

# Exploring the link between culture and biodiversity in Sri Lanka

C. M. MADDUMA BANDARA

**Abstract:** This paper highlights the importance of adopting culture-based strategies in addressing certain issues of environmental conservation and management in Sri Lanka, a country where links between nature and culture have historically been strong. It focuses on the link between culture and biodiversity in fields such as flora, fauna, ecosystems and local culture, which includes agriculture, lifestyles and place names. It also examines the policy significance of this focus, demonstrated most recently by the Sri Lankan government's support for and promotion of recent initiatives to designate specific flowers as provincial floral emblems, issue biodiversity-themed postage stamps and retain the custom of using biodiversity-related place names. It is suggested that people's traditional modes of interacting with and comprehending their natural environment may be fostered or harnessed through progressive government policy, not only in Sri Lanka but in other countries where traditional nature-based cultural practices continue to thrive.

**Keywords:** Sri Lanka, culture and biodiversity, traditional knowledge, flora, fauna, ecosystems, agricultural biodiversity, place names, policy

## 1. Introduction

### 1.1 Why explore the relationship between culture and biodiversity?

Nature conservation efforts in most countries have achieved only limited success, despite heavy investment. This suggests that some of the more commonly adopted and exclusively scientific, political, economic, or legislative strategies for nature conservation and environmental protection are not working effectively. This paper emphasises the need to adopt culture-based approaches in dealing with issues of environmental management. It focuses on Sri Lanka, a country where people's traditional ways of interacting with and comprehending their natural environment—which together compose an invaluable body of traditional knowledge<sup>1</sup> that underpins aspects of local agriculture, healthcare, food preparation, education, environmental conservation and a host of other spheres in Sri Lankan life—may be fostered or harnessed through progressive

government policy in the interests of biodiversity conservation. For this reason, although in current use the term 'biodiversity' includes at least three main components (species diversity, ecosystem diversity and genetic diversity), this paper focuses on the diversity of species and ecosystems and their links with culture in the Sri Lankan context. Its focus positions this paper within the growing body of research in the emergent field of bio-cultural diversity, which focuses on "the rich but neglected adaptive interweave of people and place, culture and ecology"<sup>2</sup> through an examination of the interdependence and interconnectedness of biodiversity and cultural diversity, both of which are coming under threat.

The objective of this paper is therefore threefold. It seeks to (i) open up the fascinating field of bio-cultural diversity for investigation through a study of culture and biodiversity in the Sri Lankan context, (ii) identify some of the main fields of traditional knowledge where ecological information is still preserved (e.g. folklore, folk poetry, literature, place names, etc) or applied (e.g. traditional medicine and traditional agricultural methods) in Sri Lanka, and (iii) explore the possible implications of the link between culture and biodiversity for Sri Lankan policy makers involved in biodiversity conservation.

## **1.2 Introducing Sri Lanka**

Sri Lanka, a south-Asian island located off the southern tip of India, has developed its own unique bio-geographical character over long periods of natural evolution through geological history. A biodiversity 'hot spot', having the highest biodiversity per 10,000 km<sup>2</sup> in Asia in terms of certain species of fauna and flora (Kotagama 1985), Sri Lanka has the highest biodiversity per unit area of land among Asian countries for flowering plants and for all vertebrate groups except birds. The country has more than 3,350 species of flowering plants and more than 300 species of ferns and fern allies. There is also considerable diversity of fauna, with more than 50 species of fish, nearly 100 species of amphibians, more than 125 species of reptiles and nearly 100 species of mammals (Mahindapala 2002).

Sri Lanka owes its natural wealth to its location near the Indian sub-continent and its unique pattern of dry, wet and intermediate climate zones (see Figure 1). Aspects of culture and history also play a role in the biodiversity for which Sri Lanka is renowned. While dominated by Indian influences, the island's insular nature has enabled it to develop and retain its own indigenous forms of language, custom, attire, architecture and culture over a recorded history of more than 2,500 years and a prehistory of several millennia. Traditions relating to the management and conservation of Sri Lanka's natural resources and rich biodiversity comprise a large part of the store of cultural wisdom that has

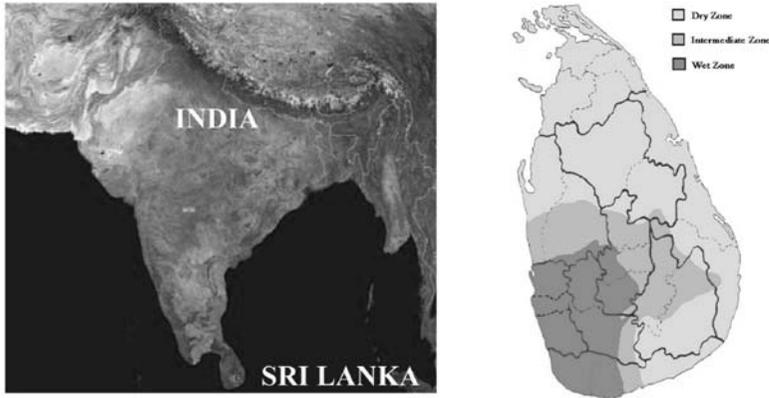


Figure 1. Sri Lanka's location in south Asia (left) and main climatic zones (right)  
(Source: National Atlas of Sri Lanka, Survey Department, Colombo, 2008)

accumulated in Sri Lanka over thousands of years. This precious knowledge base has survived critical junctures in the country's history, such as foreign invasions and a spell of colonial rule that lasted for more than 500 years. Its survival has been secured by the people of Sri Lanka, particularly those in the rural interior, whose practices, such as traditional medicine, still depend heavily on the exceptionally rich diversity of tropical plants on the island, and whose culture — for example, place names (toponymy) and literature — continue to affirm the island's rich biodiversity. Until recently, this wealth of traditional knowledge has been largely overlooked by policy makers focusing on Sri Lanka's national development or biodiversity conservation. It is increasingly recognised today that traditional wisdom and the simple lifestyles of people who exert minimal demands on their natural resource base may yet perform a vital role in promoting sustainable development and the conservation of nature.

## 2. Culture and biodiversity in Sri Lanka

### 2.1 Culture and floral diversity

The names (in Sinhala<sup>3</sup>) of the following plant species appear in folk poetry from the Uva region, where many traditional aspects of local culture still remain: burutha (*Chloroxylon swietenia*), na (*Mesua nagassarium*), aralu (*Terminalia chebula*), kitul (*Caryota urens*), dunuke (*Pandanus thwaitesii*), thala (*Corypha umbraculifera*), madu (*Cycas circinalis*), kenda (*Macaranga peltata*), bo (*Ficus religiosa*), mee (*Madhuca longifolia*), kos (*Artocarpus heterophyllus*), del (*Artocarpus altilis*), goraka (*Garcinia quaesita*), lolu (*Cordia curassavica*), himbutu (*Salacia reticulata*), kumbuk (*Terminalia arjuna*), mee amba (*Mangifera indica*), heen

thambala (*Carmona microphylla*), paramadala (scientific name not known), bukkeeriya (scientific name not known), ginithilla (*Argyreia populifolia*), una (*Bambusa vulgaris*), mora (*Glenniea unijuga*) and dotalu (*Loxococcus rupicola*). This is not a complete list — many names of fruit and vegetables that appear in the poems are not listed here. Still, it reveals the importance of flora to the people of Uva, for whom life is intimately connected to the rich biodiversity of where they live. It also provides a fascinating snapshot of the vast diversity of flora in the region — diversity that remains largely intact even today, save for one or two exceptions, such as the tree species paramadala and bukkeeriya, which appear to have become extinct.

Plants perform a significant role in life and culture throughout Sri Lanka. They appear in personal and place names and are used for agricultural purposes, in traditional medicine and diet and in religious rites. Plants and their by-products were used in the past as incense to dispel household odours, as fuel for fires, as insect repellent and even for domestic lighting, as in the case of kekuna (*Canarium zeylanicum*) and mee (*Madhuca longifolia*), two plant oils used long before the advent of petroleum and electricity. The roots of pila (*Tephrosia purpurea*), karanda (*Pogamia pinnata*) and bombu (*Symplocos sp.*) were all used as deheti to brush teeth, as was wood charcoal. Selected varieties of timber and grasses were used for house construction and roofing material and different types of timber were used for making furniture and tools designed for different purposes. Coffins, for example, were made from gonna (*Ficus sp.*) and ruk attana (*Alstonia scholaris*). A bewildering variety of sticks were used in schools for dispensing corporal punishment: wey wel kotu (*Calamus* species such as *C. ovideus*, *C. pseudotenuis*, *C. rivalis*, *C. rotang* and *C. thwaitesii*), naran (*Citrus reticulata*), siyambala athu (*Tamarindus indica*), kitul (*Caryota urens*), pol iratu (*Cocos nucifera*) and wel kahambiliya (*Tragia hispida* or *Tragia involucrata*) are just some of those described in folk poems as being used to cane students.

Traditional wisdom ascribes cultural values to different plants and awards them different levels of status. One example is the plant species esatu (*Ficus tsiela*), traditionally revered as Vanaspathi or 'lords of the forest'. Another example is the bo tree (*Ficus religiosa*), frequently found in and around temples. This tree's religious value has guaranteed not only its protection but has protected other trees and plants growing in its vicinity.<sup>4</sup> Representations of two honoured tree species — na (*Mesua nagassarium*), the national tree of Sri Lanka, and sapu (*Michelia champaca*) — feature prominently in Sri Lankan works of literature, art and architecture. They occupy strict cultural hierarchies celebrated in the Sri Lankan arts, as does the lotus, top of the hierarchy of flowers, another plant represented in a wide variety of sculpture and painting. In Sinhala folk

poetry, fragrant flowers were given higher status and allocated a role in religious rites and ceremony, while flowers without fragrance were harshly denigrated: “Suwanda neti kaela mal samawe” (a flower without fragrance is like a woman without virtue).

Invaluable knowledge of medicinal plants can be found in the *Sarartha Sangraha*, an ancient medical treatise authored by King Buddhadasa in the eighth century AD. A total of 170 medicinal plants cited in the *Sarartha Sangraha* have been scientifically identified. They comprise 51 species of cereals, 61 species of herbs, 10 species of shrubs, 20 species of climbing plants, 20 species of trees, seven species of tubers and one species of mushroom. The ruins of ancient hospital complexes located at Mihintale, Ritigala, Polonnaruwa and Anuradhapura provide a further source of information on the traditional use of plant species in herbal medicine. Traditional orthopaedics is one area of indigenous medical practice that remains popular today. A large number of practitioners still operate around places such as Ritigala, where herbal materials are abundant and the remains of stone troughs known as beheth oruwa or medicinal tubs, used widely in the past, can still be found. Some of the stone troughs that remain in and around Ritigala defy any proper understanding of how they were used originally.

## 2.2 Culture and faunal diversity

The close association between animals and Sri Lanka’s culture and society is demonstrated in the use of animal symbolism in the country’s traditional crafts, paintings and flags. Sri Lanka’s traditional national flag, which has a 2,000-year history, has a lion at its centre. This is thought to depict the origin of the Sinhala people, who in myth, were believed to have been descended from a lion. The present national flag was designed by a parliamentary committee in the 1940s and features a much plumper lion than the thinner animal shown in the ancient national flag and in some dissawa (regional) flags. The difference between the depictions has fuelled speculation that, in the past, Sri Lankan lions were smaller and slimmer than they are today. Deraniyagala’s (1963) description of his discovery of the remains of a lion identified as *Leo leo sihaleyus* lends weight to such speculations, as do works of early literature such as the Buddhist text *Anguttara Nikaya*, which names four types of lion: Thruna sinha, a lion that lives in the grasslands; Kaala sinha, a lion that would appear to have been dark in colour; Pandu sinha, probably a bronze-coloured lion; and Kesara sinha, a lion with a well-developed mane. Together, these lines of indirect evidence suggest that a smaller lion — different in type from the African and Indian lion — may have evolved within Sri Lanka’s unique habitat and lived on the island in the

distant past.

Animals, much like the plants we saw in Section 2.1, occupy allocated positions in cultural hierarchies established in folklore. Although it is lower in status than the lion, the elephant is another animal assigned a high cultural value and was a potent symbol of high social status and wealth for powerful families throughout Sri Lankan history. In the time of the ancient kings, elephants were used in battle. They formed the Eth (elephant tusker), the honoured vanguard of four battalions, ahead of As (cavalry), Riya (chariots) and Pabala (infantry). Today, elephants are mainly used in religious processions and for work that requires hard labour but the Kandy Esala Perehera or August pageant continues to celebrate the respected role assigned to the elephant, which walks on a white cloth laid out before it, bearing a casket symbolically containing the sacred tooth relic of the Buddha. After the 'water cutting' ceremony, which marks the end of the two-week pageant with the ritual collection of a pot of water from the Mahaweli river, eager parents coax their children to walk under the belly of the elephant to invoke blessings against illness and dispel any deep-seated psychological fears and ailments.

While the lion is recognised as the leader of the animal kingdom, and the elephant is not far behind, other animals have their chance to reign in different ecosystems. In lake and pond ecosystems, the loola or snake-head fish (*Channa striata*) is treated as the dominant fish while kanaya or mud-fish (*Channa punctata*) was given much lower status. Meanwhile, the crocodile (*Crocodylus porosus*) is perceived in Sinhala poetry as 'Degambada raja', the king of the interfluves and river banks, and folk tales accord the highly venomous naya or cobra (*Naja naja*) higher status than the polanga or viper (*Daboia russelii russelii*). Unsurprisingly, perhaps, given the different degrees of status awarded to animals in Sri Lankan folk culture, Sri Lankans have a habit of comparing the strength of a person to that of an animal, such as, for example, when they compare a person to an elephant, a lion or even a gawara or gaur. This last animal is now extinct but Sri Lankans still refer to it in everyday speech and it is referenced in village names such as Gawarammana, Gawaravila and Gavara Kele and a grass species, Gawaramana (*Garnotia exaristata*), which grows on highland plains.<sup>5</sup>

Traditional rural culture uses a host of words and sounds to depict the calls of animals and birds. 'Tin-tin' mimics the call of the lena (squirrel), while 'ton-ton' describes the sound of the gona or sambur (*Cervus unicolor*), 'buh-buh', the dog, and 'gnav-gnav,' the cat. Some animal sounds are more minutely differentiated: for example, the croaking of frogs is believed to alter according to the size of the raindrops that fall during wet periods. Animal and bird sounds are also assigned different meanings — bird-calls, in particular, are believed to convey messages,

complaints and grievances. The strident call of the avichchiya or Indian pitta (*Pitta brachyura*) is recounted in folklore as voicing the bird's grievance at having his dress stolen by the peacock. In Sinhala, this call is conveyed as: "Evith giya, evith giya, ayith kiyannam, methe budun buduwana vita ayith kiyannam," which translates as: "Came and went! Came and went! I'll still be complaining when the next Buddha comes! I'll still be complaining!" Likewise, the kirala or red wattle lap-wing (*Vanellus indicus*) is deemed to be raging against a sky that threatens to fall on its eggs. The same bird, when provoked, sounds to Sri Lankan ears as if he is uttering obscenities in pure Sinhala, while to the perhaps guilty ears of the early English who came to Sri Lanka, he is demanding "Did you do it? Did you do it?" in English. Traditionally, Sri Lankan villagers also believe that certain animal and bird sounds and calls are premonitions of good or bad news, or of change. The howl of the jackal (*Canis aureus*) is interpreted as a bad omen bringing sad news, as is the sinister hoot of the ulama or forest eagle owl (*Bubo nipalensis*), otherwise known as the devil bird, which is supposed to say: "Kollan walalan, kellan godagan," meaning "Bury the boys and protect the girls." The call of the hoona or house gecko (*Hemidactylus broohii parvimaculatus*), some of the calls of the kaputa or crow (*Corvus splendens*) and the sound of dogs howling ("uduburaleema" in Sinhala) are also perceived as portents of ill fortune. The calls of the wehi lena or swallow (*Hirundo rustica*) and kendetta or malabar hornbill (*Anthraceros coronatus*) are both taken as predictions of rain.

Ancient ola leaf (palm leaf) books written on traditional Sinhala medicine clearly indicate the medicinal value of some of Sri Lanka's indigenous animal species. Sinhala folklore and folktales mention many animal species and materials derived from fauna that are used in both curative and preventative traditional medicine. For instance, people in the purana (ancient) villages of the dry zone of Sri Lanka believe that regular consumption of the snake-head fish or loola, a freshwater reservoir fish, is effective in treating mandama (anaemia), particularly in pregnant women. Loola were fished from irrigation tanks by purana villagers for millennia for this reason. The flesh of many other animals was prized for its curative or nutritional properties: for instance, the flesh of the rilawa or toque macaque (*Macaca sinica*) was also believed to be effective in treating anaemia; the wandura or grey langur (*Semnopithecus entellus sp.*) was used to treat arsas (piles); and the ittewa or Indian porcupine (*Hystrix indica*) was thought to cure asthma. The tala goya or land monitor (*Varanus bengalensis*), ibba or flapshell turtle (*Melonochelis trijuga*) and diya ibba or freshwater terrapin (*Lissemys punctata*) were all consumed for the strength and vitality their flesh was believed to impart. Python oil is still used in traditional orthopaedic treatment and the flesh of the ukussa or Brahmin kite (*Haliastur Indus*) and monara or

peacock (*Pavo cristatus*) were both believed to improve eyesight. The belief that the scent gland (urule sattam) of the urulewa or civet cat (*Viverricula indica*) and the teeth and skin of the leopard (*Panthera pardus*) have preventative or curative powers is still prevalent in some areas.

Sri Lankan traditional medical practice has extended even to animal care. The care for captive elephants is well documented and history maintains that King Buddhadasa, compelled by the Buddhist concept of compassion, treated ailing venomous snakes. The treatment of cattle and buffalo is also documented in ola records, still in the possession of some rural physicians. In view of the importance of the problem of snake bites in the rural areas (even today more than 10,000 people report for treatment at state hospitals and at least 1,000 people die from snake bites each year), snake-venom treatment forms a separate branch of the indigenous medical practice and a large proportion of rural people still prefer it to western medicine. The identification of different snakes for different forms of treatment may provide a wealth of information on their diversity and behaviour. It would be of interest to codify this knowledge and subject it to some form of scientific scrutiny, since it appears to have the potential to benefit general medical practice. However, the tradition of 'Guru Musti' or 'the keeping of science secrets by teachers' confines the custody of this traditional knowledge to a limited number of practitioners and their families.

Although animal sacrifice is not practiced widely in Buddhist Sri Lanka, there are occasions when people offer the deities animals or their body parts to invoke their blessings (e.g. common fowls were used for the practice of the pideni and huniam ritual sacrifices and, for this reason, chicken was not a favoured dish in times past. Some of these systems of belief may have had their origins in ancient Hindu culture, owing to its historical association with Tamil and Sinhala communities. For instance, Hindus sacrificed goats to the much dreaded goddess Kali.

Different animal species were also used by rural people as biological clocks to remind them of the time. Almost every village had at least one rooster, whose duty it was to wake the villagers each morning. The rowdy calls of these birds returning to their nests each evening heralded the onset of dusk. Certain birds, such as the koha or Indian cuckoo (*Cuculus micropterus*), used to arrive regularly before the traditional new year, which fell in mid-April, and their arrival informed people that new-year celebrations were around the corner. Culturally, the lack of hostility towards some of the visiting birds encouraged their close association with human settlements and has contributed to their eventual conservation.

*Sarartha Sangrahaya*, referred to above, listed the medicinal properties of a number of animal species found in eighth-century Sri Lanka. What is interesting

is the continuity of thought seen in the ancient text and some present-day practices, as reflected in the classification of flora and fauna. For instance, the traditional classification of fauna is distinctly different from that of modern classification. In some cases, the traditional system is based on the nature and formation of legs, that is, Apa (without legs), Depa (with two legs), Sivupa (with four legs) and Buhupa (with many legs). With regard to elephants, present-day mahouts (elephant drivers) recognise 10 or 11 types, which is surprisingly similar to what is given in the *Sarartha Sangrahaya* as well as in writings such as those of Deraniyagala. There are similar classifications relating to cattle (Deraniyagala refers to seven types), buffalo and cobras. Most of the traditional classifications appear to be more detailed and extensive than modern classifications. It is worth, therefore, exploring how such traditional classifications reflect the vital links between culture and biodiversity.

### **2.3 Culture and ecosystem diversity**

Modern classifications categorise the majority of Sri Lanka's ecosystems within five major groups: forests, scrublands, grasslands, savannas and wetlands. Each group has several sub-types that may be examined on the basis of physiognomic features such as form and appearance. For instance, there are about five forest types based on the factors of topography and climate. If the floristic divisions are included, this number rises to seven or eight. Similarly, grasslands and savannas each have four or five types and there are eight or nine types of wetland, which include inland, marine and man-made environments.

Traditional knowledge systems identify a greater number of ecosystems and habitats than are normally found in modern classifications. This is because traditional systems are often based on a large variety of factors, such as physiognomy, ecosystem functioning, successional stage, geomorphic setting, hydrological regime, human use and conservation status. While, as aforementioned, modern classification methods identify five or six types of forest in Sri Lanka, traditional knowledge systems identify many more stages of forest succession. For example, the Sinhala word *hime* describes the mosaic where wet-zone low-country forest meets mountainous virgin high forest, whereas the dense, protected 'crown' forest in any climatic zone is considered *thahanam-kele*, or 'forbidden forest'. *Adawiya* (used to denote a forest habitat, a forest administration area or a place name derived from them), as in *Sri Pada Aadawiya* and *Singharaja Adawiya*, has some sacred value as well as protected status. *Landa* defines scrub area dotted with occasional trees found in an undulating terrain, and *leheba* denotes a forest edge. Other words — *gomuwa*, *gonna*, *gollewa*, *pelessa* and *digiliya*, to name but a few — are also used to describe

different forest ecosystems.

The traditional practice of naming certain woodlands after one or more dominant species persists today in a more advanced form in modern floristic classification methods. Madolkele, the name of a region in the Dumbara hills, suggests the dominance of madol, the *Garcinia echinocarpa* tree species. Likewise, Maussakele, near the Sri Pada Peak Wilderness Sanctuary, indicates the abundance of the maussa shrub species *Dendrocinide inuate*. It may also refer to the high forest where large eagles or kites lived. Boralanda, near Haputale, could have been a thicket or forest hosting bora trees (*Ligustrum robustum*) and other species. Finally, there are several localities called Kiralakeles in coastal areas, after the kirala (*Sonneratia*), a tree species that yields an edible fruit and is found in mangroves.

Secondary forests were identified by different stages of succession based on their subtle variations. For example, kanattha (barren land), ath-danduwawa (young forest with small trees the size of a human hand) and mookalana (forest with larger secondary forest trees) indicate different stages of recovery in the succession of abandoned lands that have been used for chena (swidden or shifting) cultivation.

The traditional names of villages in grassland and savanna ecosystems reflect their inhabitants' sensitive perceptions of their natural environment. Vegetation-related place names are useful, therefore, in understanding the close links between nature and culture, as demonstrated in the discussion of society, culture and biodiversity in Section 3 of this paper. Here it is sufficient to note that patana (montane grassland), talawa (savanna), eliya (open wet patana or grassland) and damana (a kind of savannah with larger trees scattered more widely than those found in talawa), all appear in place names such as Patana, Padiya Talawa, Nuwara Eliya, Palugas Damana or Maha Eliya. In Maha Eliya, the native name for the Horton Plains, the term 'eliya' reveals traditional perceptions of patana as an open grassland that can be wet or dry, as well as wide and open, in comparison to talawa (savanna), which is characterised by numerous scattered trees.

Local communities' perceptual sensitivity to the ecosystems in which they live is particularly evident with regards to terrestrial, boundary and transitional ecosystems such as wetlands. Hela describes a kind of wet marsh with a floating peat mat. Owita are found on the boundary between a wetland and a highland. Kalavita, which appear particularly in the southern province of Sri Lanka and are somewhat like owita, are often used for threshing and winnowing harvested paddy. Yaya, on the other hand, refers to a tract of (usually cultivated) paddy land or a tract of forest, as in the case of Mora Yaya. Badawetiya defines a kind

of hedgerow of low trees and shrubs, which provides the community with edible fruits and leaves and usually grows in areas with imperfect drainage. Deniya denotes a physiographic position on a river floodplain characterised by imperfect or poor drainage and a variety of associated trees, shrubs and rushes. Many village names in the central hills carry deniya as a suffix: Gurudeniya, Penideniya, Peradeniya, to name just a few. Similarly, many place names in the low-country wet zone have names ending with goda, which suggests a high land among surrounding lowlands, as in the case of Pagoda, Pugoda and Meegoda. Pitiya and Tenna — both of which denote flat lands at different elevations — also appear in a number of place names. In rice cultivation, goda and mada were used to denote highland and lowland cultivations: paddy fields are often cultivated during the rainy season and allowed to remain fallow for the rest of the year so are therefore considered to be wetland ecosystems. Wanaatha denotes a cleared forest strip bordering a rice field. Wila designates a small inland freshwater ecosystem (natural), usually rich in hydrophytes and fish. Wila is seasonal in old dry-zone villages such as Panama in eastern Sri Lanka, whereas pokuna is a much smaller, man-made wetland environment. Small ponds are known variously as diya heba, heba or ebe. A natural spring (hot or cold) is referred to as bubula.

Marine coastal wetlands include lagoons, which, in modern classification, denote a single brackish wetland type unique to the tropics. Lagoons were traditionally perceived in one of two categories: kalapuwa, used to define a common form of lagoon, and kala — natural salterns in the past — used to define a more extensive kind of lagoon spanning a larger area and including tidal flats, typically found in eastern and south-eastern Sri Lanka, such as Panakala, Kunukala and Koholankala. Beach rock was traditionally distinguished from coral reef by the use of two separate indigenous terms: kalapugala for beach rock and hirigala or hirigal paraya for the coral reef. Inland wetlands include villus, a seasonally flooded type of grassland found in dry-zone floodplains such as the Mahaweli Basin, and a number of estuarine sub-types identified by local Sinhala nomenclature as moya, moya kata and modera. All these ecosystems harbour characteristic avifauna, mammals and fish.

Streams have different levels of hierarchy. Ganga, the largest, is usually a perennial river (e.g. Mahaweli Ganga, Kalu Ganga, Kelani Ganga) without a pronounced seasonal regime. This differs from an oya in the dry zone, which is characterised by a seasonal regime (e.g. Malvatu Oya, Yan Oya). Oya in the wet and intermediate zones may also mean a tributary of a major river (e.g. Badulu Oya, Kurundu Oya and Ritigaha Oya). Creeks are differentiated using terms such as ara, dola and kandura at a lower scale.

In the modern systems, the country's cave ecosystems appear to have been

overlooked. Yet, the traditional system has described them as guhawas and lenas. Examples are Lunuhinda Guhawa, Wedilunu Guhawa (Nitre Cave) and Beli Lena. A lena seems to have been a place used by clergy or lay forest dwellers for meditation, as opposed to a guhawa, which was infested with bats, etc. It may be noted that, in ecology today, caves are considered as unique 'habitat island' ecosystems (MacArthur and Wilson 1967).

Kurulu paluwa (or the 'bird damage' area) is another important component of man-made agro-ecosystem types. It is a unique example of the close and deep-rooted link that existed between the early people and their biotic environment. The kurulu paluwa is a strip of cultivated rice land adjacent to a tank (derived from the Portuguese word 'tanque' to mean a small man-made reservoir) or a highland forest primarily reserved for wild birds. Although its exact function is not clear, this piece of land was probably left unharvested to provide food for the birds, thus limiting the damage they could do to the crops on the main tracts. It would have also reduced the number of rice-plant pests because the birds would have fed on them. This is an interesting example of how early people knew through experience the importance of biodiversity and how to harness it while ensuring its conservation.

Ecosystems also display some interesting cultural dimensions. A hierarchy of nomenclature can be seen in mountain ecosystems, ranging from tumbasa (termite hill), to goda (highland), hela (hills), wetiya or heenna (low range or spur), kanda (mountain), tenna (plateau), hela (escarpment), giri or gira (high mountain), etc. Folk poetry also assigns different cultural positions to different mountains, among which Samanala Kanda (Adam's Peak) is assumed to be the leader of all mountains in Sri Lanka. Local folk poetry states: "Alata kanda beri alagalle kanda, bathata kanda beri batalegala kanda, hunata kanda beri hunnasgiri kanda, me kandu thunata nayake samanala kanda," which is translated as "One cannot eat Alagalla Mountain like a potato; one cannot eat Batalegal Mountain with rice; one cannot eat Hunnasgiri Mountain as lime in betel chewing; the leader of all three mountains is Adam's Peak."

### **3. Society, culture and biodiversity**

The age-old custom of chewing betel leaves combines the areca nut with a variety of spices. Folklore reveals that those who did not chew betel were regarded as anti-social: "Bultah nokae kata kiri vavulaye" ("the mouth that has not tasted betel is smelly"). Greeting important visitors with a sheaf of betel, or respecting the elders with an offering of betel, continues to be part of Sri Lankan culture today. This custom — and its continued observation — is only a simple example

of how culture and biodiversity are linked in Sri Lankan community life. In this section, I introduce three areas of knowledge and human experience where this link may be witnessed more widely: (i) traditional agriculture, (ii) food consumption and other food-related practices and (iii) the designation of place names.

### **3.1 Biodiversity in traditional agriculture**

Legend tells that when King Vijaya (550 BC) and his royal clan from India accidentally landed on Sri Lanka's shores, he found an aboriginal Yakka woman seated on an earthen dam, weaving cotton yarn. Her name was Kuveni and she later became his first queen. Documented evidence confirms the existence of a well organised agricultural system in the country that is thousands of years old, along with a tradition of rice cultivation that is at least 3,000 years old. This traditional agricultural system was practised using local resources and indigenous knowledge and provided the foundation for human civilisation in Sri Lanka.

Traditional agriculture comprises two main categories — crop agriculture and animal husbandry. Agriculture in Sri Lanka is generally divided into lowland and highland farming. Lowland farming consists primarily of rice cultivation. Highland farming focuses on home gardening and chena (shifting or swidden) cultivation. Lowland rice farming enjoys a particularly important role in traditional agriculture, incorporating many traditional belief systems and rituals. Traditional rice farming in Sri Lanka is a diverse agricultural system. Its practices — from the type of plough and draught animal (buffalo, principally, but also cattle) used in land preparation, to methods of saving seeds and storing grain — vary according to region, society and locality. Altogether, some 4,000 traditional rice varieties are conserved today at the Plant Genetic Centre at Peradeniya, constructed through Japanese assistance, and many of these were known to people in Sri Lanka in the past.

The main cultivation seasons were traditionally referred to as yala and maha: the former coinciding with the dry season and the latter with the main rainy season. In years of abundant rainfall, a middle cultivation season — meda kanna — was also attempted: this allowed farmers to raise faster-growing varieties of rice such as heta da vee (a 60-day variety), presumed to be good for diabetic patients. Social life and religious life were organised on the basis of these seasons. The vas season or 'rain retreat' observed by Buddhist monks is one example of this; the traditional lunar calendar (which, before the advent of the biblical western calendar, reflected the names of flowers, plants and agricultural seasons) is another. In the lunar calendar, the months of Esala (August) and Binara

## *Culture and biodiversity in Sri Lanka*

Table 1. The traditional Sinhala lunar calendar

January	Unduvap (sow black gram)
February	Duruthu (cold season)
March	Navam
April	Medin (mid-cultivation season)
April/May	Bak
May/June	Wesak
July	Poson
August	Esala or Ehela (blooming of golden rain flowers)
September	Nikini
October	Binara (binara flower)
November	Vap (sowing season)
December	Il (rainy season)

(October) derived their names from flowers blooming during the respective seasons, while the months of Vap (November) and Unduvap (January) marked important times in the traditional agricultural calendar (Table 1). Most other months recognised the climatic rhythm of the seasons. Adhering to these rhythms helped farmers to not only get the maximum benefit from the rains but to benefit from the environment's rich biodiversity, such as insects and weeds, whose lifecycles followed the climatic pattern. Following the traditional calendar also ensured the farmers increased their agricultural productivity because ample water for irrigation was available at the right time and they could reduce the damage caused by pests and diseases.

Traditional highland cultivation still produces 31 varieties of grain, 73 pulses, 89 vegetables, 37 leafy vegetables, 54 types of banana and plantain, 62 other fruits, 73 yams, 22 spices and around 400 medicinal plants. Traditional cereal species, yams, vegetables, fruits and pulses cultivated in upland areas still provide farmers with food, oil, fibre, spice and medicine. Home gardens are characterised by high floral biodiversity, ranging from food crops to timber trees. These floral populations are often perennials, planted systematically or indiscriminately. For this reason, home gardens are recognised today as some of the oldest and most stable agro-forestry systems in Asia — the Kandyan Forest Garden being one of the most well known. Produce from home gardens supplements the produce from chena cultivation, which is comparatively low input, low output and carried out mostly for subsistence: chena crops are highly drought tolerant but low in productivity. Highland farmers add to the bountiful harvest from their home gardens and chena cultivation by gathering a wide variety of food items from the natural forest. These include wild honey, various fruits, mushrooms and a multitude of wild green vegetables.

Since the inception of their ancient civilisations 2,500 years ago, Sri Lankans

have kept livestock for food, sport, pets, transport, their use in combat and for their hides and skins. Deraniyagala (1963) notes that present day domesticated livestock such as cattle, buffalo and poultry — and wild species such as boar, jungle fowl and the now extinct gawara — all existed more than three thousand years ago. Many references to buffalo in ancient rock inscriptions and chronicles, including *Mahawansa* (Great Historic Chronicle), testify to the long history of buffalo use in Sri Lankan traditional agriculture systems, while other archaeological evidence confirms the existence of other livestock such as chicken, swine and poultry since pre-historic times. Keeping livestock for milk was considered a noble profession. Cattle keepers also rank highly in the caste system as Patti, a sub group of the cultivator caste, and the official status of cattle farm managers was recognised as Patti Vidane (leader of the cattle farm). Society honoured those who owned large herds of cattle with the title Gambara (trustee of the village) in some areas, particularly in the south of the country.

### **3.2 Food consumption and biodiversity**

People have defined and given a cultural meaning to the processes of food production, preservation, preparation and consumption throughout the course of human evolution. The meanings of these usages and practices vary by nation, region and province. In Sri Lanka, food consumption is exceptionally diverse. Even today, a standard serving of rice and curry will include 10 or 12 ingredients and different rice varieties have been traditionally used for different nutritional purposes: maa vee varieties were given to pregnant women, heenati varieties were given to children and convalescents, and specific varieties of rice were served for breakfast, lunch and dinner. In the past, before the advent of rice, the people's staple diet was kurakkan (finger millet), grown on rain-fed chena lands and prepared in several forms, such as rottie, pittu, talapa and helapa, to be eaten with vegetables, fish, meat or simply with a coconut salad (pol sambol).<sup>6</sup>

A variety of traditional recipes for preparing fish or meat curry, karukkal (fried pork made from fresh wild boar meat) and fumigated and dried meat indicate that various types of dada mas (wild meat or game) were popular among rural communities. However, most rural people did not eat beef or chicken until recent decades and, in many rural areas, more than half of the total diet comprised green vegetables, examples of which can be seen in Table 2. Fruits were also consumed in high quantities and there was significant variation even among the same type of fruit. For example, there are more than 10 types of banana, which can still be seen in markets today. Locally named varieties include embul, kolikuttu, poovalu, parangivalu, rath kehel, seeni kehel, anamalu, embun, alu kehel, nethrapalam and malu kehel.

## Culture and biodiversity in Sri Lanka

Table 2. Some traditional green vegetables in Sri Lanka

Name in Sinhala	Common English name	Scientific name
Karawila (large)	Bitter gourd	<i>Momordica charantia</i>
Batu karawila	Bitter gourd	<i>Momordica muricata</i>
Thumba karawila (female)	Bitter gourd (wild)	<i>Momordica cochinchinensis</i>
Thumba karawila (male)	Bitter gourd (wild)	<i>Momordica cochinchinensis</i>
Niyan wetakolu	Luffa – chena type	<i>Luffa aegyptica</i>
Dara wetakolu	Luffa – ridged type	<i>Luffa actangula</i>
Thiththa wetakolu	Luffa – bitter type	<i>Luffa amara</i>
Alu poohool	Ash pumpkin	<i>Cucurbita maxima</i>
Heen kekiri	—	<i>Cucurbita momordica</i>
Hane kekiri	—	<i>Cucurbita utilissima</i>
Pipingna	Cucumber	<i>Cucurbita stativas</i>
Pani komadu	Sweet melon	<i>Citrulus vulgaris</i>
Wattakka	Sweet pumpkin	<i>Cucumis melo</i>
Seeni kekiri	—	—
Diya labu	Goblet melon	—

Kos (jackfruit) has traditionally been a favourite meal, both as a vegetable and a fruit. The jackfruit tree is celebrated as a symbol of kiri gaha (milk tree), signifying good fortune. It is an important food source that has saved people from starvation during times of war and famine and every part of it is used for some practical purpose be it for timber, elephant feed or to satisfy cravings in pregnancy (geta polos). Jackfruit may be consumed as a main meal, a side dish or a dessert and is curried in a variety of ways as kos, kirikos, atukos, irikos, welikos, etc. Del (bread fruit) is another fruit noted for varied preparations that reflect the elaborate nature of traditional Sri Lankan cuisine.

Sri Lanka is also known for the diversity of its yams and tubers plus its mushrooms, some of which are rarely seen or consumed in urban areas today. Different types of ala (yams) were so popular in the past that they appear in place and personal names, as well as in traditional cookery. Methods of preserving yams included making them into several types of flour, which are still popular and used by rural people. The process of making flour from kitul boda (the tender sprout of the kitul palm) is typical of the way in which some natural food varieties are treated. The young sprouts are sliced, sun dried and ground to a powdery flour, which is wrapped in cloth and stored above the dummessa or hearth fumigator to preserve it and protect it from pests. In addition to several other uses, rajala (a variety of potato) is used as a food-colouring to make certain dishes more attractive.

Changing food habits and tastes, particularly among those in urban areas, and the arrival of foreign sweets has resulted in traditional Sri Lankan sweets becoming rare. Sri Lankan production methods, once lauded for their

unparalleled variety arising from the island's rich biodiversity, are no longer widely known. The preparation of sweets is often related to the availability of ingredients and the taste, preference and, above all, interest of local producers.

### **3.3 Place names and biodiversity**

Toponymy refers to the place names of a region or locality and their etymological study. The names of villages, townships and administrative divisions often reflect the richness of culture as well as nature, particularly in countries with long histories of civilisation and exceptionally high biodiversity. This is true of Sri Lanka and Japan, where biodiversity- and ecology-related names for settlements, places of residence and administrative divisions suggest the inhabitants perceive themselves to be close to nature.<sup>7</sup> Section 2 of this paper showed that literature, traditional songs and poetry, such as that of Uva region, harbour a wealth of information relating to biodiversity. In this section, I propose that an understanding of place names and the community knowledge that is embedded in them is a valuable information source that reveals much about local ecosystems, including the distribution and extinction of some species.

An analysis of several databases, particularly the US Gazetteer of Village Names and the Islamic Finder Web,<sup>8</sup> indicates that the highest density of biodiversity-related village names in Sri Lanka occur in the north-western intermediate climatic zone. Although biodiversity in general is higher in the wet zone, the maps in Figure 2 depicting the density of village names relating to flora (left), fauna (middle) and ecosystems (right) indicate that bio-cultural biodiversity is greater in the intermediate zone. This observation is reinforced by the map



Figure 2. The distribution of village names in Sri Lanka relating to flora (left), fauna (centre) and ecosystems (right), where each dot represents a village  
(Source: the author, based on data obtained from US Gazetteer of Village Names and the Islamic Finder Web)

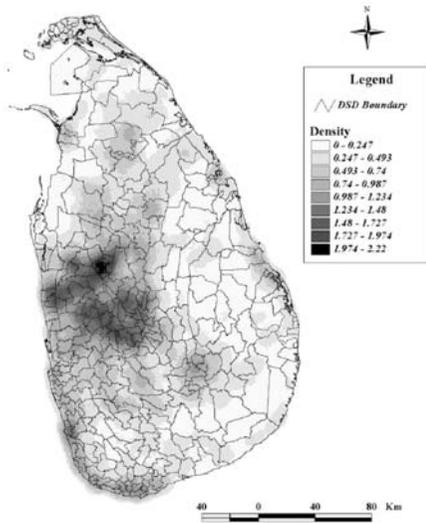


Figure 3. The distribution of village names in Sri Lanka (shown in terms of the density of place names per km<sup>2</sup>) for all biodiversity (flora, fauna and ecosystems)

(Source: the author, based on data obtained from US Gazetteer of Village Names and the Islamic Finder Web)

shown in Figure 3, which plots the combined densities of village names relating to flora, fauna and ecosystems.

What might explain this apparent anomaly between what we know of species- and ecosystem-related density spatial patterns and the place names density spatial patterns as shown in Figures 2 and 3 ? A preliminary study by the author to identify the plant and animal species used most frequently in place names indicated that mora trees (a species of wild fruit tree) record the highest number among plant species in Sri Lanka (Table 3) while gona or sambur have the highest frequency among animal species (Table 4). This may mean that these were the most common plant and animal

species close to the communities residing on the island in the ancient past. Alternatively, since these place name distributions also broadly tally with the distribution of ancient inscriptions, one possibility is that most biodiversity-related names are found in the more ancient villages. This, however, is an interesting issue that should be investigated more fully.

Table 3. Number of villages with plant-related names in Sri Lanka

Local name in Sinhala	Common English name	Scientific name	Number of villages
1. Mora	—	<i>Euphoria longana</i>	145
2. Siyambala	Tamarind	<i>Tamarindus indiaca</i>	106
3. Kos	Jackfruit	<i>Artocarpus heterophyllus</i>	96
4. Amba	Mango	<i>Magifera sp.</i>	90
5. Palu	Ironwood	<i>Manilkara hexandra</i>	87
6. Pol	Coconut	<i>Cocos nucifera</i>	87
7. Bo	Bo	<i>Ficus religiosa</i>	86
8. Mi	—	<i>Madhuca longifolia</i>	83
9. Divul	Wood apple	<i>Ferronia</i>	79
10. Kone	—	<i>Schleichera oleosa</i>	77

Table 4. Number of villages with animal-related names in Sri Lanka

Local name in Sinhala	Common English name	Scientific name	Number of villages
1. Gona	Sambur	<i>Cervus unicolor</i>	66
2. Ura	Pig/wild boar	<i>Sus scrofa</i>	54
3. Bambara	Wasp	<i>Apis dorsata</i>	33
4. Kotiya	Leopard	<i>Panthera pardus</i>	25
5. Kadiya	—	<i>Odontomachus sp.</i>	25
6. Kawuda	White-bellied drongo	<i>Dicrurus caerulescens</i>	20
7. Koka	Crane	<i>Not known</i>	22
8. Wandura	Grey langur (monkey)	<i>Semnopithecus spp.</i>	20
9. Nagaya	Cobra	<i>Naja naja</i>	19
10. Etha	Elephant	<i>Elephas maximus</i>	18

#### 4. Conclusion: the policy implications of bio-cultural diversity

Today, Sri Lanka's rural agricultural sector is showing signs of collapse. A decline triggered by the abolition of the traditional system of land tenure (Rajakariya) by the Colbrook Commission in 1833 during early British colonial rule was greatly accelerated by the so-called 'green revolution' of the 1950s. The latter's main goal — to eliminate hunger in the face of population growth — depended on the use of irrigation, chemical fertilizers, pesticides, hybrid seeds and mechanisation. Its focus on high yield cultivation led to remarkably increased yields of certain types of rice and wheat but exacted heavy costs on the environment. The use of artificial fertilizer created a toxic environment for soil organisms, hampering natural soil fertility in the long run, as did integrated pest management practices that used either biological, chemical or physical methods in isolation of one another. Sri Lankan agriculture, which had originally raised many drought-resistant crops, millets and pulses, lost much of its biodiversity. These factors, along with the disregard for the traditional crop calendar that accompanied the drive towards industrial agriculture, have taken a heavy toll on farming and have subsequently destabilised rural society.

What might be done at this critical juncture in Sri Lanka's natural history? A judicious revival of the traditional crop calendar and extensive reforms, including substantial changes to the educational system, have significant potential for improving productivity in the agricultural sector without exacting high environmental costs. Traditional practices relating to crop agriculture might also be usefully restored. The use of animal and green manure as natural fertilizers is one example: plants selected for green manure are high in nutrients and release them through decomposition at different rates. The restoration of biological systems that once played an effective role in controlling natural

parasites and predators without harming ecosystems is another: this could be achieved by promoting the use of mechanical methods and natural chemicals in place of synthetic chemicals. The government may need to take a role in these restorative efforts: in recent decades, government gave multinational corporations the freedom to lead the green revolution but it could act now to help small farmers to reintroduce more sustainable practices.

It is important here to note that state policies to protect biodiversity need not restrict themselves to the agricultural arena. In recent times, the creation of new settlements by property developers and their attempts to give them exotic or even esoteric names has dramatically undermined the traditional system of nature-based naming of villages and settlements. It is likely that attempts to encourage, retain and promote the use of biodiversity-related natural place names may prove beneficial not only to this important cultural heritage but to the cause of biodiversity conservation by reinstating the close relationship between nature and society that is characteristic of Sri Lankan culture. Similarly, a number of encouraging actions initiated by the Ministry of Environment in the recent past have helped to foster and harness people's traditional modes of interacting with and comprehending their natural environment in the interests of biodiversity conservation. The national symbol of the lion, as depicted on the Sri Lankan flag, inspired the government to declare na (ironwood) the national tree, wali kukula (jungle fowl) the national bird and nil manel (blue water lily) the national flower. The selection of these symbols was based on the degree of endemism they possessed and the degree of national sentiment each was presumed to evoke, as evaluated by an official committee appointed for the purpose. Other action taken by the Biodiversity Secretariat of the Ministry of Environment included efforts to encourage provinces to adopt a provincial flower that asserts a regional identity and enhances the image of the province. The flowers chosen included sudu nelum (white lotus), adopted by the Western Province; attaria (orange jasmine), adopted by Wayamba Province; guruluraja (foxtail orchid), adopted by the Uva region; ehela (golden rain), adopted by the North Central Province; maharatmal (rhododendron), adopted by the Central Province; wesakmal (*Dendrobium macarthiae*), adopted by Sabaragamuwa Province; vishnukranthiya (dwarf morning glory), adopted by the Eastern Province; and heen bovitiya (*Osbeckia octandra*) adopted by the Southern Province.

Figure 4 shows two of a series of postage stamps issued by the national government in 2005 to commemorate these provincial flowers. The stamps, along with the selection of provincial flowers and the national tree, bird and flower, are a simple way to revive an understanding in the minds of the Sri Lankan people of



Figure 4. Postage stamps depicting orange jasmine, the provincial flower of Wamba (left) and foxtail orchid, the provincial flower of Uva (right)

(Source: Department of Posts and Telecommunications, Sri Lanka, 2005)

the links between nature and culture and the rich biodiversity of their island. While it is impossible to measure the direct effect of these initiatives, their premise — that nature conservation efforts are best backed by a sense of belonging and deep commitment — offers great promise for Sri Lanka, given the country’s bio-culturally diverse heritage. There is clearly a great deal of scope for cross-cultural comparison and a more comprehensive study of the links between nature and culture than is possible within the remit of this paper. It is to hoped, however, that the approach outlined here may suggest useful directions for policy makers involved in biodiversity conservation in other countries. It is particularly relevant to Asian countries with long histories of civilisation, where strong links between nature and culture continue to exist.

### Acknowledgements

The research on which this study is based was carried out as part of the preparation for an addendum to the Biodiversity Action Plan for Sri Lanka, under the Biodiversity Secretariat of the Ministry of Environment, Government of Sri Lanka. I wish to thank all the members of my team, in particular, to professors H.M.D.R Herath, K.B. Ranawana, Nimal Perera, Kushan Tennakoon, and S.N. Wickremaratne, all of the University of Peradeniya. Special thanks are also due to Professor Sarath Kotagama, former chair of the Biodiversity Expert Committee, for encouraging me to enter the fascinating field of bio-cultural diversity, and Mr Gamini Gamage, Director of the Biodiversity Secretariat, for his enthusiastic promotion of the team’s work at the level of national policy making.

## Notes

<sup>1</sup> Traditional knowledge, otherwise known as indigenous knowledge or local knowledge, is embedded in the community and unique to a given culture, location or society, having been passed down from generation to generation, usually by word of mouth. To seek or recover such knowledge requires increasing effort as records or practices relating to this knowledge become rare, scattered, lost or transformed beyond recognition by processes such as development and modernisation.

<sup>2</sup> Quoted from the homepage of the Christensen Fund, a US-based private charitable foundation that “crafts its grant making and other activities on the conviction that worldwide diversity — both cultural and biological — is hugely valuable and should be cared for” ([www.christensenfund.org](http://www.christensenfund.org)). Further investigations in bio-cultural diversity can be found in recent research in the fields of ethnobiology and ethnobotany.

<sup>3</sup> In this paper, Sinhala names for plant species, animal species and various kinds of ecosystem are given first, in plain typescript, followed by their Latin names shown in italics, in brackets. Where English names exist, these are given after the Sinhala names. Indication is given in cases where the names given are in local dialect.

<sup>4</sup> For this reason, temples used as sites of retreat and meditation have also acted as refuges for rare plant species. The potential value of temples as centres of biodiversity conservation has been recognised in recent years but full exploration of this potential has yet to take place, not only in Sri Lanka but also in more developed countries such as Japan.

<sup>5</sup> Similar cultural lines of evidence, such as the decorative depictions of pigmy elephants that appear on some old maps, suggest that other species of animals (such as the aforementioned indigenous lion, gurula bird, and henakandaya snake) are not necessarily mythical creatures but animals that once existed.

<sup>6</sup> Now it is widely used by patients suffering from obesity and diabetes.

<sup>7</sup> This proximity to nature is also reflected in traditional family and personal names derived from local ecosystems. Many of these enjoy fascinating parallels across different cultures, as in Sri Lanka and Japan. A deeper exploration of the similarities in place and personal names in Sri Lanka and Japan merits further discussion.

<sup>8</sup> The following databases were also helpful to the author in extracting information relevant to the discussion of ecological place names offered in this paper: (i) official lists of village names in each province around the time of National Independence in 1948, (ii) topographical maps of Sri Lanka dating from the 19th century, (iii) a database of a survey conducted by the Ministry of Environment on biodiversity-related village names, and (iv) a database of village names available at the Plant Genetic Resources Centre at Getambe, Peradeniya, Sri Lanka.

## References

- Deraniyagala, P. (1963) *Pleistocene of Ceylon*, Colombo: National Museums.
- Government of Sri Lanka (1994) *A Strategy for the Preparation of a Biodiversity Action Plan for Sri Lanka*, prepared by the International Union for Conservation of Nature and the Ministry of Environment, Environment Division, Ministry of Transport, Environment and Women's Affairs.
- Islamic Finder Web (accessed by the author in 2004) <<http://www.islamicfinder.org/update>>
- Keller, H., Poortinaga, Y. H. and Scholmerich, A. (2002) *Between Culture and Biology — Perspectives on Ontogenetic Development*, Cambridge: Cambridge University Press.
- King Buddhadasa (Eighth century AD) *Sarartha Sangrahaya* (in Sinhala). Published by the Ministry of Indigenous Medicine in 1991 by the Government of Sri Lanka.
- Kotagama S. B. (1985) 'Biological Diversity', *Natural Resources of Sri Lanka: Conditions and Trends*, Sri Lanka: Natural Resources Science and Energy Authority and USAID.
- MacArthur, R. H. and Wilson, E. O. (1967) *The Theory of Island Biogeography*, US: Princeton University Press.
- Mahavamsa* (date unknown) [The Great Chronicle of the History of Sri Lanka]. Accessed at [www.mahavamsa.org](http://www.mahavamsa.org)
- Mahindapala, R. (2002) 'Biodiversity in Sri Lanka', *Biodiversity Planning in Asia*, Bangkok: IUCN
- US Gazetteer of Village Names (accessed by the author in 2004) <http://www.buyzips.com/zip>

**Madduma Bandara**, an emeritus professor from the University of Peradeniya, Sri Lanka, completed his undergraduate studies at that university and graduate studies in the UK. He obtained his PhD from the University of Cambridge in 1971 and served for more than 40 years at the University of Peradeniya as professor on merit, head of the Department of Geography and — for a period of three years — vice-chancellor. He has conducted research overseas at universities in India, Nigeria, the UK and Japan and worked for brief spells at several international organisations, including the World Bank, the Deutsche Gesellschaft für Technische Zusammenarbeit and the International Union for Conservation of Nature. He has also advised the government of Sri Lanka while chairman of the Presidential Land Commission, the National Water Resources Authority and the National Environmental Council. His research embraces the fields of watershed management, water policy development, coastal zone planning, biodiversity and agro-well development.