INSELBERG: ADAPTATION TO SURROUNDING ENVIRONMENT AND NEGLECTED AS NATURAL HERITAGE IN SRI LANKA

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ABSTRACT

An inselberg is an isolated rock hill, knob, ridge, or small mountain that rises abruptly from a gently sloping or virtually level surrounding plain. It results when a body of rock resistant to erosion, such as granite or gneiss, formed within a body of softer rocks, is exposed by differential erosion and lowering of the surrounding landscape. Inselbergs are isolated formations that rise above a plain, which consists of hard bedrock. If they have a soil cover, then it becomes very sparse. Where the soil is too thin or hard to support tree life in large areas, soil trapped by inselbergs can be dense with trees while the surrounding land contains only short grass. Hollows in the rock surfaces provide catchments for rainwater. They vary in height depending on their development, and they take on different forms, as far as both ground plan and cross section are concerned, according to their genesis and lithology. Microforms caused by weathering can have formed on the rock surfaces. Inselbergs enrich their surroundings with nutrients via drainage, amounts of total nitrogen, nitrate-nitrogen and potassium in rainfall, drainage from bare rock patches and vegetation mats (cover) on an inselberg. Some animals have adapted to use of inselbergs and their surroundings in Sri Lanka, including the elephants, Sri Lankan leopard (Panthera pardus kotiya), bears, and an abundance of bird and reptile life. Floral diversity from tree species to lichens are also highly useful for foods as well as for medicine. In addition to the above, inselbergs can be recognized for the education sector from secondary education to the university level. But, in Sri Lanka, all these sectors have been neglected by educators, planners and policy makers. At all events, inselbergs as natural and national heritages are invaluable resources.

Keywords: Inselberg, Planation surface, Faunal and floral, Heritages, Neglected

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1.INTRODUCTION

Sri Lanka was once the landmass of the southern supercontinent Gondwana, which also included South America, Africa, India and Antarctica which began to break up 140 million years ago. The tectonic plate on which Sri Lanka was located, the Indian plate, collided with the Eurasian plate creating the Himalayas, and it originally detached from the Indian sub-continent by Mannar - Palk Basin since early Cretaceous (113-145 Ma ago). However, the Sri Lankan land-block consists of Precambrian rocks. More than 90% of Sri Lanka's surface lies on these Precambrian strata. The granulite facies rocks of the Highland Complex (gneisses, sillimanite-graphite gneisses, quartzite, marbles, and some charnockites) make up most of the island and the amphibolite facies gneisses. The Wanni Complex is characterized by thick sequences of orthogneisses comprising amphibolite-grade migmatitic, granitic and granodioritic gneisses, and, at lower structural levels, dioritic orthogneisses with minor gabbro. The Cenozoic cover extends towards northwestern, northern and northeastern coastal zone. Amphibolite-facies hornblende-biotite granitic gneisses dominate the Vijayan Complex. These orthogneisses are usually associated with charnockites and granitic melt products (Cooray 1984, Burton and O'Nions, 1990; Baur et al., 1991; Kröner and Williams 1993). All these authors show the high-grade metamorphism of igneous rocks between ~670 and ~1950 Ma for magmatic zircons and many parts of Sri Lanka's inselbergs rocks are related these ages. In addition, the dominant rocks of the Kadugannawa Complex are hornblende and biotite-hornblende gneisses with interlayered granitoid gneisses in the core, pink feldspar granitic gneisses at the inner rim and metasediments at the outer rim of the arenas. All above-mentioned geological zones extend from the 1st Planation surface to the 4th Planation surface. Physiographically, Sri Lanka can be divided into four Planation Surfaces. The First is submerged Planation Surface, the Second is Flat terrain to Undulating terrain, Rolling and Hilly Terrains, the Third is dissected Rolling and Hilly; Steeply Dissected Rolling and Hilly Terrains, and the fourth (Mountainous and Rugged Central Highland) Katupotha, 2013. The submerged planation surface is the present coastline to the continental area (approximately ~140m). The Second Planation surface includes the present coastline to 140m level. The Third Planation belongs to (140 - 860m msl) and the fourth Planation Surface is laid as 860m over (The height point, peak Pidurutalagala is 2524m) [Adams, 1929; Wadia, 1945, Katupotha 2013 and modified 2023].

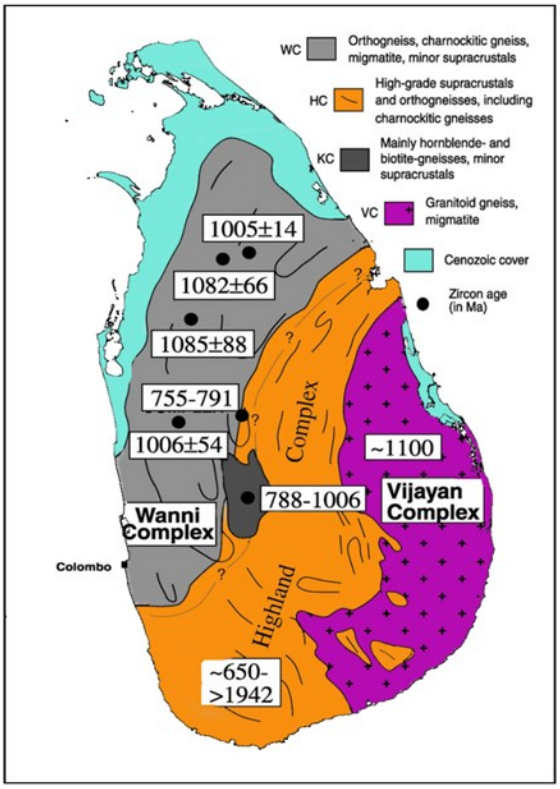

Figure 1: Main Geological Zones of Sri Lanka includes specific dating. (Coory 1984; Kroner et al 1991; Kehelpannala 2003; 2017).

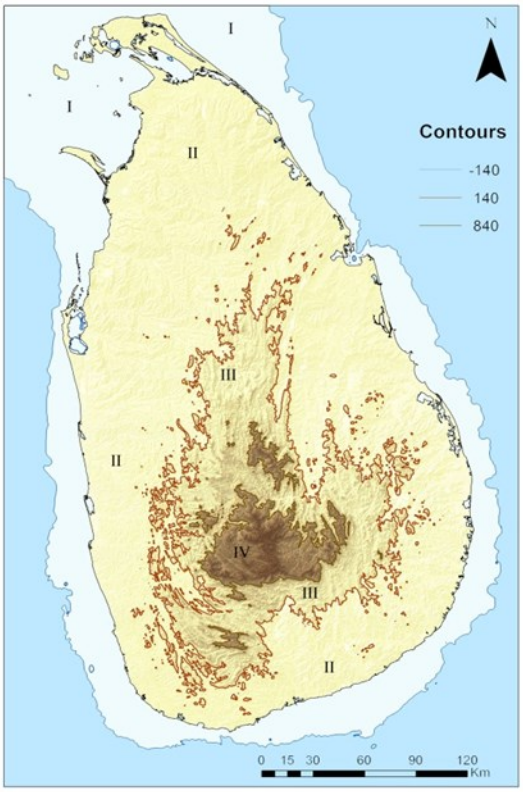

Figure 2: Planation Surfaces of Sri Lanka, Map modified by Katupotha. (I) Submerged Planation Surface; (II) Second Planation Surface; (III) Third Planation Surface; (IV) Fourth Planation Surface.

2. LITERATURE REVIEW

Granite inselbergs belong to the most fascinating landforms on the earth. Boulders, tors, and inselbergs assemblage extend over large areas that give granite terrains their unmistakable appearance (Piotr Migoń, 2006). The tallest ones are built of granite, for example, Spitzkoppe in the central part of the Namib Desert (Selby, 1982b; Migon´ and Goudie, 2003). It is a massive, north-to-south elongated dome built of Jurassic granite that rises steeply above the surrounding plain by more than 600m. Granitic and gneissic inselbergs are geologically and geomorphologically old and, occur throughout a broad spectrum of Semi-Arid, Dry Zone and Intermediate climatic zones of Sri Lanka (II, III in Figure 2). They form micro-climatically and edaphically dry growth sites that support highly specialized vegetation. The largest and most significant areas of worldwide Inselbergs are located along the Atlantic Mobile Belt, whose main distribution area corresponds to Southeastern Brazil, within the Atlantic Forest Biome domain (Safforg and Martinelli, 2000).

Clusters of inselbergs, called “inselberg fields” and “inselberg plains”, occur in various parts of the world including Tanzania, the Anti-Atlas of Morocco, Northeast Brazil, Namibia, the interior of Angola, and the northern portions of Finland and Sweden. The early German explorers of southern Africa were impressed by such features, and they dubbed the domed or castle like highlands inselbergs. Spectacular examples include Uluru/Ayers Rock and the Olga Rocks (Kata Tjuta) in central Australia.

Geologically, inselbergs are relict features. They have maintained their relief as the adjacent surrounding landscape was lowered. Twidale (1964 and 1981) of Australia demonstrated the role of subsurface weathering in shaping the flanking hillslopes and pediments of granitic inselbergs. The occurrence of inselbergs implies immense variations in the rates of degradational activity on the land surface. These structures are one of several varieties of landforms called paleo-forms that can survive with little modification for tens of millions of years. In Inselberg landscapes, the active erosional processes are confined to valley sides and valley floors (Baker, 2019). Inselbergs are isolated rock outcrops that rise abruptly above the surrounding plains. Granitic and gneissic inselbergs are geologically and geomorphologically old and occur throughout a broad spectrum of climatic zones.

Global trends of inselbergs (isolated mountains) about (a) their bioclimatic position about the

surroundings; (b) their potential for providing habitat niches; and (c) human impacts that may influence ecological processes. International-level research has been undertaken emphasizing different aspects and disciplines by many scientists. Twidale (1964, 1981) emphasized that three forms of inselberg of frequent occurrence are distinguished, and it is suggested that the bornhardt is the basic inselberg form from which the block-strewn and castellated types are derived by subsurface weathering. These studies are very relevant to understand the geological evolution and significance of inselbergs. Biotic Diversity, adaptive traits, species richness and conservation of isolated rock outcrops in Tropical and Temperate Regions have described by Barthloti, Porembski and Szarzynsk (1996). In addition, the authors have discussed the habitat types and adaptive traits, desiccation tolerance, carnivores and cultural importance and conservation. Despite the widespread occurrence of granite inselbergs throughout all climatic and vegetational zones, their remarkably rich plant life was largely neglected in the recent literature. This richly and partly in-colour illustrated description provides a detailed survey of all abiotic and biotic features characteristic of inselbergs. The extreme environmental conditions on inselbergs are described in depth and specific adaptive traits of rock outcrop plants include their morphological, anatomical and physiological responses. The diversity and structure of inselberg plant communities are examined on a global scale with detailed regional accounts for different tropical and temperate zones. In addition, many studies have discussed long-term dynamics in rock pool Daphnia (common water fleas) metapopulations by Pajunen Ilmari and Irmeli Pajunen, 2003. The study of metapopulations is concerned with the patchiness of populations in space, and the role of this patchiness in population dynamics, population stability, coexistence of species, and the maintenance of diversity. Porembski et al (1998) describe the diversity and ecology of saxicolous vegetation mats on inselbergs in the Brazilian Atlantic rainforest. Porembski and Wilhelm Barthlott (2000) described the biotic diversity of isolated rock outcrops (inselberg) in Tropical and Temperate regions. Within this diversity, the deadly black mamba snake (*Dendroaspis polylepis*) inhabits a wide range in sub-Saharan Africa; its range includes Burkina Faso, Cameroon, Central African Republic, Democratic Republic of the Congo, South Sudan, Ethiopia, Eritrea, and so on. Similarly, the variety of serpents, reptiles, mammals, birds and different types of micro-level fauna spread out throughout the inselberg world. In particular birds' species such as the Black eagle, Legge's hawk-eagle (Nisaetus kelaarti), Collared scops owl and Oriental Honey-Buzzard were recorded around inselberg environment in Sri Lanka. In addition, inselbergs and floral relationships are also very relevant topics in this field. Luiza F. A. de Paula, Luísa O. Azevedo, Luana Paula Mauad et al, (2020) described the Sugar Loaf Land in south-eastern Brazil: a tropical hotspot of lowland inselberg plant diversity. A phytosociology survey and vegetation description of inselbergs in the Ukhahlamba-Drakensberg Park World Heritage Site, South Africa done by Brand F. Robert et al in 2015. Books and theses similar to these articles are found in Africa, South America, and other countries.

Species diversity of inselbergs in Guinean rain forests is higher than on inselbergs in Ivorian rain forests due to higher numbers of growing sites (e.g. rocky slopes of mountain ranges) available for typical inselberg species. Principally, species

richness of rock outcrops is positively correlated with the existence of otherwise suitable resources. Supposedly, the most diverse inselberg vegetation of tropical Africa is found in Tanzania, Malawi, Mozambique, Zambia, Zimbabwe and Angola. Mares and Seine (2000) have explained the fauna of inselbergs. This volume has made clear that inselbergs are of enormous interest and importance in themselves as structural components of the environment, as well as through their effects on vegetation from providing substrates on which bacteria, lichens, and mosses develop, to providing special microhabitats that can permit the existence of forests in association with the rock habitat within an otherwise barren landscape. In addition to the above, the fauna of inselbergs, deadly black mamba snake (*Dendroaspis polylepis*) hawks and owls - frequent the inselbergs as places of food and shelter; gemsbok (Oryx), hyenas (Crocuta), and other mammals. Although, the list of species that are either specialized for inselbergs, or that inhabit a region in part because inselbergs provide special micro-habitats and food resources differs from region to region and the influence of the rocky isolated inselbergs on patterns of adaptation, evolution, coexistence, and regional biodiversity is profound (Bremer & Sander, 2000). A set of plant communities related to habitat types occur on rock outcrops. So far, habitats of inselbergs have been described floristically and ecologically for West Africa, the vegetation types of the inselberg in Benin, the habitat types of inselbergs in Ivory Coast and Guinea, Ecological and floristic characterization of inselberg habitats in Burkina Faso have discussed by Tindano et al 2021.

3.METHODOLOGY

This study evaluates the value of inselbergs in Sri Lanka as a natural and national heritage. Field observations of the most prominent inselberg areas relevant photographs were collected for my teaching, research and long experience of my fieldwork. Various literature data were used to arrive at the conclusions of this study. Inselbergs are landforms found widely in the second and third planation surfaces of WC, HC, and VC (complexes), and some photographs (images) were taken during the field visits. Inselberg's height and extent were studied using topographic sheets (Scale = 1 to 63 360 and Scale = 1 to 50 000 published by the Survey Department of Sri Lanka) and Google Images. Geological and mineralogical background and contours in the local inselbergs were extracted from Georeferenced Geological maps; Scale = 1 to 100 000 maps of GSMB. The usage of Inselberg was checked by published archaeological and monastery reports and field visits.

4.FINDINGS

Inselbergs in Sri Lanka

The isolation of inselbergs promotes the development of micro-climatological conditions on the landforms. These conditions provide a fertile ground for the growth of unique flora, which is adapted to the particular ecological environment. Some inselbergs have been declared as floral hotspots due to the set of vegetation present in them. The vegetation often remains undisturbed since the Inselbergs do not support agriculture and are thus spared of human activities. These conditions provide a fertile ground for the growth of unique flora, which is adapted to the particular ecological environment. The lack of soil and water, exposure to ultra radiation, high temperatures and constant winds clearly distinguish inselbergs from the surrounding area. Seen from a distance, inselbergs appear to form homogenous landscape features

that consist mainly of large areas of bare, dark coloured rock.

Sri Lanka has two main seasons, the Maha season associated with the northeast monsoon (September – March) and the Yala season associated with the southwest monsoon (May–August). With an average temperature of around 27 - 28°C, Sri Lanka is one of the hottest countries in the world. In addition to the above, 1st inter monsoon and 2nd inter monsoon seasons are conspicuous. The climate experienced during the 12-month period in Sri Lanka can be characterized by four climate seasons as follows (Meteorological Department of Sri Lanka).

1. First Inter-monsoon Season (March - April)

2. Southwest-monsoon Season (May - September)

3. Second Inter-monsoon Season (October-November)

4. Northeast -monsoon Season (December - February)

Inselbergs represent characteristics of weathered rock outcrops, which rise suddenly above a surrounding plain and a hilly country. Inselbergs can be met all over the world in tropical and subtropical climates, or where a tropical climate dominated during the history of earth. They always form distinguished landscape elements isolated from each other like islands in an ocean.

In Sri Lanka, inselbergs are granite and gneissic rock outcrops raising abruptly a gently sloping or virtually level surrounding plain. There has been little study of the geology, geomorphology, ecology and biodiversity of these karst-like features developed in the Proterozoic gneiss and Cambrian rocks of Sri Lanka. Accordingly, inselbergs distributed first submerged planation surfaces to fourth planation surfaces (Mountainous and Rugged Central Highland) , but largely occur on the second planation surfaces within the geological zones of Sri Lanka. Within these climatic seasons (Figure 10), it is possible to identify four distinct climatic zones, namely (a) Semi-arid zone, (b) Intermediate Zone, (c) Dry Zone, and (d) Wet Zone (Niranga Alahacoon and Mahesh Edirisinghe 2021).

(a) Semi-arid zone: The arid northwest and southeast coasts receive the least amount of rain within a short period of the northeastern monsoon. The rainfall is less than 1750 mm per year and there is a prolonged drought season. The vegetation has adapted to survive in drought conditions by conserving precious moisture received from the short rainy season. Part of Hambantota District is included in the arid zone.

(b) Intermediate Zone: The Intermediate zone separates the wet zone and dry zone, while it receives a mean annual rainfall between 1750 to 2500 mm with a short and less prominent dry season.

(c) Dry Zone: The dry zone receives a mean annual rainfall of less than 1750 mm and it covers predominantly the northern and eastern parts of the country. Rainfall is basically received from the north-eastern monsoon, from December to March. There is very little precipitation during the rest of the year, with a distinct long dry season from May to September. Anuradhapura, Polonnaruwa, Dambulla, Trincomalee, and Jaffna are the major tourist cities in dry zone, and

(d) Wet Zone: The wet zone covers the southwestern side of the central highlands of Sri Lanka. It receives a high mean annual rainfall of over 2500 mm rainfall from the southwestern

monsoon. This area gets rain from the southwestern monsoon from May to September and inter-monsoons in April and October. Therefore, any pronounced dry period cannot be seen in the wet zone. Colombo, Kandy, Nuwara Eliya, and Galle are the major tourist cities in the wet zone.

Within these climatic zones and on planation surfaces (Figure 2), including the submerged planation surface, different sizes of inselbergs have been naturally distributed throughout the country. All these are subjected to wetting and drying their surfaces and surroundings. Owing to the rainfall, temperature, humidity and other micro-climatic conditions, vegetation cover, faunal behaviour and surrounding sociological behaviour also change.

In Sri Lanka, the inselbergs are sometimes, designated as bornhardts, but details and scientific research on them are not found. Wind and water attack the original surface leaving round-topped inselbergs. However, inselbergs and other boulders at Sigiriya and its environs described above are mainly formed by Highland and Wanni Complexes of rock types and scatted throughout the 2nd and 3rd Planation Surfaces. Geologically, the inselbergs, erratic boulders and other rock outcrops can be classified as high-grade metamorphic rocks of granitoid origin of the Highland Complex, which is the largest unit and forms the backbone of the Precambrian rocks in Sri Lanka. The texture of these rocks shows that they have been formed from coarse grains. Many boulders of the sites have faced different directions during their moving and clustering due to the retreating of huge ice sheets and fluvio-glacial action created by the melting of glaciers after the Karoo Glaciation (360 – 260 Ma).

Many inselbergs, granite tors and corestones are naturally found as turtle-back shaped and big dome-shaped rocks, and formed as rock shelters due to formation processes and weathering conditions. Cooray (1984) interprets that throughout the length and breadth of the lowest peneplain (presently designate as Second Planation Surface), rise like lone sentinels, as several scattered steep-sided rock hills and knobs such as Sigiriya (Image 1), Yapahuwa (Images 2), and Gunner's Quoin (Dimbulagala Image 3). They are often archaeologically important and have become famous in Sri Lanka's history as the sites of fortresses, palaces and temples (Image 5). Even today, prominent rock hills have become the sites of ancient and modern shrines and temples which constitute one of the most sticking elements of the cultural landscape of the country (Katupotha 2023). Danigala Inselberg complex can be assumed to be a geological, archaeological, ecotourism, palaeontological, and early settlement site. It is possible to infer that the site was used by ancient tribes from c. 505-543 BCE ancient times. The symbols or codes on the rocky wall are not yet verified, but some scientists undertake ongoing research.

Image 1: Tourist activities are undertaking based on Sigiriya Rock and its environs.

Image 2: Rock stairs of Yapahuwa Inselberg

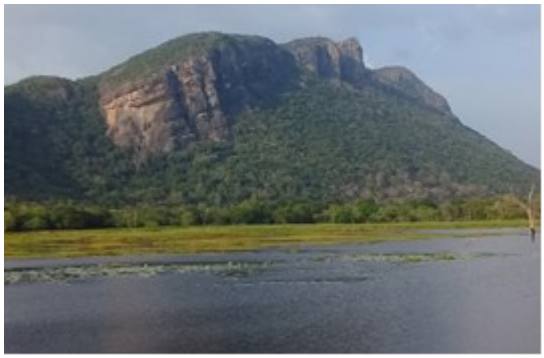

Image 3: Dimbulagala Inselberg. *Dimbulagala* also known as Gunner's Quoin or Gunner's Rock during the British colonial period. It is located in the Polonnaruwa District of Sri Lanka.

Image 4: Mihintale is a mountain peak (inselberg) near Anuradhapura in Sri Lanka. It is believed by Sri Lankans to be the site of a meeting between the Buddhist monk Mahinda and King Devanampiyatissa which inaugurated the presence of Buddhism in Sri Lanka.

Mammal species closely associated with inselbergs in Sri Lanka are elephants, bears, dotted deer, wild boar, wild buffalo, elk (Sri Lankan sambar), weli muwa or olu muwa, wild cat, fox etc, Sri Lankan leopard (Panthera pardus kotiya), and Rilawa (Toque macaque), kalu wandura/ kola wandura]/purple-faced leaf monkey (Trachypithecus vetulus), Sri Lankan Junglefowl (Gallus lafayettii) etc. The gunmen (hunters) shoot and kill animals for meat, skin and to collect horns, teeth etc.

At night in Pidurangala and surrounding inselberg areas are impressive reptiles and amphibians including Indian Rock Python (Python molurus pimbura), Sri Lanka Cat Snake (Boiga ceylonensis), Python/viper, Indian Gamma Snake (Boiga trigonata), Gravenhorst's Golden-backed Frog (Hydrophylax gracilis), Sri Lankan Painted Frog (Uperodon taprobanicus), Marbled Globular Frog (Uperodon systoma) and Spotted Tree frog (Polypedates maculatus). It is possible to find more reptile and amphibian types of Sri Lanka from inselberg-associated land areas. Therefore, it is necessary to conduct further research in this field. In addition, inselbergs and floral relationships are ecologically and environmentally very significant. Changes in the surrounding microclimate, faunal and floral relationships, and humans need to be considered. Luiza F. A. de Paula, Luísa O. Azevedo, Luana Paula Mauad, et al, (2020) described the Sugar Loaf Land in southeastern Brazil: a tropical hotspot of lowland inselberg plant diversity can be applied to our inselbergs. A phytosociology survey and vegetation description of inselbergs in the Ukhahlamba-Drakensberg Park World Heritage Site in South Africa done by Brand F. Robert et al in 2015. Several books and similar articles are found in Africa, Australia, South America, and

other countries, but no detailed documents are available on inselbergs in Sri Lanka. The archaeological evidence of caves in inselbergs and rock shelters fashioned by erratic boulders, granite tors, or clusters of corestones indicate that palaeolithic people have used such structures as their homes and gathering places, dated from 700,000 yr B.P. to 3,000 yr B.P. By 5,000 yr B.P., civilized Yakkas, Nagas and Devas who lived as native people had built settlements in the country all in a tumble, and have also used rock shelters. A large number of rock shelters formed of huge boulders are found in Sigiriya, Pidurangala, Etugala, Dimbulagala, Westminster Abbay, Kuragala, etc, and their environs. These have been offered to Buddhist monks by the native people (Katupotha and Kususmsiri, 2015a and 2015b).

By the Early Anuradhapura Period, most of these rock shelters had been converted to monasteries and used exclusively by Buddhist monks. Such usage continued between 2,300 yr B.P. and 1,800 yr B.P. drip ledges (kataram) were a salient feature of all rock-shelter monasteries, and they produced these to stop the water dripping inside the rock shelters. All locations reveal that the architects who touched up the rock shelter monasteries made them more comfortable and safer. Accordingly, these monasteries have geo-archeological values, which can be used to reveal our buried cultures and their evolution. Such natural heritages have been either partially destroyed due to construction work or are facing the danger of being destroyed by local power groups and politicians. The field evidence of many inselberg locations in the Sri Lanka reveals that the constructors or users who built rock-shelter monasteries, have selected the big holes and fractures of the main rock outcrops and a shelter of a single boulder or shelters of clusters (boulders) to construct the monasteries. There was a custom of constructing small stupas on the top of inselbergs, and these stupas would be a symbol depicting the difficulty of reaching the inselbergs. Therefore, inselbergs and erratic boulders were very useful as natural structures for constructing rock-shelter monasteries in Sri Lanka as well as for the development of tourism industry.

Rock shelters and associated inselbergs show geological diversity because of the mineral content and their distribution pattern during the metamorphism process. Field investigations further revealed that the main minerals of the gneissic rocks, particularly feldspar, mica, garnet and hornblende were eroded and weathered by wind and wet climatic conditions during the past millions of years. The flaking process also damaged the condition of the ceilings of rock shelters. It is obvious that during the rainy seasons seeping force through rock pools along the cracks also accelerated multiple flaking, splintering and back weathering due to the loss of undefinable stone aggregates, for which, Dambulla rock is a salient example. Such rock water pools can be found in Sigiriya, Yapahuwa, Aluthepola rock ridge, Mana Kanda Kalugala rock ridge (Images 5, 6, and 7): Microbiological colonization to dark-coloured crust tracing the rock surface; exfoliation; granular disintegration into /grus (grus is an accumulation of angular, coarse-grained fragments of sand and gravel resulting from the granular disintegration by the processes of chemical weathering and mechanical weathering of crystalline rocks). Similarly, excreta of the mega and mesofauna also search about the deterioration of rock shelters. Present day, rock shelters have been partially destroyed due to construction work either associated with rock

shelters, for making metal quarries or are facing danger of being destroyed.

Image 5: Rock pools inselberg ridge at Minuwangoda, Aluthepola Purana Rajamaha Vihara Complex.

Image 6: A rock pool on Mana (Manewa) (Kanda) Ridge in Maradankadawala is about 450m long. (kanda).

Image 7: Rock pool of the Yapahywa inselberg is significance for micro climate, micro fauna and faunal studies.

The scientific studies on inselbergs in Sri Lanka is completely neglected by subject owners mainly geographers, geologists, and environmentalists. If utilized with proper management, these areas can be used for food, shelter, and as a source of income. For these purposes, it is possible to line up the following recommendations:

- It is necessary to undertake a detailed study and prepare an inventory of island-wide inselbergs, and should consider all as natural and national heritages,
- Categorize the inselbergs using geography, geology etc., height, climatic zones,
- Preserve inselbergs and associated caves as existing cultural, archaeological, anthropological, tourism and zoological sites,
- Select suitable sites for geo-tourism and geo-heritage,
- Encourage A/L students to undertake their Project Reports emphasizing Geography, Zoology, Biology, Environment, Chemistry, Microbiology etc.
- Encourage students to undertake research on inselberg emphasizing Ecology, Tourism, Geography, Geology and Mineralogy, History, Archaeology, Paleontology, and Geo-archaeology.
- Encourage students to commence higher degree programme to undertake collaborative research with other Universities of Sri Lanka as well as African, Australian, Latin American, and relevant European countries

- Prepare regional plans for one-day or two-day excursions encircling. eg. Pilikuttuwa, Warana, Maligatenna inselbergs and their cultural significance.
- Similarly, such regional plans should be prepared for Dambulla, Sigiriya, Pidurangala, Danigala, Seruwawila, Toppigala, Rajagala, Westminster Abbey, Yala National Park associated inselberg rock complexes.
- Following in this way, the northwestern, Polonnaruwa area, Ampara, Monaragala, and Yala, covering with Wet Zone inselbergs mini plans should be established to promote local and international tourism. For this purpose, friendly infrastructure facilities should be provided, but, during these activities, the existing environment should not be damaged.
- Encourage locals and tourists on camping, hiking, sightseeing, enjoying nature, and photography with proper management at the regional level.

5. CONCLUSION

Inselbergs are isolated hills that stand above well-developed plains and do not appear as islands rising from the sea. Such features impressed the early German explorers of southern Africa, and they dubbed the domed or castle-like highlands inselbergs. Granitic and gneissic inselbergs are geologically and geomorphologically old and occur throughout a broad spectrum of climatic zones. They form micro-climatically and edaphically dry growth sites that support highly specialized vegetation.

Inselbergs in Sri Lanka are rampant in the second planation surface of Sri Lanka. But these features have been distributed in other geomorphic zones at different heights, and sizes, showing weathering patterns. Geology, micro-relief and microclimatic conditions on Inselberg and their surroundings support forming of xeric habitats, and associated fauna and flora showing considerable differences in plant species, particularly tree species, leguminosae, uminoceae, linaceae and other bushes. Most of these local floras are being used widely for different purposes including medicinal usage. Therefore, undertaking detailed research and conservation of granite and gneissic inselbergs, fauna and flora is highly essential.

Based on Inselberg structures and adjoining grounds, it is possible to develop attitudes, skills, and income generation capabilities. Similarly, such regional plans should be prepared district-wise based on Dambulla, Sigiriya, Pidurangala, and associated rock outcrops. Following in this way, the northwestern area, Polonnaruwa area, Ampara, Monaragala, and Yala, and covering with Wet Zone inselbergs, should be established mini plans to promote local and international ecotourism and geotourism. For this purpose, friendly infrastructure facilities should be provided. Students should be encouraged to develop their subject disciplines and locals and tourists should be encouraged to camp, hike, scenery, enjoy nature, sightseeing, and photography with proper management at the regional level. However, there are no Journals, learned articles, or books that have been published yet in Sri Lanka related to inselbergs. It appears as a neglected field with some gaps related inselbergs of Sri Lanka. However, it is essential more in-depth research emphasizing

inselbergs vegetation, fauna, rock pool, cultural relationship, geology and mineralogy in Sri Lanka.

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