all assemblage together in a beautiful way under the sky.

The Sattra are the centres of Assamese culture with their traditional prayer form, a 566 years old tradition of open-theatrical custom, classical dances and handicrafts. The very nature of the topic suggests that there is a great scope to investigate and

conduct a detailed study on cultural and Religious Tourism in Majuli with special Reference to Auniati and Uttar Kamalabari Sattra.

Review of literature

For the presentation of this paper, a number of secondary sources in the form of books, journals, periodicals, articles, English and vernacular magazines have been consulted.

Edward Gait(1962) provides a comprehensive account of the history of the region and can be said to be an authority on the same. The evolution of Shrimanta Sankaradeva's movement has also been covered by his book that provides relevant information about the course of its development. Neog(1963) has thrown light on the essence and philosophy of *Eka- saran –Naam- Dharma* or *Neo – Vaishnavism* initiated by Srimanta Sankardeva. He has also dealt with the various works of Srimanta Sankardeva and his direct disciple, Madhavdeva. Barua (1965*)* treats in details the cultural contribution of Shrimanta Sankardeva ranging from the plays (*Ankiya Nat or Bhaonas*), their various forms, timings to the poems, songs and verses composed by the Saint (*Bargeet,Kirttan-ghosa* etc). Neog (1967) has traced the background of the *movement* at the very outset of his work. Subsequently, he goes on to discuss Srimanta Sankardeva's *Neo-Vaishnative* order, the tenets and practices of the faith and his attempts at social reorganization significantly, in the chapter titled *An Anthology Of Songs and Verses*. In the fourth stanza of one of his poems, the readers can get an insight into Srimanta Sankardeva's concern for all living creatures. The dance form of *oja-pali* of Assam was studied by Goswami (1997), who has described the dance gestures and the musical modes attached to it. It is intended to give to the readers some glimpses of the multi-faceted genius and personality of Shrimanta Sankaradeva and his long-lasting contributions practically in all fields of life and literature, art and culture. Neog (2004) has discussed about the Assamese culture with particular reference to *Vaishnava* renaissance, the *Bhakti* cycle of Assam, *Vaishnava* music and the Indian Ballet. Barkakoti's work (2006) is a comprehensive one dealing with diverse themes ranging

from the life sketch of Shrimanta Sankaradeva and his philosophy to *ankiya nats* (one-act devotional plays) and *bhaonas* (a dramatic show of *Vaishnavite* dramas; a religious performance) of the Saint. He gives the readers an insight into how Shrimanta Sankaradeva through his *Neo-Vaishnavite* creed brought the composite Assamese nation into being. The treatise breaks new ground in bringing to light the sociological import of the cultural processing that *Vaishnava* movement has set in motion over the Centuries.

Methodology

The data for the present study which is exploratory in nature was collected at two levels: -

(i) The first step was the collection of secondary data related to the topic through intensive library work.

(ii) The second step was information collected through field work conducted in various phases.

As a first step of creating the universe of the study, relevant information was collected from various sources like books, reports, research journals, newspapers etc. and also from the various institutions and libraries. The facts and qualitative and analytical data presented in this study have been collected from numerous visits to Auniati Sattra and Uttar Kamalabari Sattra of Majuli. Personal meetings, one to one interaction, structured as well as unstructured interviews with the inmates of both the Sattras and observation method were employed to collect data.

Statement of the problem

This study is devoted towards understanding the potential of religious and eco-tourism in Majuli River Island with special reference to Auniati Sattra and Uttar Kamalabari Sattra. This River Island is considered as the cradle of Vaishnavite culture due to its unadulterated culture and spirituality and this uniqueness needs to be showcased to the world.

Natural beauty: Cut off from the mainland, the pollution-free and peaceful atmosphere of the island provides a welcome respite from the tiring, strident and monotonous existence of city life. The river banks and sandbars (*chars*) present an alluring picture with the blooming white reeds (*kohua*) moving relentlessly to and for. Isolation from the mainland has helped in the protection and preservation of some of the rare species of flora and fauna. It is at its best in winter as innumerable migratory birds flock to the island during this season because of which it has been declared as one of the Important Bird Areas (IBA) of India. The sunset in the heart of the Brahmaputra is always a tourist's delight. On the floral side, Majuli has more than a thousand species of trees, grasses, creepers, flowers, orchids ferns and other forms of plants. Sufficient rains and humidity endow Majuli with evergreen and deciduous forests. Some of the prominent bird watching sites are Saluki *beel* (a lake-like wetland with static water) Dowkpara, Borbilla, Duboritoli and Rambolia. All these have made Majuli one of the most sought tourist destinations.

Ethnic composition: Majuli is the homeland of multiple ethnic tribes -the Mishings, Deuris, Sonowal Kacharis and Mataks. Traditional cottage industries like cane and bamboo, pottery, mask making, boat-making, mat-making, handloom and weaving is not only a source of income but a living tradition guarded jealously by the people. The Kumar community of Salmara, a small village in Majuli, is famous for its pottery products. Silk, *endi* and cotton fabrics of Majuli are in great demand all over the State. *Ribigachang* (a hand-woven shawl worn by women), *Mibugaluk (*a traditional shirt worn by men), *Mirizim* (a type of hand-woven cotton blanket), silk and cotton dresses woven by Mishing women are in demand in the international market. Women of the Nath community are also expert in weaving *pat* (the silk of the mulberry fed silkworm) and *muga* (amber colour silk produced from a muga cocoon) clothes. *Bishu*, a colourful spring festival and *Hurairangali*, a dance form of the Deuri tribe, the spring festival of the Sonowal Kacharis, the *Bathou Puja* and *Haidang Hagra*, *Bohua* the main dance forms of this community can leave a tourist spellbound. Ali-ye-ligang, the harvest festival of the Mishings can also charm a visitor.

The *Vaishnavite* religion and culture: Shrimanta Sankaradeva, a 16th Century religious preacher, social reformer, poet, musician and dramatist brought about a cultural renaissance in Assam through an institution known as Sattra (*Vaishnavite* monastery) which provided the venue and atmosphere for religious, social and artistic activities. This institution not only served as the vehicle for propagating *Vaishnavite* faith and religion but also helped in making the society free from blind religious dogmas, superstitions and ritualistic processes. After Shrimanta Sankaradeva, the faith was propagated by his two chief apostles Sri Madhavadeva and Sri Damodaradeva.

64 Sattras were established in the 16th and 17th century, of which only 22 remains at present. The rest have either been eroded away or had to be shifted to other places. Majuli is regarded as the nerve centre of *Neo–Vaishnavite* religion, art and culture. The Sattras and their influence in the religious, cultural and social life of the people have made Majuli the principal seat of pilgrimage for all people in general and the *Vaishnavites* (followers of *Vishnu*, who has a thousand Names) in particular.

The following are some of the prominent Sattras of Majuli- Auniati *Sattra*, Uttar Kamalabari Sattra, Dakhinpat *Sattra*, Natun Kamalabari Sattra, Garmur *Sattra*, Natun Samuguri Sattra, and Bengenaati *Sattra*. Of these, the Auniati Sattra and Uttar Kamalabari need special mention.

Tourists throng Auniati Sattra and Uttar Kamalabari as these two Sattras are the treasure house of various dance forms, drama, music, arts and crafts and preserve antiques like weapons, utensils, jewellery and other items of cultural significance.

Auniati Sattra: The Auniati Sattra was patronized by the Ahom king Jayadhwaj Sinha and founded by Niranjan Dev. This Sattra has been the epicentre of Vaishnavism and Sattriya culture of Assam. The museum of the Sattra has an enviable collection of historical relics including old Assamese utensils, jewellery, handicraft and ivory works. Apart from the daily holy religious practices, the Sattra also pursues various literary activities, dance forms, songs and music, drama etc. In addition, various religious activities devoted to the Lord Vishnu are performed in the form of

festivals. Some of them like the *Paalnaam*, *Kati Bihu*, *Rasotsava*, *Holi*, *Janmastami* are worth mentioning. Among others, the death anniversary of Shrimanta Sankaradeva, Madhavadeva, Damodaradeva are widely celebrated. The special occasions which attract tourist to this Sattra are-

i. ***Palnaam*:** It is a five-day festival beginning on the 25th day of the Assamese month of *Kartika*. (a very important month in the Hindu calendar from mid-October to mid-November). Thousands of people come every year to witness this event. At this time there is a ritual to offer "Salt" to the Lord as there is a belief that the donation of 'Salt' is equivalent to the donation of 'Gold'.

Figure 1: *His holiness Sattradhikar with other Bhakats in Palnam*

Figure 2: *The bhakat (inmate) lighting the earthen lamps (Akash Banti)*

ii. ***Kati Bihu*:** In the month of *Kartika* a traditional lamp lighting ceremony is observed in the Auniati Sattra. This tradition is being followed scrupulously every year since its inception in the year 1653 AD. The *bhakats* (inmates) light the earthen lamps (*akash bonti*) for peace, happiness and prosperity of mankind and to seek the Almighty's blessings on the eve of the auspicious month of *Kartika*. Altogether 21 pairs of earthen lamps are lit which is a sight to behold.

iii. ***Rasotsava*:** In the festival of *Rasotsava* a special puja is performed in a *mandapa* (altar) erected inside the *namghar (* 'Nam' consists of the meaning of prayer to Hindu's supreme God Vishnu and 'Ghar' consist of the meaning of the house (where prayer is done) instead of the *manikuta(*is an independent

room located towards the eastern end of Namghar. It is the place that represents the worshipful god, or a guru-asana (the guru's seat). Here the idols of Radha Krishna are installed and worshipped. During this festival, various dance dances, drama and *bhaona*'s (is a traditional form of entertainment, with religious messages, prevalent is Assam, India.) is performed.

iv. ***Sachipat* manuscripts:** In Auniati Sattra a lot of age-old manuscripts written in *Sachipat* can be found. *Sachi* is the writing material prepared from the bark of *Sachi* (Aquilaria agallocha) tree.

v. **Handicrafts:** Of the different types of handicrafts, hand fans find a prominent place. In the making of the hand fans a special ingredient known as *hengul haitaal (*yellow arsenic (*haital*), vermillion (*hengul*) is used which give long life and colour to the hand fans.

vi. **Museum:** The premises of Auniati Sattra also boast of a very informative and well-maintained museum. It has preserved varied artefacts of common use, tools, weapons, statues, decorative ornaments etc for centuries. These articles throw considerable light on the rich cultural heritage of Majuli.

Figure 3: *Ancient Articles preserved at the Auniati Sattra Museum (Bhringar, Guwa Bota, Joy Ghanta, Pitalar Gorur)*

The table below shows the number of domestic tourist visits (DTV)and foreign tourist visits (FTV) to Auniati Sattra Museum and the revenue collected from there.

Year	Visitors to Museum in AuniatiSattra		Collection from visitors (in Rs)		General visitors to AuniatiSattra.
	DTVs	FTVs	DTVs	FTVs	
2010	7,320	360	36,600	18,000	21,000
2011	8,275	415	41,375	20,750	27,000
2012	9,140	450	45,700	22,500	30,000
2013	9,000	520	45,000	26,000	24,000
2014	9,470	318	94,700	15,900	28,000
2015	10,025	430	100,250	21,500	35,000
2016	11,000	310	110,000	15,500	44,000
2017	12,130	470	121,300	23,500	55,000
2018	10,420	510	104,200	25,500	47,000
2019	11,390	440	113,900	22,000	38,000
2020	600	15	6,000	750	15,000

Table 1: During Pal Naam, the number of tourists visiting Majuli exceeds one lakh

Figure 4: *Overseas visitors visiting the Auniati Sattra*

Uttar KamalabariSattra: It is one of the most culturally developed Sattras of Assam. The rosary used by ShrimantaSankaradeva and Sri Madhavadeva, footprints of Madhavadeva engraved on stones and manuscripts such as *Nammallika Ratnawali* written by Madhavadeva and *Dasama* authored by Shrimanta Sankaradeva are preserved in this *Sattra*. Both Uttar Kamalabari *Sattra* and Natun Kamalabari *Sattra* impart training in Sattriya dance and music.

The primary attractions of this Sattra are:

i. **Uttar Kamalabari *Kristi Kendra*:** It is a cultural centre established in 1955 so that the inmates of the Sattra gets enough opportunity to show their talents in both the national and international arena. It is through their performance the *Vaishnavite* culture and tradition of the Sattra gets national and international recognition. It is run by a Cultural Committee which is formed through a formally elected body elected after a period of every three years.

ii. **Performing Arts:** The senior *bhakats* expertise in different fields of dance and music imparts training to the novices. Songs composed by the two Saints Sankaradeva and Madhavadeva are taught those that are sung and practised in the Sattra. Among them, the most popular is the *Bargeets* (Songs of Higher Praise) or prayer songs sung during various services of the Sattra. "*Bargeet* is a convergence of philosophical reflections, secular and ethical broodings, agonies of the spirit, and saintly humility. Each *Bargeet* invariably concludes with a passionate cry for refuge at the feet of Lord Govinda and deliverance from the sufferings of the world (Phukan,2010:110)". The other types of songs are the ones that are used in the presentation of the drama, also known as *ankar geet*. *Oja-pali* is another form of dance music that is also taught to the junior *bhakat*s .It consists of a band of singers with a leader called *Oja* and his supporters called *pali*. *Gayan-bayan*, a kind of dance-cum-choral music performed in groups is also taught. The young *bhakats* are also trained

to play the different percussion instruments like *khol*, *mridanga* and various types of *tal*(cymbals).

Figure 5*: Getting ready for Bhaona*

With a number of *hasta mudras* (hand postures), intricate choreographic patterns, distinctive costumes and use of masks, Sattriya dance is unique in itself. The various forms of dances that are taught in the Sattra are *sutradhar anach*, *gosai prabeswar nach*, *gopi prabeswarnach*,*chali nach, behar nritya, jhumura ,dasaavatar*, *mati-akhara* and *nadu- bhangi*. Besides, the young inmates are also taught the techniques of performance of *ankiyanat* or *bhaona* presentation

a. The *Sutradhar* or the narrator plays the principal role in the presentation of *ankiya nat* (one-act play). His part is pivotal in the

dramatic performance as he strings together all the components, right from introducing the theme, announcing the entrance and exit of the character, explaining the different situations and then leading the benedictory singing. This dance requires not only the ability to sing and dance but also a clear understanding of the entire play.

b. *Gosai praveswar nach* is also known as *Krishna bhangi*; it signifies the entrance of Lord Krishna to the stage with dancing movements. The *gopi praveswar nach* introduces the entrance of *gopis* (Lord Krishna's beloveds) to the stage, characterized by soft and feminine dance movements.

c. The *chali* dance is performed by young *bhakats* wearing female costumes representing the *gopis* while in *behar nritya* the dancing boys numbering 25-30 dress like Lord Krishna. The *jhumura* nritya (nritya means dance) is based on a variety of Assamese medieval plays, written and introduced by Madhavadeva. This distinctive form of dance is divided into two parts- *ramdani* and *ga-nach*. *Ramdani* or the preliminary dance is performed before the song begins and the main part or *ga-nach* is performed along with the song and it is believed that this dance stands for the sentiments and physical condition of the *gopis* when Lord Krishna disappeared from their midst. Songs for this dance form is taken from the *nats* and *jhumuras* of Sankaradeva and Madhavadeva. The ten incarnations of Lord Vishnu namely, *Matsya* (Fish), *Kurma* (Tortoise), *Varaha* (Boar), *Narasimha* (the Man-lion), *Vamana* (Dwarf), *Parashurama*, Lord Rama, Balarama, Lord Krishna, *Kalki* is depicted through the *dasaavatar* dance.

d. Regarded as the basic science of *Sattriya* dance, *mati-akhara* means ground exercise. There are 73 types of *mati-akhora*s, however, 64

are accepted and accordingly appropriate training are imparted. These ground exercises acrobatic and are of two types:(i)pure exercise and (ii)basic dance units. After prolonged and rigorous practice of these ground exercises, the body becomes flexible and helps the trainee dancers to learn the dance techniques easily. *Nadu-bhangi* is the dance of Lord Krishna with three pairs of *gopa*s (*gopa*- a cowherd) and *gopi*s (daughter of a cowherd) in Vrindavan. The costumes of all three pairs are different. One pair wears the costume of Lord Krishna; the other two pairs wear the costume of *jhumura nritya* & *chali nach*. The costume of Krishna consists of a yellow-coloured *dhuti*, a small black coat with quarter sleeves (*bukuchula*), silver laced cross-bands and waist bands. Besides these, a head gear (*mukut*) with a peacock feather, a garland of flower (*angamala*) and *nupur* (anklet) are also worn by the performer.

Figure 6: *Behar Nritya*

Figure 7: *Raas Nritya*

Some domestic as well as international tourists, when they visit the Sattra express their desire to see the *bhakat*s perform the different *Sattriya* dances or *Ankiya bhaona* (The Assamese Vaisnava dramatic tradition established by Saint Sankardeva). The *bhakats* make arrangements for such performances, for which the visitors are required to pay the following amount as given in the table below.

Fees to be paid at the time of Video recording

Sl.No	Particulars	**Artist Fare**	**Kristi Sangha Dev.Fund**	**Kirttan Ghar Dev.Fund**	**Ashirbadia**	**Total**
1.	*Gayan Bayan*	Rs.2500	Rs.1000	Rs.1000	Rs.500	Rs.5000
2.	*Ankiya Bhaona*	Rs.3500	Rs.1000	Rs.1000	Rs.500	Rs.6000
3.	*Behar Nritya*	Rs.2500	Rs.1000	Rs.1000	Rs.500	Rs.5000
4.	*Jhumura Nritya*	Rs.1500	Rs.500	Rs.500	Rs.300	Rs.2800

5.	*Chali Nritya*	Rs.1500	Rs.500	Rs.500	Rs.300	Rs.2800
6.	*Nadubhangi Nritya*	Rs.1500	Rs.500	Rs.500	Rs.300	Rs.2800
7.	*Mati-Akhora*	Rs.1500	Rs.500	Rs.500	Rs.300	Rs.2800
8.	*Krishna Leela*	Rs.4000	Rs.1000	Rs.1000	Rs.500	Rs.6500

Figure 8: *Overseas Visitors from Europe*

Figure 9: *Overseas Visitors from Japan*

It is worth mentioning that the inmates of the Sattra have also been invited overseas in 2008, 2010 and 2012 to participate in the following festivals.

Name of the festival	**Place**	**Year**
Festival Les Orientales,	Saint Florent Le Vieil , France	02 to 06 July,2008
Le Festival d'Evora	Evora , Portugal	07 to 10 July, 2008
Le Festival de Musiques Sacree de I'Abbaye de Sylvanes	Sylvanes, France	11 to 14 July, 2008
Festival Autres Rivages	Uzes, France	15 to 16 July 2008

Le Festival International de Folklore	Issoire, France	17 to 20 July , 2008
Le Festival Interfolk	Puy en Velay, France	21 to 27 July , 2008
Muse du quai Branly	Paris	10 to 13 June 2010
Participated in twenty-two different festivals sponsored by ICCR	France & Switzerland	14 June -15 July 2012

These invitations reflect the enchanting charm of the *Sattriya* culture *at par excellence* and thus bring recognition to the splendid Sattriya dance at the international level. This recognition has been possible due to the efforts of prominent French writer Nadine Delpech and others by the name 'Preserva Majuli' in Paris to promote Sattriya culture.

It is mention-worthy that Ballary and Sojique, two young ladies from France stayed in the Sattra guest house for the purpose of learning *Bargeet* in 2009. They initially came as a tourist to Majuli and were later fascinated by the cultural and spiritual beauty of the Island. After visiting the Uttar Kamalabari Sattra, they decided to stay back and take lessons in music. The researcher would like to mention here that two other ladies, Rebecca and Patricia from France stayed in the Sattra for months together and took training in Sattriya dance. Rebecca is the first foreigner who took part in the *Rasotsava* festival held in November 2010. A Mumbai based young choreographer from Ghana, South Africa, stayed in the Sattra for 15 days and took training in Sattriya dance form with special emphasis to *mati-akhara*.

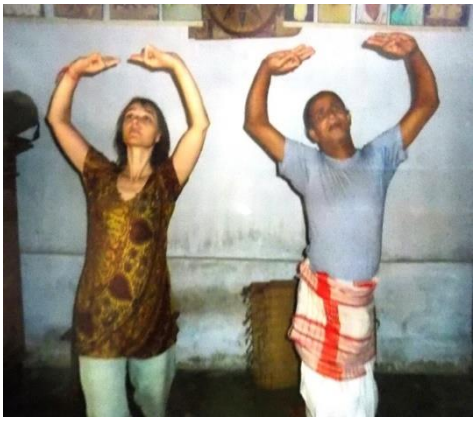

Figure 10: *Patricia taking lessons in Sattriya dance*

Figure 11: *Overseas visitors learning Sattriya dance*

iii. Fine Arts- Wood carving and Mask making:

Some of the residential devotees are skilled in the art of wood carving, especially in making the miniature images of deities, thrones or *asanas* and beautifully decorated doors and windows required in the Sattras and for other purposes as well. They are also skillfully specialized in making and preparing the decorative materials, accessories and masks connected with *bhaona.* The elderly *bhakat*s train their young counterparts in different techniques associated with these two forms of arts and thus the tradition is handed down from one generation to the other.

Conclusion

It can always be said with conviction that this immense potential place is indeed a visitor's delight and can be one of the most sought-after tourist destinations which will not only boost up the economy of the place but will also contribute to State revenue. However, a lot needs to be done to increase the flow of domestic and foreign tourists to this place. During the annual Raas festival, visitors would have thronged Majuli had there been proper lodging and food facility. Another major hindrance for the tourist is the ferry service, the only means of transportation to the island, which is available only four times a day (twice upstream and twice downstream). So, we would like to request the State and the Central Government to build up the

infrastructure for the inbound tourist in terms of hotels, information centres and transportation facilities.

The fortune and lives of the inhabitants of Majuli are dominated by the river Brahmaputra. Developments through ages are nullified in an instant occurrence of high flood and severe erosion Erosion and flood in Majuli are two problems which restrict the visits of tourists. So, it is an appeal to the concerned authorities to take urgent steps to curb these two nuisances. The decision to declare Majuli as a World Heritage Site is still to be seen but efforts can be made to save this unique riverine island with all its grandeur and glory.

References.

Barkakati, S.K.,(2006),*Unique Contribution of Srimanta Sankardeva in Religion and Culture, Nagaon,* Sankardeva Sangha

Barua Arindam (ed),(2009), *Majuli Nature's Silent Paradise,* Majuli Sub Divisional Information and Public Relation Officers.

Barua, H.,(1965), *Assamese Literature*, New Delhi, National Book Trust, India.

Bora, Pranjal and Mala Gayan Bora, (2009), *Majuli Cao Ahok*, Kamalabari, Majuli, Assam, Gyan Mandir.

Gait, E.A.,(1962), *A History of Assam*, Guwahati, Lawyers Book Stall

Goswami, B.M.,(1997), *A Study of the Ojapali Art Form of Assam*, Guwahati, Charu Prakashan.

Mahanta, Prasanta Kumar (ed) (2001), *Majuli*, Tarajan. Jorhat 785001, Assam, GranthaSanskriti

Nath D,(2009), *The Majuli Island: Society, Economy and Culture*, Vikas Marg, Shakarpur, Delhi-110092(India), Anshah Publishing House

Neog, Dimbeswar,(1963), Jagat Guru Sankardev (In Assamese), Nagaon, Srimanta Sankaradeva Sangha.

Current Science.Vol-84. No-7 April 10,2003.

Majuli, Island of the Sun: Banamallika Oct 2002.

Report 1997 Director Tourism.Govt of Assam.Plavan. 1999 IV 14-18.

Phukan, Bimal, (2010), Srimanta Sankaradeva, Dr. S.K. Bhuyan Road, Guwahati, Kaziranga Books.

Apendix 01

TRIVALENT

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Journal of Archaeology, Tourism & Anthropology

Department of Archaeology

University of Kelaniya

Sri Lanka

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About

The Journal of Archaeology, Tourism & Anthropology is to provide a platform for researchers and professionals to publish their research findings, theoretical overviews, models, concepts related to Archaeology, Anthropology & Tourism & Cultural Resource Management with a multidisciplinary research approach. This is an interdisciplinary, open access journal which is exclusively devoted to the publication of high-quality research in the fields of Archaeology, Anthropology & Tourism & Cultural Resource Management. The Journal focus on new trends in each field.

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The academic journal of Archaeology, Tourism & Anthropology is the official journal of the Department of Archaeology, University of Kelaniya, Sri Lanka. The journal provides a platform for researchers and professionals to publish their research findings, theoretical overviews, models, concepts related to relevant fields of Archaeology, Anthropology & Tourism & Cultural Resource Management. Further, the journal encourages collaboration by teams of researchers to create special issues on the latest developments in related topics of national and international importance.

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Archaeology has become a subject field of studying human culture through human activities beyond mere appraisal of past cultures & societies. The application of new knowledge & secrets of human history uncovered through that scientific study is the main aim of archaeology. Based on the multidisciplinary & multivocal concept of archaeology, it is an internationally connected subject via likes Tourism & Cultural Resource Management. The department offers a student-centred learning system by instilling in lectures a series of practical skills in fieldwork & research.

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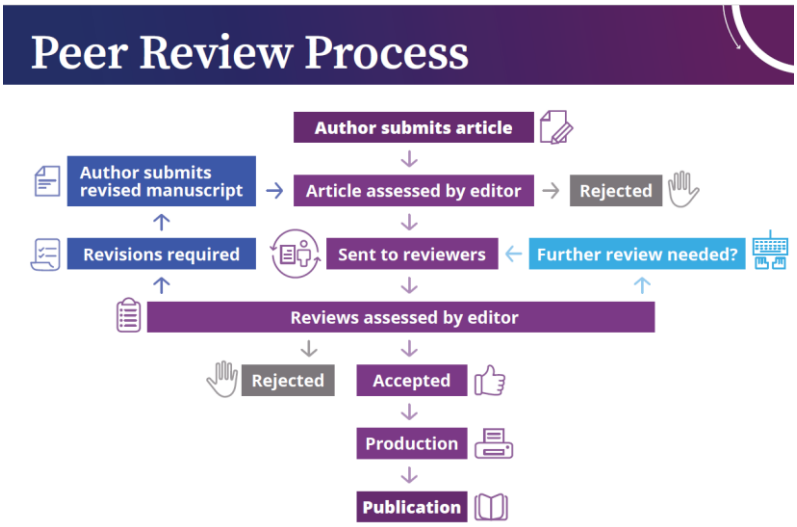

1. Submission of Paper

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II. Relevance of the Topic
III. Importance of the Topic
IV. Contribution to the Literature
V. The proper research methodology adopted
VI. Organization of the contents
VII. Discussion
VIII. Conclusion
IX. Quality of writing & Mechanics
X. Any other comments from the reviewers

Otherwise, they will read the paper several more times, taking notes to build a detailed point-by-point review. The review is then submitted to the journal, with a recommendation to accept or reject it – or else with a request for revision (usually flagged as either major or minor) before it is reconsidered.

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	• All illustrations, figures, and tables should be placed within the text at the appropriate points, rather than at the end.
References	• Please use the APA (American Psychological Association) reference style. • For detailed information, please see the Publication Manual of the American Psychological Association, Sixth Edition (2010); http://www.apastyle.org/ and http://blog.apastyle.org/ • References should be 1.5 spaced, 1.5 cm 2nd line right indent, and listed alphabetically at the end of the paper

Table of Contents

		Page
01.	Comparative Systematic Analysis of Milankovitch Cycles to Identify Variations of Glaciers and Interglacial Periods of Late Pleistocene in South Asia	01
02.	Nature Tourism in India-Red Sander Plant Species of YSR District, Andhra Pradesh	13
03.	Scientific Investigation of Ancient Sri Lankan Private Labor Room (Thimbiri Geya)	24
04.	Reviewing the Paleo- Biological Remains of Rajagala Mahalena Cave in The Eastern Province of Sri Lanka.	35
05.	Effect of Environmental and Socio-Cultural Impacts Caused by Tourism on Residents' Lives with Special Reference to Ancient City of Anuradhapura	48
06.	Bamboo Crafts and Associated Knowledge System of The Karbi Tribe of Assam Plains, North- Eastern India: A Cultural Heritage	63
07.	New Perception to Proto History Burial Site in Andarawewa An Archaeological and Geochemical Prospection	78
08.	Potentials of Underwater Cultural Heritage Towards Tourism in Galle, Sri Lanka: Perspectives of Tourism Service Providers and Maritime Archaeologists	93
09.	A Forensic Anthropological Analysis on The Consumption of Forensic Science Methods Utilized to Detect Homicides Along with Sharp Weapons (With Special Reference to Court Records)	105
10.	Cultural and Religious Tourism in Majuli With Special Reference to Auniati Sattra And Uttar Kamalabari Sattra	114

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