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Cover Page & Last page : Photograph by H. I. R Perera

Cover page : Rhino-horned Lizard (*Ceratophora stoddartii*) perfectly camouflaged against tree bark in its natural habitat

Last Page : A tender moment between a toque macaque (*Macaca sinica*) mother and her baby, surrounded by nature's quiet beauty

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Contents

From the Editor...

"Look deep into nature, and then you will understand everything better." – Albert Einstein

With great pride and enthusiasm, we present this volume 4 of **Protect Nature Sri Lanka**, the official journal of the Zoologists' Association, University of Peradeniya (ZAUP). This journal is more than just a collection of research and experiences—it is a celebration of curiosity, exploration, and an unwavering commitment to the natural world. It provides a platform for students to share their scientific findings and unforgettable encounters with nature while also serving as a voice to raise awareness about the urgent need for environmental conservation.

In this volume, you will find a fascinating collection of research articles, field observations, and stories that highlight the beauty, complexity, and fragility of Sri Lanka's biodiversity. From groundbreaking studies to firsthand experiences in the wild, each contribution reflects the passion and dedication of those who seek to understand and protect our ecosystems.

This publication would not have been possible without the guidance and unwavering support of Prof. Suyama Boyagoda, the Patron of ZAUP and Head of the Department of Zoology, Faculty of Science, University of Peradeniya. On behalf of ZAUP, I extend my deepest gratitude to her for her mentorship and invaluable contributions in making this volume a reality. I am grateful to Dr. Chaminda Wijesundara, the Senior Treasurer of ZAUP, for his kind guidance. I also wish to sincerely acknowledge the lecturers of the Department of Zoology for their time and effort in reviewing, editing, and refining the articles presented here. A heartfelt thank you goes out to all ZAUP members, authors, photographers, undergraduates, and researchers whose dedication has shaped this journal into what it is today.

We hope that as you turn these pages, you will find inspiration, knowledge, and a renewed sense of responsibility toward conservation. Let this journal be a reminder that protecting nature is not just a duty—it is a collective journey we embark on together.

We warmly invite you to be part of our future endeavors and contribute to the next volume of **Protect Nature Sri Lanka**. For inquiries or submissions, feel free to reach out to us at zauperadeniya@gmail.com.

Happy reading, and let's continue our mission to protect and cherish the natural world!

H. I. Reshani Perera
Editor,
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Beyond the Bite: Mosquitoes as Pollinators

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An *Aedes* mosquito with pollen sacs on its eyes feeding from *Platanthera* flowers. (Source: www.scitechdaily.com)

When we imagine mosquitoes, an unpleasant feeling comes to mind because of their itchy bites and the transmission of life-threatening diseases. However, they have a hidden talent as pollinators, which is ecologically significant rather than a vector. Rather than blood feeding of female mosquitoes, both sexes ingest sugar and other nutrients from a variety of sources such as flower nectar, extrafloral nectaries, hemipteran honeydew, overripe fruit, damaged plant tissue, seed pods, leaf guttation, and even vascular sap from undamaged plant parts in some cases. The ultimate goal is to gather energy and nutrients. These different sources are to boost their reproduction and enhance the overall fitness of the individual.

Mosquitoes may not be as efficient pollinators as bees, wasps, and butterflies. But their contribution to pollination is important to some ecosystems where common pollinators cannot thrive. For instance, in the northern region, where environmental temperature is very low, snow-melt mosquitoes such as *Aedes communis* and *Aedes nigripes* play a significant role in pollination of - leafed orchid *(Platanthera obtusata),* becoming frequent visitors of the flower. The reason behind that is that orchids release lilac aldehyde, which is known as a specific volatile chemical that can attract these mosquitoes. Also, *Aedes impiger* and *Aedes nigripes* visit tundra plants like cloudberry (*Rubus chamaemorus)* and arctic willow *(Salix arctica)* in the Arctic region. Their ability to pollinate these plants occurs in the short arctic summer when insect activity is high. Moreover, black salt marsh mosquitoes, *Aedes taeniorhynchus,* have been discovered visiting flowers of mangroves in Florida, namely, black mangrove *(Avicennia germinas)* and buttonwood *(Conocarpus erectus).* A vast array of these mosquitoes emerges during high tide and heavy rainfall, potentially assisting in pollination, especially while other pollinators are scarce.

However, due to several circumstances, mosquitoes are not the most effective pollinators. In general, mosquitoes are not capable of carrying large quantities of pollen, and they spend much time probing and feeding on nectar, often returning to the same flower constantly rather than moving between different plants, which reduces their role in cross-pollination. So, these remind the low pollination efficacy of mosquitoes. In addition, not only nectar but also mosquitoes can feed on other sugar sources like honeydew, damaged fruits, and extrafloral nectar, which may come across further decrease their contribution to pollination.

Despite the minor ability of mosquitoes for pollination, their role is more significant in specific ecosystems where mosquitoes are more abundant and other effective pollinators like bees are scarce. Therefore, conserving those particular mosquito species indirectly influences the pollination. So, such a hidden ecological role of mosquitoes claims the traditional view of them as a nuisance pest, reminding us that their impact on the environment is more complicated than just ‘Beyond the Bite’.

This art is related to the significant move aimed protecting the unique ecosystem of Mannar Island by environmental protection organization; Wildlife and Nature Protection Society (WNPS)

Drawing by Himashie Navodya

The Willow Tree's Secret: How Nature Gave Us Aspirin

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Figure 1Willow tree (Source: pinterest.com)

Imagine yourself walking through a forest, and you pass a willow tree. It may seem ordinary, but it carries a powerful secret. This tree has played an important role in one of medicine's most remarkable stories, which is the invention of **Aspirin**.

Many cultures have utilised the willow tree's *(Salix alba*) therapeutic benefits for ages. Willow was employed as a pain reliever by the ancient Egyptians, and the Greek physician Hippocrates, known as the father of medicine, recommended willow bark tea to cure fever and pain. It was a simple, natural remedy, passed down through generations, offering relief from the discomforts of everyday life.

But what was present in the willow tree that made it so special? The bark of the willow tree contains a compound called ***salicin***. When consumed, the body converts it into ***salicylic acid***, which is a substance that has strong anti-inflammatory and pain-relieving effects. For those living in ancient times, chewing on willow bark was like receiving a painkiller directly from nature's pharmacy.

In the 19th century, when the Industrial Revolution was taking over the world, a German scientist named Felix Hoffmann, who was working for the pharmaceutical company Bayer, was motivated by a personal mission. The available treatments for his father's arthritis at the time were very aggressive and irritating to the stomach. Hoffmann went back to the age-old wisdom of the willow tree to find a solution. Although salicylic acid, which is generated from salicin, might reduce pain, its frequent use is not recommended due to its unpleasant effects on the stomach. Salicylic acid was altered by Hoffmann in 1897 to produce ***acetylsalicylic acid***, which is a compound that retains pain-relieving properties. but is much Gentle on the stomach. This discovery was known to the world as Aspirin.

Aspirin soon gained popularity as a miracle drug, praised for its capacity to reduce fevers and treat pain. Over time, researchers discovered that aspirin could also reduce inflammation and even aid in preventing heart attacks and strokes by inhibiting blood clots. The little white pill born from the bark of an ancient tree soon became an important component in medicine cabinets throughout the world.

Today, over a century since its creation, aspirin remains one of the most widely used drugs worldwide. Doctors prescribe it for several ailments, from reducing the risk of cardiovascular disease to treating arthritis pain. While it’s easy to take this small pill for granted, it’s important to remember that it all began with the Willow tree, which serves as a reminder to us of the incredible power of nature.

The story of the willow tree and aspirin is a beautiful example of how humanity and nature are intertwined. It demonstrates to us that the natural world is the source of some of the most significant discoveries. It’s a story that inspires us to keep exploring, keep questioning, and never lose our connection to the environment around us. After all, who knows what other secrets nature has in store for us?

LOST IN THE URBAN JUNGLE Cartoon

by Ayanajith Kumarasinghe

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Seeing the Unseen: Genetic Advances Shed Light on Data-Deficient Species

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In the world of endangered species, there exists a significant blind spot: species classified as "**data deficient**" by the International Union for Conservation of Nature (IUCN). The IUCN Red List, recognised globally as the standard for assessing species' risk, includes over 20,000 species, nearly 14% of all organisms on the list. Fifty species of birds (0.4 %), 840 mammal species (22 %), and 1193 amphibian species (28 %; IUCN, 2022) are currently classified by the IUCN as Data Deficient. These are species for which there is insufficient knowledge about their ecology, population, or distribution to classify them accurately. As a result, many could be at risk of extinction without our knowledge or intervention.

IUCN Red Listing Categories and the “Data Deficient” Label

The IUCN Red List categorises species based on their extinction risk, ranging from "Least Concern" to "Critically Endangered" and, ultimately, "Extinct."

Species are labelled as "Data Deficient" (DD) when the information necessary to assess their conservation status is missing or insufficient. This means the species could be vulnerable or endangered, but due to a lack of data, no conservation plan can be accurately formulated. Sri Lanka, with its rich biodiversity, also has several data-deficient species, such as the Red Slender Loris (*Loris tardigradus*), the Horton Plains Shrub Frog (*Pseudophilautus alto*), and the Sri Lankan Mountain Ebony (*Bauhinia racemosa*). These species need further study to determine their conservation needs.

Genetic Insights into Species at Risk

Recent advances in genetic science offer hope for shedding light on these data-deficient species. Research has revealed that even the DNA of a single individual can provide clues to the extinction risk of its entire species. Scientists have found that the genome holds evidence of the species' population health, genetic diversity, and vulnerability to environmental change. Genomic data from species with a history of small populations or with more genetic similarities among parents often show higher extinction risk. In essence, species with diverse genetic backgrounds are more resilient because harmful mutations are diluted over generations.

Conservation Potential

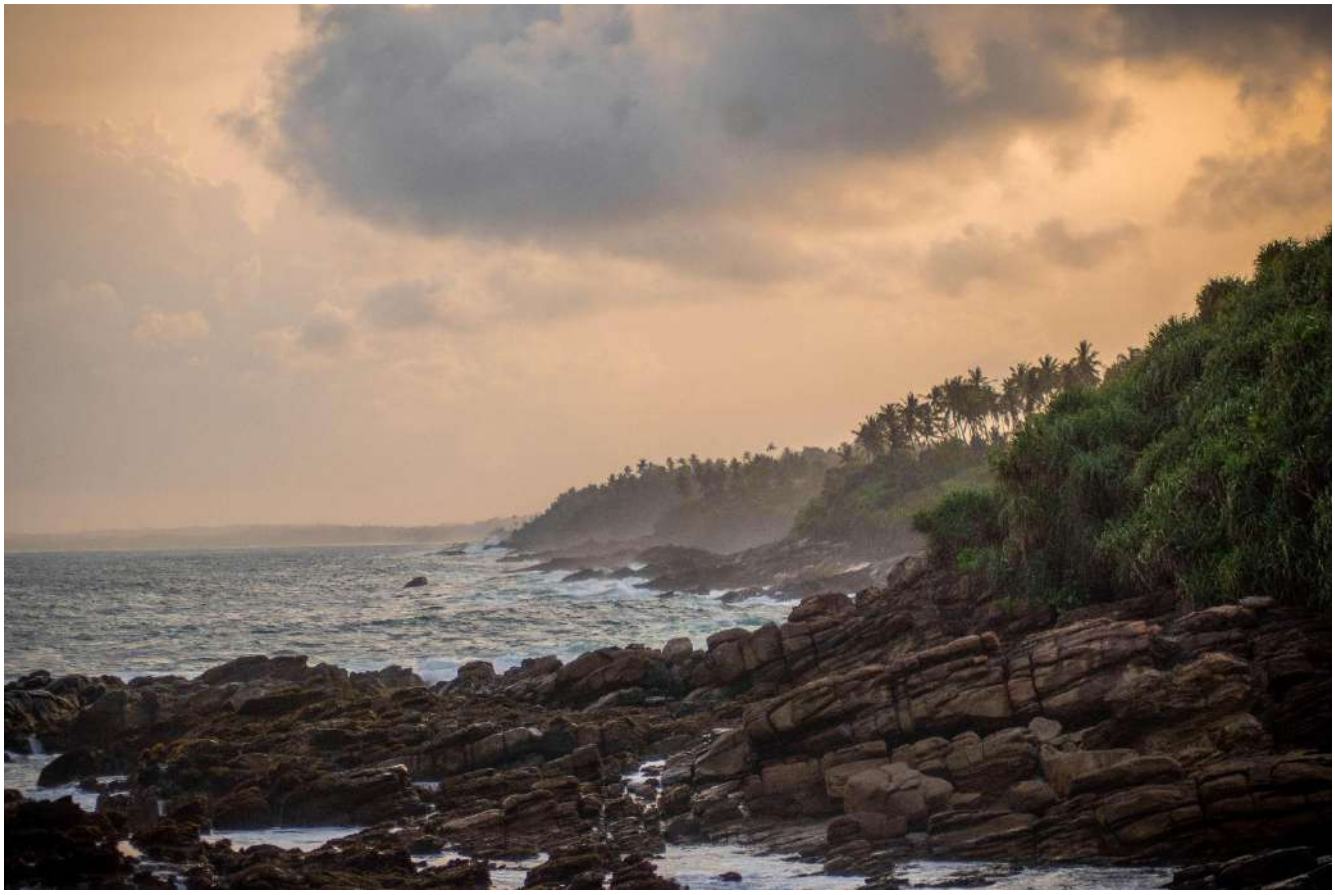
When enough information becomes available, species can be moved out of the data-deficient category into categories where specific conservation actions are feasible. For instance, if we gather sufficient ecological and population data on the Red Slender Loris or the Horton Plains Shrub Frog, conservation strategies can be developed to protect these unique species in their natural habitats. Similarly, identifying population trends and genetic diversity in plants like the Sri Lankan Mountain Ebony would provide insights into effective conservation measures for their preservation.

By unravelling the genetic and ecological mysteries of data-deficient species, we can integrate them into conservation planning, ensuring they don't vanish from our ecosystems before we've had a chance to save them.

FIGURE 01 - {Southwestern Red slender loris (*L. t. tardigradus*)

FIGURE 02- Horton Plains Shrub Frog (*Pseudophilautus alto*)

FIGURE- 03 - Sri Lankan Mountain Ebony (*Bauhinia racemosa*)



"Where the wild ocean kisses the rugged land, and the golden sky whispers stories of the untamed—nature's poetry in motion."

Photograph by Karunairaja Jathukulan

Natural Areas and Tourism in Sri Lanka: Potential Impacts

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Sri Lanka, rich in its different natural environments ranging from mountains to beaches, is such an island nation located in South Asia. Drawing in millions of tourists from home and abroad every year, these natural sites are an integral part of the national tourism economy. There are various natural areas for tourism in Sri Lanka, and here are some key natural areas are Sinharaja Forest Reserve, Ritigala Sanctuary, Wilpattu National Park, Yala National Park, Horton Plains National Park, Udawalawe National Park, Bundala National Park, Knuckles Mountain Range, Minneriya National Park, Kumana National Park, etc. These natural areas are home to tourism-related activities; they have potential impacts.

Ecotourism generates revenue from donations and conservation projects that can support the finances of ecosystem restoration, aesthetic preservation, such as animal refuges in zoos or rehabilitation centers, and maintenance operations for national parks. By promoting awareness and educating visitors on the importance of preserving natural ecosystems, ecotourism can encourage support for conservationist efforts as well as lead us all towards higher respect for our environment. The benefits of that are also easy to measure, as it leads towards sustainable development. This way, it will be implemented in the improvement of roads, sewerage systems, and medical facilities to benefit locals as well as tourists. In addition, it helps to benefit the community by providing a range of employment and revenue streams in their neighbourhoods, from guide services to hospitality and craft sales. It thereby reduces poverty and increases living standards.

Considering the Negative impacts, the degradation of the environment, which is an example of a negative impact, may result from the increase in tourism. For example, Wilpattu National Park's high safari vehicle density might disrupt wildlife, erode soil, and pollute the area. In a lot of natural

lands, we witness garbage disposal trouble, and this badly interrupts the health of an ecosystem, as well it leading to pollution. In this article, a loss of biodiversity is one more which can be worsened by tourism, following the introduction of invasive species (formally or informally), pollution, as well as habitat damage. When human activities are intensified, such as in the Sinharaja Forest Reserve, the native species populations may fall due to disruptions caused to their habitats. Also, there will be economic risks as well like for example, while earnings from ecotourism frequently go to foreign investors rather than locals, the advantages are not always dispersed fairly and can even worsen economic disparities within communities. Besides the above impacts, there can be a depletion of water resources, and cultural and social impacts can happen as well.

However, the negative impacts can be mitigated, allowing ecotourism to be a force for positive change through monitoring and regulation processes, community involvement, sustainable practices, carrying capacity management, etc. For example, it can allow for the implementation and support of sustainable travel methods, including waste management plans, on-site conservation education to tourists, & even environmentally friendly accommodations through sustainable practices. Carrying capacity management processes can also limit the number of visitors to sensitive areas, so as not to cause overuse and degradation.

According to the above information, tourism in Sri Lanka's natural areas boosts the economy, fosters cross-cultural interchange, and many other aspects of life, but it also carries several serious concerns for the local community and environment. To ensure that these priceless natural regions remain secure for the time being and may be protected for future generations, it is necessary to balance the benefits and impacts through a commitment to sustainable tourism practices.

Sea Turtles

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Sea turtles are reptiles. They are cold-blooded and found in ocean waters that are around 22 - 25 degrees Celsius. Sea turtles migrate to warmer waters when the temperature of the water drops. Sea turtles have four flippers. They use their front flippers to paddle through the ocean. Their Back flippers are used for steering and stopping. They have sharp jaws to tear apart their food. They are oviparous animals.

Sea turtles have been recognised as 'keystone species', which means they hold important roles in the ecosystem. They help maintain the balance food web.. For example, Leatherback Sea turtles control the number of jellyfish by feeding on them, Hawksbill Sea turtles keep coral reefs healthy by feeding on competitive Sponges. that grow faster than corals, Green Sea turtles keep seagrass beds healthy. by feeding on seagrass and controlling their overgrowth

Sea turtles in Sri Lanka face several threats that impact their population size. Poaching and illegal trade, habitat destruction, pollution, climate change, and fishing gear And the tourism impact is Some of the anthropogenic impacts.

There are several things that we can do to save the sea turtle population, such as turning out lights visible from the beach, trying to reduce garbage on the beach, being aware of sea turtle nesting areas, and reducing the number of chemicals around the beachside And volunteering to save the sea turtles.

Protecting the sea turtle population in Sri Lanka is vital for biodiversity conservation and ecosystem health. It is essential for long-term survival. of these endangered groups In Sri Lanka's coastal waters. Therefore, let's try to protect the sea turtle population of our country.

Biomedical Promises from Sri Lanka's Biodiversity Vaults

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Being a tropical island in the Indian Ocean, spanning from the lush landscapes to misty highlands to coastal wetlands to arid dry lands, Sri Lanka harbours an astonishing array of fauna and flora, earning its place among the world's biodiversity hotspots, which is remarkable for its small size. The biodiversity in Sri Lanka serves a wide range of uses, contributing significantly to both environmental stability and human well-being. We must know the extent of use of these fortunes that we've inherited as a nation and cherish and protect them for the next generation, and sustainably use them.

This article discusses the conservation of the genetic diversity of the unique species found in Sri Lanka, which possess the biomedical compounds and genetic traits that have potential biomedical applications.

Hosting a rich faunal biodiversity, some of the animal species found in Sri Lanka are identified or studied for their potential medicinal properties. One of such species is the Hump-nosed Viper (*Hypnale hypnale*), a venomous pit viper species endemic to India and Sri Lanka. Its bites are known to cause serious complications such as coagulopathy and acute renal failure, which could be fatal for human beings unless treated within a few hours. Although life-threatening, the research conducted on the proteome (the complete set of proteins expressed by an organism, cell, or tissue at a particular time under specific conditions) of its venom shows that it contains various enzymes and proteins with potential pharmacological properties, including those related to blood clotting and blood pressure regulation. Understanding these properties is crucial for potential therapeutic applications in treating blood clotting disorders and the development of anticoagulant medications.

Furthermore, the studies have analysed the venom of another snake species endemic to Sri Lanka, the Green Pit Viper (*Trimeresurus trigonocephalus*), a highly venomous snake that is widely distributed in all climatic zones of the island except at high elevations and arid zones. It is most commonly found in wet zones, grasslands, and rainforests. The research identified various enzymes, peptides, and proteins with potential pharmacological properties, including those affecting the cardiovascular system. Studies have explored how components within its

venom interact with the cardiovascular systems, including their effects on blood pressure regulation and heart function.

Another such species is, Giant Golden Orb Weave Spider (*Nephila pilipes*) also known as banana spider due to its yellow-coloured body and the elongated abdomen and is found in warmer regions of the world such as tropics and subtropics including Sri Lanka's primary and secondary forests and gardens where the climate is humid, and the vegetation offers shade against direct sunlight. They are mostly known for the impressive webs they weave. *Nephila pilipes* is one of the largest spiders that produces silk with exceptional torsional deformation, toughness, and other properties to support its mass. Also, orb-weaver spiders can produce up to seven different kinds of silks presenting different combinations of polypeptide motifs and, consequently, possessing distinct mechanical properties, including major ampullate silk, minor ampullate silk, flagelliform silk, aggregate silk, tubuliform silk, aciniform silk, and pyriform silk. Its silk has been known to have exceptional torsional deformation properties surpassing those of manmade materials that are related to high proline content.

Advances in synthetic biology have enabled the design and production of spidroins, the primary structural proteins found in spider silk, to mimic the structure, properties, and functions of spider silk. Spider silk is immensely valuable in the field of biomedical science due to its unique properties. Its biocompatibility makes it ideal to be used in wound healing and sutures. Also, spider silks can encapsulate drugs and release them over time, offering controlled drug delivery. Spider silk's protein structure provides cell adhesion, proliferation, and differentiation, supporting tissue growth. Research has investigated the use of spider silk, including that of *Nephila pilipes*, in wound dressings and scaffolds for tissue engineering. These studies focus on the ability of spider silk to promote wound healing, reduce scar formation, and provide a suitable environment for tissue regeneration. Given the numerous applications of spider silks, studies are being carried out to explore the modification of spider silk fibers from *Nephila pilipes* to incorporate bioactive molecules or nanoparticles for controlled drug delivery systems. This current research aims to enhance the therapeutic efficacy of spider silk-based materials in biomedical engineering.

Discussed here are just a few of the numerous fauna that are included in Sri Lanka's genetic treasure trove. Most species of fauna and flora found in Sri Lanka, whether endemic or not, offer or have the potential to offer a plethora of resources to all Sri Lankans and humankind in general, such as medication, ecosystem services like water purification, and climate regulation,

and lay the foundation for sustainable agriculture and tourism industry while inspiring innovations in the fields of medicine, biotechnology, and bioengineering. By unravelling the mysteries of Sri Lanka's varied ecosystems, we can advance biotechnology and medicine while simultaneously preserving ecological equilibrium. Therefore, protecting Sri Lanka's biodiversity is essential not only for preserving our unique natural heritage but also for ensuring the continued health and well-being of the human communities that depend on these resources while honouring a global responsibility to our future generations by maintaining ecological balance, and supporting local-global resilience against environmental changes.

"When you realise the value of all life, you dwell less on what is past and concentrate more on the conservation of the future."

-Dian Fossey - (American primatologist and conservationist)

In the quiet corners of the shore, life moves with resilience—clinging to rocks, seeking shelter in shells, and navigating the tides with silent strength...

Photograph by Karunairaja Jathukulan

Animal Behaviour as a Tool in Conservation Biology

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What is conservation biology?

What is meant by animal behaviour?

How can animal behaviour help to conserve biology?

Examples of animal behaviour help in the conservation of biodiversity

Introduction

Animal behaviour provides crucial insights and tools for conservation biology by helping scientists understand species' adaptations, habitat preferences, social structures, and responses to environmental changes. By studying behaviour, conservationists can make informed decisions about habitat management, species reintroduction, and mitigating human-wildlife conflicts. This knowledge enhances conservation efforts by improving strategies for species protection and promoting ecosystem health and resilience.

Conservation of Biology

Biology is the study of life and living organisms, from one-celled creatures to the most complex living organism of all to the human being. Biology is a natural science discipline that studies living things. It is a very large and broad field due to the wide variety of life found on Earth, so individual biologists normally focus on specific fields. These fields are either categorised by the scale of life or by the types of organisms studied. The rapid degradation of biodiversity in recent years stems from a complex interplay of human activities and environmental factors. Habitat destruction, driven primarily by agriculture, urbanisation, and infrastructure development, has drastically reduced available living space for countless species. Pollution, including chemical contaminants and plastic waste, further disrupts ecosystems and threatens aquatic and terrestrial life. Climate change is altering habitats and disrupting species' reproductive cycles and migration patterns. Overexploitation through hunting, fishing, and wildlife trade also contributes significantly to biodiversity loss, driving many species towards extinction. Additionally, invasive species introduced by human activity

can outcompete native species, further reducing biodiversity. Collectively, these factors underscore the urgent need for comprehensive conservation efforts and sustainable practices to mitigate further biodiversity loss and preserve the natural world for future generations. This understanding helps conservationists develop effective strategies for habitat preservation, species reintroduction, and population management. By studying animal biology, scientists can assess the health of populations, predict their responses to environmental changes, and devise targeted conservation interventions to protect biodiversity and promote ecosystem resilience. Thus, animal biology plays a crucial role in informing and guiding conservation efforts worldwide.

Animal behaviour

Animal behaviour is the study of how animals move in their environment, how they interact socially, how they learn about their environment, and how animals might achieve cognitive understanding of their environment. Behaviour is the change in activity of an organism in response to a stimulus. Behavioural biology is the study of the biological and evolutionary bases for such changes.

How can animal behaviour help to conserve biology?

Animal behaviour plays a critical role in conservation biology by providing valuable insights and tools for effective management and preservation of species and ecosystems. By studying animal behaviour, scientists gain critical knowledge about species' habitat requirements, social structures, reproductive strategies, and responses to environmental changes. This understanding enables conservationists to design and implement targeted conservation strategies that meet the specific needs of wildlife populations. For instance, behavioural studies help in identifying key habitats for protection and restoration efforts, ensuring they adequately support species' survival and reproduction. Monitoring animal behaviour also serves as an early warning system for detecting population declines or environmental stressors, prompting timely conservation interventions. Additionally, insights into animal behaviours inform the development of strategies to mitigate human-wildlife conflicts, such as implementing deterrents or modifying human activities to minimise negative impacts on wildlife. By integrating behavioural science into conservation practices, we can enhance the effectiveness of conservation efforts, promote biodiversity conservation, and sustain healthy ecosystems for the future.

Examples of animal behaviours that conserve biology

❖ Increasing reproductive stress

Many of the mechanisms by which behaviour can affect reproductive success can be grouped under the rubric of social facilitation. Of conservation interest is the breakdown of these social factors at small population sizes, which can result in a sudden reduction in reproductive success or survival. Another behavioural problem related to small population size is increased frequency of hybridisation, which results from inadequate behavioural barriers to mating. The obvious solution to problems of inadequate population size is to increase its size. This option is not always available, such as with rare species or with some captive populations. Researchers working on captive populations of flamingos (*Phoeniconais* spp.) found a unique solution to the problem. However, flamingos are social breeders, and small groups of birds do not breed.

❖ Increasing survival

Predator avoidance is key to survival for most species. For some vertebrates, an effective predator avoidance is related to local habitat familiarity for some other species, predator defence can be a social behaviour that depends on a minimum group size. For example, when groups of pronghorn (*Antilocapra americana*) drop below 12-15 individuals, their typical defensive behaviour breaks down, making them more susceptible to predation. These behaviours are important to decisions about how to release individuals when reintroducing them to a new site, but are not readily manipulated in wild populations. Recently, researchers have used models of predators to condition wild and captive-reared animals to predators. Any increase in predator recognition escape proficiency could increase the survival rate.

Social facilitation also affects proximate foraging behaviours. For example, group size can affect prey selection in species that sometimes cooperate in foraging. In some species, there is conspecific attraction to other foraging animals, and decreased predation risk associated with large foraging groups can increase the amount of time spent foraging. Foraging behaviours in many species have already been manipulated to increase survival probabilities, particularly in the use of feeding stations. For example, although diurnal cycles and weather affect white-tailed deer (*Odocoileus virginanus*) foraging patterns, Henke (1997) showed that deer enclosed in natural areas could be conditioned to feed at any time of day at feeding stations. Feeding stations can be used for more than just increasing food availability, however. They could also

be used to train individuals on a new food type, to train aversion to a food type that is associated with increased mortality (such as crops, or a food type that has become poisonous through pollution), or to train animals to avoid high-risk areas. For species that feed in groups, decoys can be used to attract species to new feeding areas.

❖ Dispersal and Colonisation

When a population becomes diminished and isolated, its chances of persistence are diminished because smaller populations are subject to stochastic factors affecting genetic variability, demography, chance environmental events, and reduced opportunities for population rescue through immigration. Dispersal among populations is typically treated in population biology as a mechanical or diffusional process, where an animal leaves its natal or breeding territory, travels in a random direction, and settles in the first appropriate site it finds. However, dispersal in many species, particularly vertebrates, involves behavioural decisions regarding whether or when to disperse, what path to travel, and where to settle. In addition, the nature of the landscape that defines population distributions can affect the behavioural decisions involved in dispersal. For example, behaviour can affect emigration decisions, either by increasing dispersal in response to local interactions or by inhibiting emigration. Inhibition can be due to a reluctance to cross an ecotone or a gap in habitat, or avoidance of a particular habitat type. An example of a behavioural inhibition to emigration comes from hyraxes living in the Serengeti. These species live on isolated rock outcrops, and individuals tend not to disperse to other outcrops if they do not see or hear conspecifics at that outcrop. Similar behavioural mechanisms can inhibit immigration once an individual has dispersed, such as failure to settle in a suitable habitat. The behaviour of emigration, immigration, and colonisation can be exploited in conservation settings. Colonisation of new or unused areas could be encouraged if the cues used by a particular species to assess habitat suitability were known and could be altered. Hunters have used cues to manipulate behaviour for centuries, e.g., in attracting waterfowl using calls and decoys (e.g., Kear 1990). Along the same lines, nest boxes have been employed to attract cavity-nesting ducks to areas from which they had been absent (Kadlec and Smith 1992). Decoys and playback also have been used to induce colonially nesting birds to establish new colonies (e.g., Kress 1983), and dispersing Griffon Vultures (*Gyps fulvus*) were attracted to former breeding sites by spreading white paint to simulate droppings species with other breeding systems

Conclusion

Attention to animal behaviour, particularly in enhancing reproduction, survival, and dispersal, is crucial. Reviewing methods from domestic animal care and captive breeding can offer new conservation strategies. Collaboration among conservation biologists, animal behaviourists, and breeders is essential for progress and for developing conservation medicine, which combines veterinary, medical, and biological research to maintain ecosystem health**.**

Photograph by Reshani Perera, Kaudulla National Park

Human-Leopard Conflict in Southern Asia: Understanding, Mitigating, and Coexisting

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Introduction

A leopard, which had been struggling for its life after being caught in a snare, tragically died in Maskeliya.

Source- (Newsfirst.lk)

Human-wildlife conflict is a pressing issue in many regions where human activities overlap with wildlife habitats. The IUCN Species Survival Commission (SSC) Human-Wildlife Conflict & Coexistence Specialist Group defines human-wildlife conflict as Struggles that emerge when the presence or behaviour of wildlife poses an actual or perceived, direct and recurring threat to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife. This often leads to negative consequences for both people and wildlife. The typologies of human-wildlife conflict include human-elephant conflict, human-leopard conflict, human-tiger conflict, human-jaguar conflict, human-wolf conflict, and human-bear conflict.

In Southern Asia, one of the most prevalent conflicts involves leopards (*Panthera pardus*), which are widely distributed across sub-Saharan Africa, India, and Southern Asia, primarily due to their highly adaptable hunting and feeding behaviour. The leopard has 14 recognised subspecies worldwide, and it preys on medium-sized ungulates (1–45 kg). Their habitat has been significantly reduced from its original distribution, and they now occupy a diverse range of habitats, from pristine protected forests to urban edges. The species is categorised as vulnerable by the IUCN (2016) due to a decline of over 30% in its global population over three generations, caused by habitat loss, hunting, prey depletion, and conflict with humans. Leopards frequently attack livestock grazing in forests and inside human settlements, posing risks to human lives. This article examines the human-leopard conflict in Southern Asia, its causes, and possible mitigation strategies.

The Human-Leopard Conflict

Human-wildlife conflicts are becoming more frequent, serious, and widespread. Human-leopard conflict is common in various parts of the leopard's distribution range around the world. It is a complex issue influenced by species biology, political and social attitudes, and management practices. Leopards often visit human-dominated landscapes to take advantage of the available cover, easy prey, and food provisioning by people. The lack of wild prey in the forests and diminishing forest cover in the area are likely major factors driving leopards out of forest areas and into "prey-rich" farmlands.

The primary issues contributing to human-leopard conflict are habitat loss and livestock depredation. Due to growing rural populations in and around wildlife habitats, people and leopards are increasingly sharing the same spaces and activity periods. Forest fragmentation, habitat heterogeneity, human population growth, agricultural expansion, infrastructure development, climate change, and other factors driving habitat loss all significantly increase the likelihood of leopards preying on livestock. As natural habitats shrink, leopards are forced to venture into multi-use landscapes, leading to negative interactions with humans, including the risk of injury and death.

Livestock depredation is a principal cause of human-leopard conflict, especially in areas where communities live near protected zones, and wild prey has been replaced by domestic animals. As leopards move into human settlements to hunt livestock, they inadvertently come into contact with people, which can result in injury or death. The economic damage caused by the loss of livestock often angers local farmers, for whom livestock is a crucial source of income. This economic strain intensifies resentment toward leopards, increasing the desire for retribution among affected communities, further escalating the conflict.

Recommendations on Mitigating the Human-Leopard Conflict

Effective management of human-carnivore coexistence requires a comprehensive understanding of the factors that drive negative interactions between people and wildlife. To ensure the conservation of leopard populations while minimising conflict, various strategies must be implemented. These strategies address both ecological and social aspects and include habitat management, ensuring prey availability, and community-based approaches. Non-lethal deterrents, such as barriers and alarms, along with education and awareness programs, help foster coexistence between humans and leopards. Additionally, policy and legislation, research and monitoring, and efforts to promote sustainable livelihoods for local communities are essential in mitigating conflicts. Collaborative approaches, including translocation of wildlife in extreme cases, are also employed to reduce human-leopard interactions and ensure the long-term survival of this vulnerable species.

Habitat management is crucial for mitigating human-leopard conflicts. One key strategy is habitat restoration, which involves restoring and preserving natural habitats to reduce fragmentation. This can be achieved through reforestation projects and the creation of protected areas that provide safe spaces for leopards and their prey. Additionally, the establishment and maintenance of wildlife corridors are essential. These corridors connect fragmented habitats, allowing leopards to move freely across their range, reducing the likelihood of human encounters, and enabling them to thrive in more suitable environments.

Ensuring prey availability is another important aspect of managing human-leopard conflict. Prey conservation involves implementing measures to protect natural prey species, which reduces leopards' dependence on livestock. This can be achieved through anti-poaching initiatives and effective habitat management to support healthy prey populations. Additionally, in some instances, supplementary feeding can be introduced, providing alternative food sources for leopards in the wild. This can help deter them from targeting livestock and reduce the frequency of human-wildlife conflicts.

Community-based strategies are essential for fostering human-leopard coexistence. Community engagement involves actively involving local populations in conservation efforts through education and awareness programs. This encourages community participation in monitoring and protecting leopard populations, fostering a sense of ownership and responsibility. Compensation programs are also vital, providing fair and prompt compensation for livestock losses due to leopard predation. Such programs help mitigate economic hardships and reduce the motivation for retaliatory killings. Additionally, promoting livestock management practices, such as securing livestock in predator-proof enclosures at night, using guard animals, and implementing rotational grazing, can significantly reduce the risk of leopard attacks and further lessen conflict.

To safeguard livestock and human settlements from leopard intrusions, implementing non-lethal deterrents is crucial. Electric fencing and sturdy barriers can create physical obstacles that prevent leopards from accessing vulnerable areas, while noise and light devices can effectively disrupt their behaviour. By utilising devices that emit loud sounds or intense lights, communities can create an environment that is unappealing to leopards, thereby reducing the likelihood of encounters and protecting both people and animals from potential harm.

To effectively manage human-leopard interactions, research and monitoring play a pivotal role. Regular monitoring of leopard populations through the use of camera traps, GPS collars, and other tracking technologies provides valuable insights into their numbers and movements, allowing for better-informed conservation strategies. Concurrently, establishing a comprehensive database to record and analyse instances of human-leopard conflict helps identify patterns and hotspots. This data-driven approach enables the development of targeted mitigation strategies, ultimately reducing conflicts and promoting coexistence between leopards and local communities.

Educational initiatives are essential for fostering a harmonious relationship between humans and leopards. Conducting educational campaigns to raise awareness about leopard behaviour and their crucial role in the ecosystem helps the public understand the importance of conservation and the benefits of maintaining biodiversity. In addition, providing training programs for local communities equips them with knowledge on how to handle leopard encounters safely and effectively, empowering them to manage potential conflicts and contribute to the protection of these majestic creatures.

Strengthening policies and legislation is vital for the conservation of leopards and the management of human-wildlife conflicts. Enforcing strict wildlife protection laws is crucial to prevent illegal hunting and retaliatory killings of leopards, ensuring their populations remain stable. Additionally, developing clear and efficient conflict resolution frameworks, including the establishment of rapid response teams, can provide timely and effective management of leopard incidents.

Translocation involves relocating leopards that frequently come into conflict with humans to alternative, suitable habitats. This approach helps mitigate immediate threats and reduce retaliatory actions. However, it requires careful planning to ensure the new environment supports the leopard's needs and does not exacerbate human-wildlife conflicts. Coordinating with wildlife experts and local authorities is essential to ensure that translocation is both ethical and effective.

Collaborative approaches are crucial for effectively managing human-leopard conflicts. By fostering multi-stakeholder collaboration among government agencies, conservation organisations, local communities, and other relevant parties, integrated conflict mitigation strategies can be developed and implemented more effectively. Additionally, engaging in regional and international cooperation allows for the sharing of knowledge, resources, and best practices, enhancing the collective ability to address and manage conflicts. This cooperative effort ensures a comprehensive approach to conservation and conflict resolution, benefiting both leopards and human communities.

Current strategies and future recommendations

Several innovative, low-cost techniques have been developed to reduce conflicts between leopards and humans:

Halogen Light Technique: Installation of halogen lights on the roof of houses and livestock sheds facing the boundary and bushy forest area illuminated the hideout spots of leopards during the nighttime. Leopards have a habit of scanning their territory where they wish to conduct an ambush. In these conflict hotspots, leopards stopped lying in wait for their attack victim around attack-prone houses in forest fringe areas. This technique discouraged leopards from entering the area.

I-Cow Technique: The Eye-Cow project is a practical and cost-effective method designed to mitigate livestock-carnivore conflicts by painting eyes on the rumps of cattle. This innovative approach is based on the prediction that ambush predators, like lions and leopards, will be deterred from attacking when they perceive themselves to be 'seen' by their prey. The outcome has been promising; cattle adorned with painted eyes on their hindquarters have shown a significant reduction in leopard attacks.

I-Cow Technique

Metallic Livestock Sheds: Encouraged shepherds to build metallic livestock sheds for their animals with the aim of better protection from predation by leopards. A better alternative is the construction and installation of wire mesh cages with thorny bushes along the outer surface of the livestock sheds. This technique discouraged leopards from coming near the livestock sheds both during the day as well as at nighttime. These metallic livestock sheds have been very resourceful. After making these sheds leopard movement in villages reduced.

Cattle Bell Technique: Tie cattle bells around the necks of a few members in a shed every night, so that even if some leopard strayed into the neighbourhood at night, these few cattle with bells around their necks would act like an alarm. This is most useful in those houses in which villagers could not afford a cemented base for metallic livestock sheds, and there are chances for the leopard to dig around the wired mesh and enter the shed. The villagers are instructed to remove the cattle bells every morning before they go for grazing to avoid every possible chance for the leopard to follow the cattle bell sound in the forest fringe area while the cattle are grazing.

Conclusion

The human-leopard conflict in Southern Asia is a significant issue requiring a comprehensive strategy for resolution. Key measures include protecting and restoring natural habitats to reduce encounters, along with creating wildlife corridors. Engaging local communities through education and active participation in conservation efforts is essential for fostering coexistence. By combining habitat conservation, community involvement, and proactive conflict mitigation strategies, it is possible to enhance human safety and ensure the long-term survival of leopard populations.

Souls of the Forest: The Battle for Sri Lanka's Elephants

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In our Pearl's lush and green,
Elephants are often seen.
Majestic giants, calm and wise,
With gentle hearts and soulful eyes.

Through dense forests and clear rivers,
They wander free without fear.
Their trumpets echo through the trees,
A melody upon the breeze.

But dangers lurk in shadows dark,
Poachers leave a painful mark.
For ivory, they hunt and take,
Leaving sorrow in their wake.

We must unite, stand strong and true,
To protect these giants and their view.
Guard their homes, their paths, their ways,
So they can roam for all their days.

In every heart, a promise is made,
To keep them safe for the future's sake.
For elephants, both great and small,
Deserve a life that's free for all.

In Sri Lanka's fields and skies,
Let's ensure their legacy never dies.
Together, we can make it right,
For elephants, we stand and fight.

The Power of Virtual Mind-Body Practices in Cancer Care

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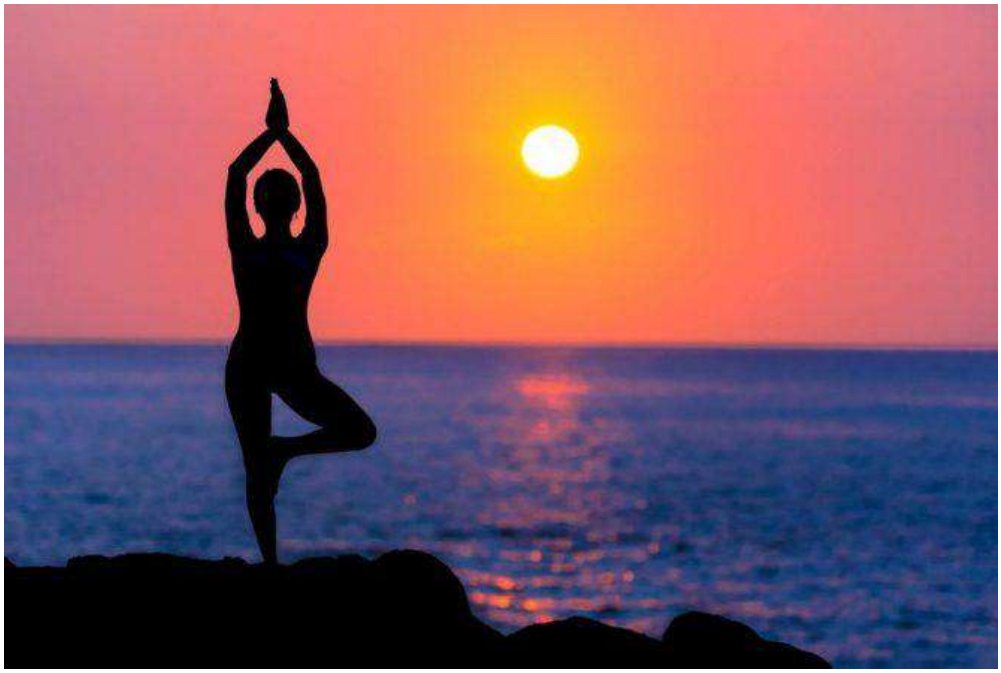

An Alternative in Cancer Care: Virtual Mind-Body Training

Mind-body practices like yoga, tai chi, and mindfulness are increasingly recognised as essential components of cancer treatment. These practices help patients improve their quality of life and cope with the physical and emotional challenges of battling cancer. Thanks to virtual platforms, these programs are now more accessible, allowing patients to participate from the comfort of their homes. A key study led by Dr. Jun Mao at Memorial Sloan Kettering Cancer Centre (MSKCC) demonstrates how virtual mind-body fitness programs can significantly improve outcomes for cancer patients.

The IM@Home Study

The "Integrative Medicine at Home" (IM@Home) trial tested the effectiveness of delivering mind-body fitness programs via Zoom. The results were striking: patients who participated in these virtual classes experienced fewer hospitalisations, spent less time in the hospital, and had fewer urgent care visits compared to those receiving standard cancer care. While mind-body practices are already known to alleviate symptoms such as fatigue, anxiety, and depression during cancer treatments like chemotherapy and radiation, this study revealed that virtual programs could also reduce hospitalisation rates and the need for urgent care. This adds a new dimension to how mind-body practices can support patients throughout their cancer treatment journey.

Virtual Care: A Blend of Flexibility and Community

The IM@Home program offered more than 20 live classes, including movement-based activities like yoga, tai chi, and dance therapy, along with meditation-based practices such as mindfulness and music therapy. The virtual format was highly flexible, allowing patients to choose classes based on their energy levels and needs. This flexibility made it easier for patients to stay engaged in their treatment, adapting the program to fit their personal health circumstances.

Dr. Mao also emphasised the sense of community fostered by the virtual format. "Patients can build a sense of community with others on a similar journey," he said. This sense of connection helped patients combat the isolation and fear often associated with cancer, especially in the post-COVID world. The virtual platform provided a safe space for patients to share their experiences and encourage each other throughout their treatment.

Reduced Hospitalisation and Shorter Stays

One of the most remarkable outcomes of the IM@Home trial was the reduction in hospitalisations. Only 5% of participants in the IM@Home group were hospitalised, compared to 14% in the standard care group. Moreover, when participants in the IM@Home group were hospitalised, their average stay was significantly shorter, five days compared to nine days for those receiving standard care.

While the exact reasons for these improvements are not yet fully understood, the researchers hypothesise that the virtual mind-body practices helped patients better tolerate treatment symptoms and develop coping mechanisms. This may have allowed them to avoid complications that would otherwise lead to hospitalisation.

The Future of Cancer Care

The IM@Home trial is part of a larger movement toward integrative cancer care, which emphasizes mental, emotional, and social wellness alongside physical health. Major cancer centers, including MSKCC, are now recommending mind-body practices like yoga and meditation to reduce stress and fatigue in cancer patients.

As telehealth and virtual health services continue to grow, programs like IM@Home could become a standard part of cancer care. The convenience and accessibility of virtual platforms make it easier for patients to participate in supportive therapies, even when they are too fatigued to attend in-person sessions.

The IM@Home trial provides evidence that virtual mind-body fitness programs can complement traditional cancer treatments. By helping patients manage symptoms, reducing hospital stays, and fostering a sense of community, these programs have the potential to play a key role in future cancer care. While further research is needed to fully understand the benefits, the early results are encouraging. Virtual platforms offer a practical and effective way for patients to actively participate in their healing journey from home.

Parasitoids: Real-Life Zombies and Friends of Farmers

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Figure 01: *Cotesia glomerata* parasitizing L2 instar Pieris caterpillars

Do you believe there are real-life zombies around you? Indeed, there are. They are the unbelievable creatures of the environment known as parasitoids. Parasitoids are insects whose immature stages feed on other arthropods (usually insects), eventually causing the death of their host. Parasitoids exhibit intriguing life history traits and can be categorised based on various factors such as host type, mode of parasitism, the life stage of the host they attack, host specificity, and trophic level.

They are broadly classified into endoparasitoids and ectoparasitoids. Endoparasitoids feed and develop inside the host. In contrast, ectoparasitoids lay their eggs on the external surface of the host, and the developing larvae feeds through the host's skin, sucking out body fluids. Parasitoids can also be categorised based on the life stage of the host. They attack egg parasitoids, egg-larval parasitoids, larval parasitoids, larval-pupal parasitoids, and pupal parasitoids. Parasitoids can also be solitary, gregarious, or polyembryonic based on their mode of life. Solitary parasitoids ensure that only a single parasitoid will emerge from a single host, usually laying one egg, though if multiple eggs are laid, only one parasitoid ultimately emerges. Gregarious parasitoids lay numerous eggs in the host's body, resulting in several parasitoids emerging from a single host. Polyembryonic parasitism is unique in producing genetically identical individuals inside the host

by splitting an egg into many embryos. These fascinating creatures are primarily found in two orders: Hymenoptera and Diptera.

Major families of parasitoids in the order Hymenoptera include Braconidae, Ichneumonidae, Chalcididae, and Pompilidae. These adult parasitoids consume resources such as pollen, plant nectar, and honeydew. Sarcophagidae, Calliphoridae, Conopidae, and Gasterophilidae are major family of parasitoids of dipteras.

These remarkable creatures can alter the behaviour of their host organisms to ensure their survival, a phenomenon called host manipulation. For instance, certain parasitoids inject their hosts with a venom that paralyses them but keeps them alive, providing fresh food for the wasp larvae. Others can induce the host to create protective structures or even move to locations that are safer for the developing wasps. This phenomenon has earned parasitoids the nickname "real-life zombies."

Figure 02: *Telenomus podisi* parasitizing eggs of the stink bug *Euschistus heros*

Most of the hosts that parasitoids target are pests that damage crops. In this way, parasitoids naturally help control pest populations, preventing them from growing out of control and maintaining their numbers below harmful levels. By doing so, these incredible organisms act as nature's very own pest control system, making them invaluable friends to farmers.

However, the use of chemically synthesised insecticides in agriculture poses a serious threat to this delicate balance. While these insecticides are designed to target pests, they often harm beneficial parasitoids as well. This indiscriminate killing of both pests and their natural enemies leads to an unbalanced ecosystem, making it harder to maintain sustainable pest control. By relying on nature's incredible parasitoids instead of harmful insecticides, we can effectively control pests while preserving the health of our environment. It’s time we reconsider our approach and embrace these natural allies in agriculture.

Emotional Intelligence (EI)

-The scientific epithet of humanity-

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Throughout history, scientists considered emotion and cognition to be separate areas. They also thought emotions were a threat to cognitive abilities such as rational thinking. However, in the early 1970s, scientists understood the limitations of the Intelligence Quotient (IQ) and the inability to explain differences among individuals based only on cognitive abilities. These reasons led to more advanced research regarding intelligence, and the concept of Emotional Intelligence (EI) was founded. According to this interesting concept, cognition and emotion are interrelated. That means emotions influence everyday behaviour, such as decision making, interaction with others, and relationship building.

To accurately assess something complex, such as EI, we need models. These models act like blueprints, outlining the key abilities that make up EI and how they might interact. This framework allows researchers to develop targeted assessments and track progress in developing emotional intelligence.

We can refine these models or create new ones to reflect our evolving understanding of EI. Currently, there are 3 primary models of EI measurement.

1. The ability models
2. Mixed models
3. The trait EI model

The ability model, the most prominent model, was introduced by John D. Mayer and Peter Salovey in 1997, and this describes how EI comprises four emotion-related abilities. The first is the *perception of emotions,* which is the ability to recognise emotions in oneself and others using facial expressions, body language, tone of voice, etc. Those skilled in this ability can express emotions accordingly. Second is the *use of emotion to facilitate thinking.* People who are skilled in this ability can use some emotional states for targeted outcomes more than others. For example, high

adrenaline levels associated with frustration can be used for better outcomes in sports. But the same emotions may hinder some performances, such as writing an essay. *The ability to differentiate between emotional states and their causes* is the third component. People skilled in this area are aware of emotional pathways, and they may also understand how two or more emotions work together to produce another, such as contempt, which may be a result of anger and disgust. *Emotion management*, the fourth one, includes the ability to tolerate and regulate various emotions, understanding the value of feeling certain emotions in specific situations, and understanding which strategies are the most efficient for emotion regulation. These ability models utilise performance measures. In performance measures, participants display their four emotional skills by solving emotion-related problems. Among these measures, the *Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)* is the most popular one.

Mixed models of EI combine mental abilities with personality traits such as openness, generosity, and helpfulness. The Boyatzis-Goleman model and the Bar-On model of emotional-social intelligence are the most commonly used mixed models. According to the Boyatzis-Goleman model, there are four components of the EI: self-awareness, self-management, social awareness, and relationship management, whereas the Bar-On model divides the EI into five parts: intrapersonal skills, interpersonal skills, adaptability, stress management, and mood. The trait model suggests emotional intelligence is like a personal map of one's emotional strengths, based on how they see themselves.

Although trait and mixed models offer insights into emotional intelligence, some researchers argue they downplay EI's role as a distinct mental skill that can be measured. They propose that viewing EI as an ability provides the most accurate picture of how thinking and emotions interact. This ability-based approach captures how EI influences individual results, which might be overlooked by simply focusing on changes in cognitive intelligence or personality traits.

Emotional intelligence can be applied in numerous real-world situations. For example, in conflict resolution, self-awareness allows individuals to stay calm and prevent careless actions. Social awareness can be used to identify other perspectives, which leads to effective communication. Individuals with a good EI can become great leaders because of self-awareness, emotion regulation, and building strong relationships with others. Further, EI is important in teamwork,

negotiations, customer service, and personal relationships. These make EI a significant skill for personal growth.

The field of EI needs further development in theory, measurement, and research on its impacts. Despite its popularity, the MSCEIT test has limitations, such as not assessing emotional expression or reflection. Additionally, broader criticisms challenge the very idea of EI as a unified concept. Researchers must address these issues by finding common ground on definitions and improving existing measures. Future research should explore the genetic and environmental influences on EI, its fluidity over time, and cultural variations. Studies beyond Western cultures are necessary for broader applicability. Examining developmental patterns, gender differences, and how EI functions in work and education would also be valuable.

While more exploration is needed, current evidence suggests a link between emotions and thinking. A key aspect of EI is the ability to manage our emotions, which were once seen as uncontrollable. However, with this control comes responsibility. Emotional regulation allows us to see situations objectively without ignoring our true feelings. By simply calming down, we can approach problems more effectively.

Even though EI has gained significant attention, some researchers question its validity as a unified concept. EI might overlap with existing constructs like personality traits or cognitive abilities. Further, the measurement of EI, particularly through self-report questionnaires like the MSCEIT, is usually subject to biases and limitations. Beyond the MSCEIT's flaws, other models of EI also face criticism for their lack of theoretical coherence, inconsistent definitions, and limited predictive validity. Some researchers suggest that EI might be better understood as a collection of related abilities rather than a single, unified construct. Further research is compulsory to identify the nature and measurement of EI and its impact on various outcomes.

In conclusion, the knowledge of emotional intelligence aids in improving the quality of life by encouraging stronger relationships between individuals, improving decision-making, and increasing overall well-being. By managing emotions effectively, people can overcome challenges more easily. EI strengthens personal relationships by enhancing empathy, effective communication, and conflict resolution. Ultimately, EI can be used to improve mental health. Therefore, EI allows individuals to live a fulfilling life.

The Cry of Earth

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She bears us in her gentle arms,
With air, with food, with all her charms;
But now she weeps, her heart is torn,
By those she raised, fed, and warmed.

We take and take, with greedy hands,
Destroying seas and choking lands;
We spill our dirt upon her face,
And poison life in every place.

Her skies, once blue, now thick with smoke,
With every breath, our throats choke;
The oceans deep, now ruined, grey,
The coral reefs are stripped. all Away.

The soil, once rich, is now dust and stone,
No fields remain No crops are grown;
The forests fall, the rivers dry,
We turn our backs As nature dies.

We tear, we Scar, we drill and mine,
For riches vast, we cross the line;
Ignoring warnings, we forge on still,
As Mother Earth grows weak and ill.

She gave us life, she gave us all,
But now she stumbles, now she falls;
And as we flee this broken land,
We bear the guilt of what was planned.

Her voice now quiet, her cries subdued,
Yet echoes haunt, and guilt pursued.
A prayer unanswered, love betrayed,
A world undone by what we've made.

Fluttering Jewels: The Enchanting World of Butterflies

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Butterflies are nature's living masterpieces, fluttering mosaics of colour that grace our gardens with their delicate presence. These enchanting insects are not merely beautiful; they are vital to our ecosystems, playing crucial roles as pollinators, indicators of environmental health, and part of the food chain. In the tranquil sanctuary of my garden, a symphony of wings unfolds each day, revealing the intricate dance of life that thrives within. This feature invites you to explore the mesmerising world of butterflies, where each species tells a story of survival, adaptation, and the incredible journeys they undertake. Join us as we delve into the vibrant tapestry of the butterfly kingdom, celebrating the splendor of these ethereal creatures and understanding the importance of preserving their delicate habitats for generations to come.


Tailed Jay (Graphium agamemnon)
Crimson rose (Pachliopta hector)
Monkey Moth (Eupterote spp.)
Common Eggfly (Hypolimnas bolina)
Common Eggfly (Hypolimnas bolina)
Glassy Tiger (Parantica aglea)
Lesser Band Dart (Potanthus omaha)
Lemon Emigrant (Catopsilia pomona)
Common mormon (Papilio polytes)
Common mormon (Papilio polytes)
Red Pierrot (Talicada nyseus)
Zebra Blue (Leptotes plinius)
Zebra Blue (Leptotes plinius)
Pulsudu Premasinghe


Common mormon (Papilio polytes)
Tailless Line Blue (Prosotas dubiosa)
Blue Mormon (Papilio polymnestor)
Common Palmfly (Elymnias hypermnestra)
common Leopard (Phalanta phalantha)
Psyche (Leptosia nina)
Common Grass Yellow (Eurema hecabe)
Sri Lankan Lesser Albatross (Appias galene)
Smallest Swift (Parnara bada)
Common Mime butterfly (Papilio clytia)
Glassy Tiger (Parantica aglea)
Chocolate Pansy (Junonia iphita)
Lime Blue (Chilades lajus)
Common Pierrot (Castalius rosimon)
Pulsudu Premasinghe

PROTECTING SRI LANKA'S NATURAL HERITAGE

Shyamali Herath

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Sri Lanka, often called the "Pearl of the Indian Ocean", is renowned for its stunning landscapes, rich biodiversity, and unique ecosystems. From lavish rainforests and peaceful seashores to assorted untamed life, the natural beauty of Sri Lanka is unmatched. However, a variety of human activities and environmental changes pose a threat to this ecological paradise. Protecting Sri Lanka's natural environment is not only an ecological necessity but also essential for the well-being of future generations. This exposition investigates the basic advances expected to protect Sri Lanka's cultural legacy.

Sri Lanka is a biodiversity hotspot, home to many endemic species. Conservation efforts must prioritise the protection of these species through the expansion and strengthening of protected areas. Protected areas such as national parks and wildlife reserves are crucial in safeguarding habitats and species. Moreover, targeted conservation programs for endangered species such as the Sri Lankan leopard, elephants, and marine turtles are essential. To ensure long-term success, these programs should focus on habitat restoration, anti-poaching measures, and community engagement.

Numerous species of plants and animals that are unique to Sri Lanka are endemic, meaning they cannot be found anywhere else on the planet. This biodiversity must be preserved. Prioritising specific conservation initiatives for endangered species is necessary. Examples of these species include the secretive Sri Lankan leopard (*Panthera padus kotiya*, beautiful elephants (*Elephas maximus*), and vulnerable marine turtles. To ensure long-term effectiveness, these programs should prioritise community engagement, habitat restoration, and anti-poaching measures.

When considering, tourism in Sri Lanka is a significant economic engine, but to stop environmental damage, it must be managed responsibly. It is important to encourage eco-friendly tourism activities to reduce tourists' ecological impact. This entails promoting ethical conduct, cutting back on waste, and assisting environmentally conscious lodging. It is essential to include local communities in tourist efforts. People in the area are more inclined to participate in conservation initiatives and safeguard natural resources when they gain financially from tourism.

Tourism can bring many economic benefits, but it also has significant negative impacts. Here are some of the key damages caused by tourism. **Environmental Degradation, Cultural Erosion, Economic Disparities, Social Issues,** and **Wildlife Threats.**

However, an important threat to Sri Lanka's natural habitats is pollution. Systems for managing garbage effectively are necessary to keep land and aquatic bodies clean. The negative consequences of plastic pollution can be lessened by encouraging recycling and minimising the use of plastic. To further safeguard the quality of the air and water, stronger laws about industrial pollution are required. Healthy ecosystems and communities can be ensured in Sri Lanka by tackling pollution at its source. Also, planting New Trees and reforestation, two consequences of deforestation, are the loss of important habitats and biodiversity. Initiatives for afforestation and reforestation are essential to repairing these damaged environments. Programs to plant large trees can improve carbon sequestration, aid in the rehabilitation of deforested areas, and lessen the effects of climate change. Promoting agroforestry, or the integration of trees into agricultural methods, can also benefit farmers financially while improving soil and biodiversity.

Climate change poses a significant threat to Sri Lanka's natural and human systems. Investing in renewable energy sources such as solar, wind, and hydro can reduce the country's reliance on fossil fuels and decrease greenhouse gas emissions. Enhancing natural carbon sequestration through reforestation and the conservation of peat lands and mangroves can also help mitigate climate change impacts. By taking proactive measures, Sri Lanka can contribute to global efforts to combat climate change while protecting its natural resources.

Collaboration between nations can improve Sri Lanka's conservation efforts. Working together with other organisations and nations makes it possible to exchange best practices, resources, and information. For large-scale conservation projects, seeking money and technical assistance from non-governmental organisations and global environmental funds can provide essential support. Collaboration between Sri Lanka and the global community can lead to increased success in preserving the environment.

It takes coordinated efforts from all facets of society to protect Sri Lanka's natural environment. Sri Lanka can protect its natural heritage for future generations by emphasising the conservation of biodiversity, sustainable tourism, pollution control, reforestation, marine conservation, mitigating climate change, environmental education, robust legislation, research, and international cooperation. Sri Lanka's natural beauty and biodiversity are priceless assets that must be protected for the prosperity

EARTH IS HEALING ITSELF – MICROORGANISMS THAT EAT PLASTIC AND POLYTHENE

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Plastic is one of the most abundant human-produced, versatile materials on earth due to its high stability and long durability. Plastic is a polymer that consists of the elements carbon, hydrogen, silicon, oxygen, chlorine, and nitrogen. The current global plastic production exceeds 300 million tons annually because of its inertness, low production cost, and relatively low weight. But the primary disadvantage of plastic is its extremely slow natural degradation. This is the major reason for the accumulation of plastic waste in nature. Recent estimates report that 12,000 billion tons of plastic waste will have accumulated on the Earth by 2050. Therefore, it is essential to develop an effective plastic biodegradation process to accelerate the natural degradation rate of plastics. Recent scientific discoveries have highlighted the potential of microorganisms, such as bacteria and fungi, to break down these materials, offering hope for sustainable waste management.

Certain bacteria, like *Ideonella sakaiensis*, discovered in 2016, can degrade polyethylene terephthalate (PET), commonly used in bottles. This bacterium produces enzymes, such as PETase, which break down plastic into its basic components, allowing them to be further processed by the organism as a source of energy and carbon. Similarly, *Pseudomonas putida* is known for degrading polyurethanes, which are used in foams and coatings.

Fungi, like species from the *Aspergillus* and *Penicillium* genera, also show promise in degrading plastics. These fungi secrete enzymes capable of breaking down plastic polymers into smaller molecules. This process, known as biodegradation, occurs when microorganisms use plastic as a carbon source, slowly converting it into carbon dioxide, water, and biomass.

While these microorganisms offer promising solutions, their natural degradation rates are still slow compared to the vast amount of plastic waste generated. Scientists are now working on genetically modifying or enhancing these organisms to accelerate the process. These advancements could significantly reduce plastic pollution in the future.

In conclusion, the discovery of plastic-degrading microorganisms is a promising step toward addressing the global plastic waste problem. Continued research and innovation in this field could offer an environmentally friendly solution to managing plastic and polythene waste.

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Nature’s Tiny Superheroes: The Incredible Powers of Insects

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In the vast and diverse world of nature, some of the most extraordinary creatures are often the smallest. Insects, despite their seemingly simple appearance, have incredible abilities that can be compared to superheroes in comic books. From an ant's strength to a bee's navigational skills, these tiny marvels amaze and inspire. In this article, we'll look into the hidden lives of these miniature titans, discovering their incredible powers and the remarkable roles they play in the ecosystem.

Freeze-Resistant Cockroaches: The Super Survivors of New York

A new type of cockroach has made headlines in New York City. In 2013, an exterminator working on the High Line Park discovered a cockroach capable of surviving freezing temperatures and snow. Jessica Ware and Dominic Evangelista, insect biologists, identified this insect as the *Periplaneta japonica*, which originated in Japan. This species, unlike typical New York cockroaches, can survive in cold climates, setting it apart from its peers. While these cockroaches compete with local species, their incredible ability to withstand cold temperatures distinguishes them as true urban super survivors.

Killer Bees: Nature's Fierce Guardians

In 1956, Brazil attempted a bold plan to increase honey production by importing African bees and crossbreeding them with local bees. However, this experiment took an unexpected turn when 26 African bee queens and multiple swarms escaped. What followed was the birth of a new hybrid, known as the "killer bee."

These Africanized bees, blending the traits of African and European honeybees, began spreading rapidly through South and Central America, advancing 100 to 200 miles per year. By the time they reached the southern United States, they had earned a fearsome reputation. Unlike their European counterparts, killer bees are highly defensive and quick to attack. They can sting up to 10 times more frequently and chase perceived threats for up to a quarter of a mile.

The name "killer bee" is not just hyperbole. Their aggressive nature has led to approximately 1,000 human fatalities. Yet, their story is more than just one of fear; it is a tale of survival and adaptability. These bees have become formidable pollinators, playing a crucial role in the ecosystems they inhabit, demonstrating nature's resilience and the unexpected consequences of human endeavours.

Expensive Termites: The Billion-Dollar Pests

Every year, Formosan termites cause billions of dollars in damage in the southern United States. These tiny invaders, which originated in East Asia, have become notorious for their destructive abilities. Formosan termites, unlike other termites, form massive colonies of millions of individuals, and their foraging range extends from a single building to entire properties, including trees and adjacent structures.

Their impact is staggering, costing approximately $1 billion per year in property damage, repairs, and mitigation measures. This relentless destruction necessitates a multifaceted approach to combat. Pest control professionals in states such as Florida and Louisiana use chemicals, bait traps, and detailed studies of termite behavior to identify and exploit weaknesses. The bait traps contain slow-acting poison that termites bring back to their colonies, infecting others and providing a strategic defense against these formidable pests.

The story of Formosan termites highlights the significant financial and structural challenges posed by these persistent invaders, as well as ongoing efforts to protect properties from their voracious appetites.

Spider Superpowers: Webbing Stronger Than Steel

Imagine a material that is both strong and delicate, capable of being spun by tiny arachnids while outlasting steel. Spider silk is a natural wonder that is five times stronger than steel. Yes, those itsy-bitsy spiders weave webs made of one of the strongest materials found in nature. These tiny architects have incredible web-spinning abilities. Their intricate web designs, crafted from the strongest natural material, demonstrate their insect superpowers. Spiders use their silk to build super homes that can catch prey and support their weight without tearing or fraying. They're like miniature construction workers, spinning silk with the strength of steel cables.

Nature’s Master Illusionist: Sonic Abilities of the Tiger Moth

Prepare to be amazed by the Tiger Moth, an insect with supersonic abilities rivalling those of a superhero! This tiny creature has the incredible ability to jam bat signals, creating sonic illusions that fool these predators into seeing things that do not exist. It's as if the Tiger Moth has its magical abilities, casting illusions to trick its enemies.

Imagine a moth that confuses bats with sound waves, causing them to swing wildly in search of prey that does not exist. These sonic tricks keep the Tiger Moth safe while demonstrating its mastery of illusion and stealth. Despite its small size, this moth possesses extraordinary abilities, demonstrating that even the smallest insects can wield impressive superpowers.

The Tiger Moth's remarkable skills highlight insects' hidden talents and surprising abilities. So, the next time you see a moth, remember that it could be a tiny hero with superpowers, utilising nature's magic to stay one step ahead of its predators.

PROTECT NATURE SRI LANKA

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Everything we see is nature's gift.
God gave us this to heal and lift
Trees are our gems, tall and strong
Don't cut their stems, they don't belong

The ocean sings with cleaner tides.
We mend the world where life resides
From snowy peaks to desert sands
A planet thrives by nature's hand

Creatures all around us
That crawl or swim, or fly
Which one is your favourite
And can you tell me why?

The animals roam wild and free.
Until humans harm as much as they can
Let's keep them safe, their freedom bright
Show kindness, give them their right

Preserve the woods, the forest green
Protect the beauty, pure and serene
Don't waste the treasures that feed us all
Take care, respond to nature's call.

Camouflage in sea animals

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Camouflage is a defence mechanism or tactic that organisms use to disguise their appearance, usually to blend in with their surroundings. Camouflage helps organisms to mask their location, identity, and movement. It is also known as cryptic colouration.

A species' camouflage depends on several factors, such as physical characteristics and behaviours. Animals with different physical characteristics such as fur, scales, and feathers camouflage differently. When considering behaviour, animals that live in groups camouflage differently from those that are solitary.

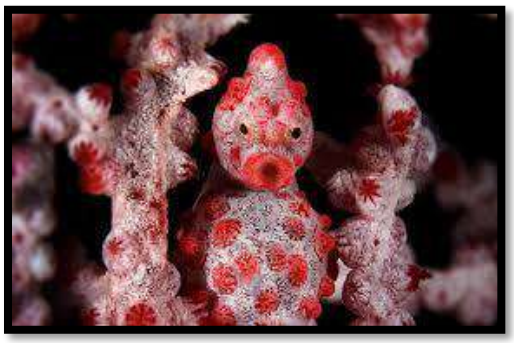
A species' camouflage is also influenced by the behaviour or characteristics of its predators. Animals use several camouflage tactics depending on their environmental and behavioural factors. Some of them are background matching and disruptive colouration. In background matching, a species conceals itself by resembling its surroundings in colouration, form, or movement. E.g., the camouflage of the walking stick and walking leaf insects. In disruptive colouration, the identity and location of a species may be disguised through a colour pattern. E.g., eyespot patterns in the upper parts of the wings of some butterflies. Some species use colouration tactics that highlight their identity rather than hiding it. This type of camouflage is called warning colouration or aposematism.

Warning colouration makes predators aware of the organism's toxic or dangerous characteristics. E.g. larva and adult stages of the monarch butterfly. Countershading is a form of camouflage in which the top of an animal's body is darker in colour, while its underside is lighter. E.g. Sharks

Animal species can camouflage themselves through two primary mechanisms: pigments and physical structures. Some species have natural, microscopic pigments, known as bio chromes, which absorb certain wavelengths of light and reflect others. It helps them to change their colour. Other species have microscopic physical structures that act like prisms, reflecting and scattering light to produce a colour that is different from their skin. Camouflage can change with the environment.

When considering ocean animals, many have the amazing ability to camouflage themselves to blend in with their surroundings. They show a great variety of diversity and various camouflage tactics to escape from predators and to catch prey by blending with the environment. Let's look at some examples.

Pygmy seahorses spend their entire adult lives living on a type of coral called sea fans. Calcium-rich bumps, known as tubercles, cover the seahorses' bodies and help them blend in with the sea fans' polyps. Two colour morphs exist in the wild: yellow seahorses with orange tubercles and purple seahorses peppered with pinkish-red tubercles that spend their days hanging around the similarly colored corals. The colouration of his imperial shrimp allows it to blend in perfectly on a Spanish dancer nudibranch. These shrimps are also known as cleaner shrimp because they eat algae, plankton and parasites off their nudibranch and sea cucumber hosts. The leaf scorpion fish has not only camouflaged external looks, but also their movements. It looks almost entirely like a leaf and can also act like one. It sways side-to-side gently as if in underwater currents, mimicking the movements of a dead leaf. Stonefish inhabit rocky coral in and around the Indo-Pacific. They very well resemble the surrounding coral and rocks. Stonefish is a very dangerous hide and seek player. Their venom is among the world's most toxic. Two other examples for the best camouflaged species are the giant frogfish and hairy frogfish. Once fully mature, these fish are formidable predators because they can blend exceptionally well into their surroundings. The giant frogfish often looks like coral and rock covered in algae, and the hairy frogfish closely resembles a fluffy ball of algae. Their superior camouflage helps them both hide and hunt at the same time, all without moving an inch.



Pygmy seahorses

Hairy frog fish

Cuttlefish and octopus are two other notable creatures in camouflage. They are cephalopods that can change shape, colour and texture to elude predators. They can also mimic their surroundings in an instant, blending in with algae, coral, rock or even sand, appearing almost invisible. This is done by the colour cells in their skin. The mimic octopus can mimic a variety of other sea creatures to trick, confuse and escape predators. On the other hand, animals inhabiting the open ocean often conceal themselves by being highly transparent, silvery fish is an example of an organism that reflects the downwardly directing sunlight by their mirror-like scales to disappear in the surrounding. This helps to protect them from predators.

Overall, these wonderful creatures in the ocean and the land, which show amazing camouflage tactics, not only help them in survival but also contribute to the diversity of the environment.

"Parasites as Immune System Modulators: Can Helminths Help Treat Autoimmune Diseases?"

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"Could parasitic worms hold the key to treating autoimmune diseases?" This question might be interesting and debatable, particularly in Parasitology and Immunology. Recent studies have suggested that certain parasitic worms may modulate the immune system. When studying parasites, we often consider them harmful organisms with their ability to cause devastating diseases. However, new findings challenge this theory, especially about immunological modulation. Exposure to parasitic helminths showed that it may be possible to restore balance to the immune response, reducing inflammation and preventing tissue damage. Helminths are parasitic worms that have coexisted with humans for thousands of years. One of the most interesting discoveries in the recent past is the possibility that parasitic helminths may provide therapeutic benefits for autoimmune diseases. These diseases, which include rheumatoid arthritis, multiple sclerosis, and Crohn's disease, are brought on by the immune system attacking the body's tissues inadvertently, causing chronic inflammation and damage. Over the last few decades, autoimmune disorders and allergies have become more common in Western countries, affecting 5–10% of the population. In these industrialised, developed countries, the burden of infections has also declined considerably. Nonetheless, there is a negative association between the rise in autoimmune disorders and the frequency of helminth infections in emerging nations. In recent years, scientists have explored that those helminths, which have evolved sophisticated mechanisms to manipulate their host's immune system for their survival, might hold the key to rebalancing overactive immune responses. This concept is named the "hygiene hypothesis," which suggests that the rise in autoimmune diseases in industrialised nations may be linked to reduced exposure to infectious agents like parasites. The "hygiene hypothesis" was first put forth by Strachan while monitoring almost 17,000 children born in 1958. He found an inverse relationship between hay fever and the number of elder siblings. By modifying the host immune system to their advantage and fostering host immunological tolerance, helminths can persist within their host. For instance, several epidemiological and immunogenetic pieces of evidence connect the rise in multiple

sclerosis (MS) in Sardinia and the elimination of malaria because of the human eradication campaign with a high genetic susceptibility of HLA DR3 within the island. Could the absence of these organisms, which once regulated our immune systems, contribute to the modern surge in autoimmune disorders? By investigating the methods by which helminths create regulatory T cells (Tregs) and other immune-regulating components, we can have a better understanding of their potential as novel, yet promising, therapeutic agents. Helminths aim to survive within the host. Their purpose is to live along with the host rather than to kill him. Therefore, the helminths delineate pathways to escape the human defense immune network and induce tolerance. Different helminths were proven to secrete molecules able to trigger tolerance in human hosts via diverse pathways. Helminth products were seen to act on T cells, B cells, and dendritic cells (DCs). The main mechanism by which helminth molecules modulate the immune system is by shifting T-helper-1 cells (Th1) to T helper-2 cells (Th2). In addition to the development of Tregs, the protective role of helminths is also driven by B-regulatory cells (Bregs). Bregs have a suppressive effect on the progression of immune-mediated diseases. Moreover, many helminth parasites are known to release biologically active excretory-secretory (ES) antigens that directly modulate host immune function. The immunomodulatory molecule was found to be a phosphorylcholine (PC) moiety presented by secreted proteoglycan. In most cases, helminths will induce tolerance, but in some scenarios, they may cause an inflammatory response. Innovative methods for treating autoimmune illnesses have been spurred by the intricate and flexible interaction between parasites and the human immune system. Helminths are being reevaluated as potential partners in the fight against inflammatory illnesses such as colitis and psoriasis after previously being considered primarily as detrimental invaders. Using helminths' ability to regulate immunity, scientists are discovering a wealth of biological chemicals that have the potential to transform the way we treat autoimmune diseases and provide hope to millions of people throughout the globe.

Wetlands and Waterbirds in Sri Lanka: Habitat Utilisation and Conservation Needs

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Abstract

Wetlands are critical ecosystems that support a high diversity of waterbirds. This study examines the habitat utilisation by waterbirds in Sri Lankan wetlands and identifies their conservation needs. Through field observations and literature review, we analyze the habitat preferences of various waterbird species, the threats they face, and propose conservation strategies. Our findings underscore the importance of wetlands for both resident and migratory waterbirds, highlighting the urgent need for comprehensive conservation efforts to mitigate habitat loss, pollution, climate change, and invasive species.

Keywords: Conservation, Wetlands, Waterbirds

Introduction

Wetlands are among the most productive ecosystems globally, providing essential ecological services such as water filtration, flood control, and carbon sequestration. In Sri Lanka, wetlands are crucial for maintaining biodiversity, particularly for waterbird species. These habitats offer feeding, breeding, and nesting grounds for a wide variety of waterbirds, both resident and migratory. Despite their importance, wetlands face significant threats from human activities and climate change, necessitating focused conservation efforts. This study aims to explore the habitat utilisation by waterbirds in Sri Lankan wetlands and identify their conservation needs to ensure the sustainability of these critical ecosystems.

Literature Review

Waterbirds rely heavily on wetlands for their survival. Wetlands in Sri Lanka host numerous waterbird species, including the Lesser Whistling Duck (*Dendrocygna javanica*), Painted Stork (*Mycteria leucocephala*), and the globally near-threatened Spot-billed Pelican (*Pelecanus philippensis*). Migratory species such as the Northern Pintail (*Anas acuta*) and Garganey (*Spatula*

querquedula) also depend on these habitats during their seasonal movements. Various studies have highlighted the importance of wetlands for waterbirds, emphasising the need for conservation. However, comprehensive data on habitat utilisation and specific conservation needs in Sri Lanka are limited (Ali and Ripley, 1987).[1]

Methodology

This study employed a mixed-method approach, combining field observations with a literature review. Field observations were conducted in selected wetlands across Sri Lanka, focusing on species diversity, habitat preferences, and seasonal variations. Data were collected on water depth, vegetation type, and food availability. Data were collected on water depth, vegetation type, and food availability. The literature review included peer-reviewed articles, government reports, and conservation organisation publications to identify threats to wetlands and existing conservation strategies.

Results

- Habitat Utilisation

Waterbirds exhibit a range of habitat preferences within wetlands, influenced by factors such as water depth, vegetation type, and food availability. Shallow wetlands with abundant aquatic vegetation are favoured by dabbling ducks and waders, while deeper waters attract diving birds and piscivores. For instance, the Purple Swamphen (*Porphyrio porphyrio*) is often found in reed beds and marshes, whereas the Black-headed Ibis (*Threskiornis melanocephalus*) prefers open mudflats and shallow waters.

- Threats to Wetlands

1. Habitat Loss and Degradation: Urbanisation and agricultural activities have led to significant wetland loss in Sri Lanka. The conversion of wetlands into rice paddies and other agricultural lands reduces the available habitat for waterbirds and disrupts ecological functions. Infrastructure development, such as road construction and drainage projects, can fragment

[1] Ali, S. & Ripley, S.D., 1987. Handbook of the Birds of India and Pakistan. Oxford University Press, pp. 112-115.

wetland habitats, making them less suitable for waterbird populations (Millennium Ecosystem Assessment, 2005).[2]

2. Pollution: Wetlands act as natural filters, trapping pollutants and sediment from entering freshwater systems. However, excessive pollution from pesticides, herbicides, and industrial effluents can degrade water quality, affecting the health and reproductive success of waterbirds. Nutrient enrichment from agricultural runoff can lead to eutrophication, causing algal blooms that deplete oxygen levels and harm aquatic life (Central Environmental Authority, 2006).[3]

3. Climate Change: Changes in precipitation patterns and rising temperatures pose significant threats to wetland ecosystems. Altered hydrological regimes can result in prolonged droughts or increased flooding, both of which can negatively impact waterbird habitats. (Ramsar Convention on Wetlands, 2018).[4]

4. Invasive Species: The introduction of invasive plant species, such as water hyacinth *(Eichhornia crassipes)* and salvinia *(Salvinia molesta),* can outcompete native vegetation, altering habitat structure and food availability for waterbirds. Invasive predators, such as rats and feral cats, can also pose a threat to ground-nesting waterbird species (Kottelat and Whitten, 1996).[5]

[2] Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Wetlands and Water. Synthesis. World Resources Institute, pp. 45-47.

[3] Central Environmental Authority (CEA), 2006. National Wetland Directory of Sri Lanka. Ministry of Environment and Natural Resources, Sri Lanka, pp. 22-24.

[4] Ramsar Convention on Wetlands, 2018. Global Wetland Outlook: State of the World's Wetlands and their Services to People. Ramsar Convention Secretariat, pp. 36-39.

[5] Kottelat, M. & Whitten, A.J., 1996. Freshwater Biodiversity in Asia, with Special Reference to Fish. World Bank Technical Paper No. 343, pp. 76-79.

Discussion

- Conservation Strategies

To address these challenges, a multifaceted approach to wetland conservation is essential. Effective strategies should include habitat restoration, pollution control, climate adaptation measures, and community engagement.

1. Habitat Restoration: Restoring degraded wetlands can enhance their capacity to support waterbird populations. Efforts should focus on re-establishing natural hydrological regimes, removing invasive species, and replanting native vegetation. Restoration projects should be guided by ecological principles to ensure the long-term sustainability of wetland ecosystems (Wijesundara and Senaratna Sellamuttu, 2014).[6]

2. Pollution Control: Implementing best management practices for agriculture and industry can reduce the input of pollutants into wetland systems. Constructed wetlands can be used as natural treatment systems to filter and purify runoff before it enters natural water bodies. Raising awareness among farmers and industrial operators about the impacts of pollution on wetlands and waterbirds is also crucial (Millennium Ecosystem Assessment, 2005).[7]

3. Climate Adaptation: Enhancing the resilience of wetlands to climate change involves protecting and expanding existing wetlands, creating buffer zones, and restoring degraded areas. Monitoring and research are essential to understand the impacts of climate change on wetland ecosystems and to develop adaptive management strategies. Wetland conservation should be integrated into broader climate change mitigation and adaptation plans at national and regional levels (Ramsar Convention on Wetlands, 2018).[8]

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[6] Wijesundara, C. & Senaratna Sellamuttu, S., 2014. The Ramsar Convention in Sri Lanka: 25 Years of Wetland Conservation and Wise Use. IUCN, Sri Lanka, pp. 14-16.

[7] Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Wetlands and Water. Synthesis. World Resources Institute, pp. 51-54.

[8] Ramsar Convention on Wetlands, 2018. Global Wetland Outlook: State of the World's Wetlands and their Services to People. Ramsar Convention Secretariat, pp. 44-46.

4. Community Engagement: Involving local communities in wetland conservation efforts is vital for their success. Community-based conservation programs can empower local stakeholders to take an active role in protecting and managing wetlands. Education and awareness campaigns can highlight the importance of wetlands and the services they provide, fostering a sense of stewardship among community members (Wijesundara and Senaratna Sellamuttu, 2014).[9]

5. Policy and Legislation: Strengthening and enforcing environmental regulations can provide a legal framework for wetland protection. Policies should promote sustainable land use practices and restrict activities that harm wetland ecosystems. International cooperation and agreements, such as the Ramsar Convention on Wetlands, can support national efforts by providing guidance and resources for wetland conservation (Ramsar Convention on Wetlands, 2018).[10]

Conclusion

Wetlands are indispensable for the survival of waterbirds in Sri Lanka, offering essential resources for feeding, breeding, and roosting. However, these habitats face significant threats from human activities and climate change, necessitating comprehensive conservation efforts. By implementing effective habitat restoration, pollution control, climate adaptation, and community engagement strategies, it is possible to safeguard wetlands and ensure the continued survival of waterbird populations. Protecting these vital ecosystems is not only crucial for biodiversity conservation but also for the well-being of human communities that depend on the ecological services provided by healthy wetlands

[9] Wijesundara, C. & Senaratna Sellamuttu, S., 2014. The Ramsar Convention in Sri Lanka: 25 Years of Wetland Conservation and Wise Use. IUCN, Sri Lanka, pp. 19-21.

[10] Ramsar Convention on Wetlands, 2018. Global Wetland Outlook: State of the World's Wetlands and their Services to People. Ramsar Convention Secretariat, pp. 52-55.

Nocturnal Secrets: Exploring Slender Loris: a review

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Sri Lanka, an island rich in its biodiversity, harbours a unique array of flora and fauna. Among its wildlife, the Slender Loris stands out as a fascinating species to study due to its distinguishing characteristics and the crucial role in the island's biodiversity.

The Slender Loris is a native and small primate. Larger reflective eyes for darkness are a major characteristic of these elusive inhabitants. They have a small, long, slender body and short, round-shaped skulls. The Slender Loris has short and sharp claws. Commonly, they have brown fur and small ears. The Slender Loris's tail is absent. Furthermore, their long and slender limbs, including thin arms and legs are distinctive. Moreover, they have a wet nose for an acute sense of smell.

Distribution

Slender Lorises are majorly distributed in Sri Lanka and parts of southern India. But Red Slender Loris (*Loris tardigradus tardigradus*) is endemic to Sri Lanka.

Reproduction

Female Slender lorises reach sexual maturity in 10-18 months, depending on the environmental conditions. At the beginning of the reproduction season, male species move to the female species habitat. Typically, their copulation period lasts 2-16 minutes. The gestation period for female slender lorises is usually 163-175 days (about 5 and a half months). Females give birth to single offspring or twins. Newborns are entirely furless, and their eyes are partially opened. The mother carries the small infants less frequently when the infants are 2-3 months old. during this period, the mother will park the babies and go to feed. At dawn, babies make a 'zic' call as a form of vocal communication with their mother, and when the mother approaches, the babies climb onto the mother's belly.

Food Habitat

Slender lories are mostly carnivores. They feed on eggs of small birds, small vertebrates, plant materials, tree flowers, leaves and fruits. Additionally, they consume small insects such as moths, sticks, grasshoppers, cockroaches, dragonflies, and beetles.

Social behavior

Slender lories are nocturnal animals. During the daytime, they sleep in hollow trees. These inhabitants sleep alone or sleep in small groups. They are adapted to an arboreal lifestyle. Male species will not tolerate other males in their territory. When Loris faces a life threat, it freezes and becomes motionless to avoid danger. Sometimes they release an unpleasant odour from their scent glands located under their arms. Slender Lorises regularly communicate via scent marking and loud noises.

Threats

Slender Loris species have been facing threats such as deforestation due to human activities, habitat loss, habitat degradation, invasive species, and being hunted for medicine. According to the Ecological Niche Modeling studies have revealed that only 25% of the remaining habitats in Sri Lanka are suitable for *Loris* species.

Conservation

The Slender Loris Conservation Project (SLCP) and the Department of Wildlife Conservation (DWC) have started a pilot montane reservation program in Hakgala to conserve the highland Loris species in Sri Lanka. Additionally, awareness workshops for locals and government officials, protection of existing habitats, reduction of firewood extractions, and monitoring of these species' activities have been conducted throughout the island.

Slender Loris species in Sri Lanka

1. Red Slender Loris (*Loris tardigradus tardigradus*)

Red Slender Loris (https://www.srilankansafari.com/primates_srilankan_redslender.php)

Order	- Primates
Family	- Lorisidae
Genus	- *Loris*
Species	- *tardigradus*
Sub species	- *tardigradus*

The Red Slender Loris is the smallest species in this family. Their body length is less than 205mm. They are generally woody russets in colour. The ventral hair is yellowish white with dark grey. Their hands and feet are pink or yellowish pink in colour. They have small ears with large eyes. Red Slender Loris is endemic to Sri Lanka.

Distribution

Red Slender Loris is primarily distributed in wet lowland rainforests. They can be found at an average altitude of about 470m.

Conservation status

According to the IUCN Red List, the Red Slender Loris is considered an Endangered species in Sri Lanka. These inhabitants face severe habitat fragmentation. They are listed as one of the five most concerning species in Sri Lanka.

2. Montane Slender Loris (*Loris lydekkerianus (tardigradus) nycticeboides*)

Montane Slender Loris

Order	**- Primates**
Family	**- Lorisidae**
Genus	**- *Loris***
Species	**- lydekkerianus (*tardigradus)***
Sub species	**- *nycticeboides***

The Montane Slender Loris is a subspecies of the Loris family. These inhabitants are brown in color. Their throats are light buff in colour, and they have a dark crown. Furthermore, their bellies are yellowish cream, and ears have grey, brown fur. No dorsal strips can be found in these species. The Montane Slender Loris has shortened hind limbs and a large skull (52.3mm in length). Moreover, they have long, thick, soft fur and thickly furred limbs.

Distribution

The montane slender Loris can only be found in montane evergreen forests such as Horton Plains in Sri Lanka. Their habitat is distributed at an average altitude of 1600-2100 m.

Conservation Status

According to the IUCN Red List, these species are critically endangered.

3. Grey Slender Loris (*Loris lydekkerianus grandis*)

Order	- Primates
Family	- Lorisidae
Genus	- *Loris*
Species	- *lydekkerianus*
Sub species	- *grandis*

Grey Slender Loris (Source- https://www.adventurebirding.lk/grey-slender-loris-loris-lydekkerianus/)

Grey Slender Lorises are a subspecies of the Loris family. They are also known as highland Slender Loris. The Grey Slender Loris is dark grey or grey-brown in colour. They have no dark hair bases in their ventral hair. Moreover, their throats are pure white, and their cheeks are white. They are usually of medium size, with a body length is about 209-256mm and weight is about 220g. Grey Slender Lorises are an uncommon species.

Distribution

These species are mainly distributed in moist monsoon forests, wet lowland forests and sub montane forests. They can be found at an average altitude of 900m.

Conservation status

According to the IUCN Red List, these inhabitants are considered endangered species.

4.Northern Slender Loris (*Loris lydekkerianus nordicus)*

Order	**- Primates**
Family	**- Lorisidae**
Genus	**- *Loris***
Species	**- *lydekkerianus***
Sub species	**- *nordicus***

Northern Slender Loris; location- Wilpattu National Park

Northern Slender Loris is also a subspecies. They are grey-brown, grey or buff brown in colour with white or light buff accents. They have dark dorsal strips that meet at a dark crown. Their throats are creamy buff with no grey hair, and their cheeks are white or light grey. The ears of the Northern Slender Loris are large compared to their black- or yellow-colored eyes. Their body length is about 215-238mm. These are not very active species.

Distribution

Northern Slender Loris are primarily distributed in arid monsoon forests, dry monsoon forests and moist monsoon forests.

Conservation Status

According to the IUCN Red List, these species are considered endangered species.

Impact of Urbanisation on Natural Habitats in Sri Lanka

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Urbanisation, the process by which rural areas transform into urban areas, is driven by population growth, economic development, and the pursuit of modern lifestyles. In Sri Lanka, this transformation has been particularly pronounced in recent decades, bringing with it significant environmental challenges. One of the most pressing issues associated with urbanisation is its impact on natural habitats, which has profound implications for biodiversity, ecosystem services, and the overall health of the environment.

Loss of Biodiversity

Being home to a wide range of flora and wildlife, many of which are native to the island, Sri Lanka is well known for its abundant biodiversity. These natural habitats are being threatened by the fast urbanisation process. There is a loss and fragmentation of habitat when woods, wetlands, and other natural regions are transformed into urban areas. Relegated to smaller, isolated regions, species that historically flourished in vast, continuous environments are more susceptible to extinction due to their reduced genetic variety.

For example, several endemic species are found in the Western Ghats-Sri Lanka biodiversity hotspot. These vital habitats have been intruded upon by the growth of towns such as Galle, Kandy, and Colombo. Due to the destruction or fragmentation of their habitats by urban extension, several amphibian and bird species are at increased risk. Furthermore, the threat to native animals is increased by the introduction of exotic species, which is frequently made easier by urban expansion.

Ecosystem Services Disruption

Natural habitats provide essential ecosystem services that support human well-being, including water purification, air quality regulation, climate regulation, and soil fertility. Urbanisation disrupts these services, leading to a cascade of environmental problems. For example, forests play a crucial

role in regulating the climate by sequestering carbon dioxide. When forests are cleared for urban development, not only is this carbon sequestration capacity lost, but the carbon stored in trees is also released back into the atmosphere, contributing to climate change.

Wetlands like Muthurajawela, Kumana, Bundala in Sri Lanka, offer services such as flood control, water filtration, and habitat for numerous species. The conversion of wetlands into urban land reduces their ability to absorb floodwaters, resulting in increased flood risk and water pollution. In Colombo, the rapid urban expansion has led to the destruction of wetland areas, exacerbating flooding during the monsoon season and affecting the city's water quality.

Soil and Water Degradation

Urbanisation also leads to soil degradation through erosion, compaction, and contamination. Natural vegetation, which protects and enriches the soil, is often removed to make way for buildings and infrastructure. This loss of vegetation cover increases soil erosion, particularly on slopes and in areas with heavy rainfall. Additionally, the construction process itself can lead to soil compaction, reducing its ability to absorb water and support plant life.

Urbanisation has a comparable effect on water supplies. Because of the growing demand for water in metropolitan areas, groundwater is frequently over-extracted, which depletes it and causes saltwater intrusion in coastal areas. The natural hydrology is also altered by the construction of impermeable surfaces like buildings and roads, which increase surface runoff and decrease the groundwater recharge. This runoff, which is frequently polluted, ruins aquatic ecosystems and endangers people's health by contaminating rivers, lakes, and coastal waterways.

Air Pollution and Urban Heat Islands

Urbanisation contributes to air pollution through the increased emission of pollutants from vehicles, industrial activities, and construction. In cities like Colombo, air quality has deteriorated significantly, posing a threat to both human health and the environment. Pollutants such as particulate matter, nitrogen oxides, and sulfur dioxide can have detrimental effects on plants and animals, reducing biodiversity and disrupting ecosystems.

The phenomenon of urban heat islands, where urban areas experience higher temperatures than their rural surroundings, is another consequence of urbanization. The replacement of natural vegetation with concrete and asphalt surfaces increases the absorption and retention of heat, raising temperatures in urban areas. This not only affects human comfort and energy consumption but also alters local climates and disrupts the natural behaviours of wildlife.

Strategies for Mitigation and Conservation

Planning, policy, and community involvement are all necessary components of a multifaceted strategy to address the effects of urbanisation on natural ecosystems. Integrating green infrastructure into urban planning is one practical tactic. To protect biodiversity and ecosystem services, this involves establishing and maintaining parks, green roofs, urban forests, and wetlands inside city limits. Sustainable land-use techniques can assist in striking a balance between the demands of environmental preservation and development.

Furthermore, enforcing strict environmental regulations and conducting thorough environmental impact assessments for new developments can mitigate the adverse effects of urbanisation. Promoting sustainable transportation options, such as public transit, cycling, and walking, can reduce air pollution and traffic congestion. Engaging communities in conservation efforts through education and awareness programs is also crucial for fostering a culture of environmental stewardship.

In conclusion, the effects of urbanisation on natural habitats is a complicated and urgent problem. Urban development must be pursued in a way that respects and preserves the natural environment, even though it is necessary for economic growth and raising living standards. Through the adoption of sustainable practices, the implementation of green infrastructure, and the proactive pursuit of conservation initiatives, Sri Lanka may effectively address the adverse effects of urbanisation while simultaneously safeguarding its abundant biodiversity and essential ecosystems for the benefit of future generations.

Quirky Friendships in Nature

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Imagine a tiny frog resting close to a massive tarantula. In any other story, this would be a nightmare. However, in nature, it is quite the contrary. Can you guess what their relationship is? That is among many bizarre alliances in nature, which I plan to write about in this article.Back when I was in my second year as an undergraduate, we had to do a presentation for our English course. We had the privilege of picking any topic we wanted, and I thought of exploring mutualism in nature. That opened the door for me to learn about these unlikely partnerships fostered by our Mother Nature.

We know that species have different relationships with other species, which is called symbiosis. **Mutualism** is a symbiotic relationship where both species involved benefit from interaction. Their gain might be food, protection, transportation, or other essential resources.

If you have arachnophobia, you might not find this cute. Tarantulas keep small frogs as pets. These tiny amphibians, often referred to as "microhylid frogs," have a symbiotic relationship with their eight-legged hosts. The frog's foraging helps protect the tarantula's eggs from ants and other small predators that might harm them. In return, the tarantula protects the frog from larger predators, creating a safe home for it to live and thrive. This unusual partnership showcases how even the most seemingly unlikely creatures can find ways to benefit from each other's company.

The most obvious example is the relationship between bees and flowers. While bees collect nectar from flowers to make honey and feed their colonies, flowers receive pollination services from the bees. This exchange allows flowers to reproduce and spread their genetic material, ensuring the continuation of their species.

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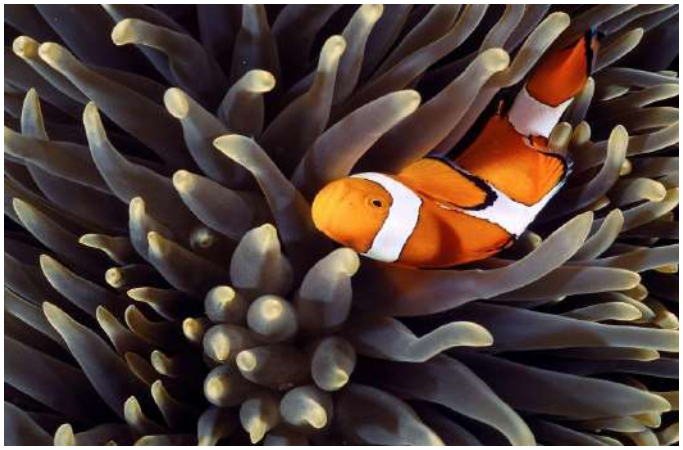
Another friendship showcased by Disney in *Finding Nemo* is the unique bond between clownfish and sea anemones. The anemones protect clownfish with their stinging tentacles, shielding them from larger predatory fish. On the other hand, clownfish bring food to the sea anemone through their waste, which provides the essential nutrients that it needs. Clownfish also help lure other fish towards the anemone, which the anemone can then capture and consume. This mutualistic relationship benefits both species, enhancing their chances of survival in the competitive ocean environment.



Next is the relationship between the goby fish and the pistol shrimp. They live together in the same burrow. Goby fish have excellent eyesight, which enables them to be highly alert to potential dangers. As they watch for predators, they communicate with the shrimp through tail movements, warning them of any approaching threats. The shrimp, with its powerful claws, excavates and maintains the burrow, providing a safe and comfortable home for both. This teamwork ensures that they both stay protected and can continue to thrive in their shared environment.

Moving on, one of my favourites is the relationship between humans and honeyguides. Honeyguides are a type of bird with a keen sense of smell and a remarkable ability to locate beehives. They guide humans to these hives, flitting from tree to tree and calling out to attract attention (hence the name, honeyguides). Once humans use their skills and tools to harvest the honey, the honeyguides benefit by feasting on the beeswax and larvae left behind, making this an extraordinary example of cooperation between humans and wildlife.

Furthermore, there are relationships based on cleaning, where one species provides cleaning services, and the other receives food in return. Some fascinating examples include crocodiles and Egyptian plover birds, where the birds pick food from the crocodiles' teeth; oxpeckers and mammals (such as impala, zebra, giraffe and buffalo), where the birds feed on ticks and other pests from the mammal's coat; shrimp and eels, where the shrimp clean the eels' skin by removing parasites and dead skin; sea turtles and yellow tangs, where the fish eat algae and parasites off the turtles' shells; and turtles and butterflies, where butterflies feed on the tortoises' tears, removing excess salt and moisture.

These mutualistic relationships remind us about how these connections provide sustenance to our home planet. It is truly amazing how Nature can cultivate such relationships for survival and success. Understanding these partnerships is crucial when it comes to preserving the balance of the ecosystems worldwide.

Next time you see a flower, a fish, or even a bird, remember that there is much more to them than we know. I hope this article has inspired you to foster a deeper love, respect, and commitment to protecting our environment.

Pathways of Life: The Vital Importance of Wildlife Corridors in Sri Lanka

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Habitat fragmentation is a major threat to Sri Lanka's environment and wildlife. This happens when large areas of habitat are broken into smaller patches due to human activities like urbanisation and deforestation. This isolation reduces biodiversity and disrupts essential ecosystem processes. Wildlife corridors have emerged as a crucial solution to connect these fragmented landscapes, allowing species to move freely and promoting genetic diversity.

Wildlife corridors are essential connections across fragmented landscapes, enabling species to move between habitat patches. These corridors vary in size, from small areas along creeks to large-scale corridors spanning tens or hundreds of kilometers. Regardless of their size, these corridors are strategic conservation efforts designed to protect biodiversity.

In Sri Lanka, wildlife corridors are particularly important. The Department of Wildlife Conservation has declared two jungle corridors: Kavuulla – Minneriya and Nelugala. The Minneriya wildlife corridor, the only one currently implemented, helps mitigate human-elephant conflict caused by the high elephant population. It connects Minneriya National Park with Kaudulla and Wasgamuwa National Parks, allowing elephants to migrate between the parks.

During the dry season in August and September, many elephants migrate to Minneriya National Park because its larger tank can support more elephants. During the rainy season, elephants return to the other parks to avoid overcrowding. This seasonal migration reduces the risk of elephants entering nearby villages and farms in search of food and water, thus mitigating human-elephant conflicts.

Another crucial corridor is the Dahaiyagala Wildlife Sanctuary in Uva province. This sanctuary links several wilderness areas and serves as an important corridor for elephants. However, recent land grabs threaten this vital lifeline. The elephant population of Udawalawe, Sri Lanka's second-most visited national park, relies on this corridor for seasonal migration. Blocking the corridor could increase human-elephant conflict and create socio-economic problems for local communities dependent on nature-based tourism.

Dahaiyagala, a 2,685-hectare forest, lies between Udawalawe National Park and Bogahapattiya, a proposed forest reserve. This area serves as a refuge during droughts, making it essential for wildlife. Sri Lankan law restricts human activities in wildlife sanctuaries, but the threat of encroachment from nearby communities remains.

The Dahaiyagala corridor is not large enough to sustain resident elephants, but is crucial for their seasonal migration. Blocking this corridor could have devastating effects, including increased human-elephant conflicts and the loss of iconic elephants that attract tourists.

The Corridors for Conservation (CC) initiative by the Wilderness & Wildlife Conservation Trust (WWCT) emphasises the importance of wildlife corridors in Sri Lanka. The deaths of ten leopards in the southern Central Highlands highlighted the need to understand leopard movement in tea-dominated landscapes. Research led to the identification of leopard-centric conservation corridors in the Central Highlands.

Remote cameras showed leopards using tea plantations to move and access forest patches. This data informed the selection of these corridors, highlighting the need to protect remnant forest lands. These corridors are upland linear ridge lands with remnants of montane forests. Wildlife, including leopards, have adapted to these highlands over the centuries.

In collaboration with the Lanka Environment Fund, the WWCT's project in the Central Highlands aimed to establish vital forest corridors. The project focused on ensuring the viability of the leopard population, using them as ecological umbrellas. The project identified the Western Ridge and Elbedda Forest Corridors, detecting 57 leopards. Insights from 76 leopard scat samples emphasised the importance of preserving wild prey, with top prey species including the Black-naped Hare, Barking Deer, and Macaque Monkeys.

Conserving wildlife corridors not only helps threatened populations but also addresses the livelihood concerns of people living nearby. Linear infrastructures like roads and railways impact wildlife movement, leading to roadkill and collisions. Marine wildlife corridors also need attention, as species like sea turtles, whales, and dolphins are disturbed by fishing and commercial activities. BirdLife International has mapped flyways used by migratory birds that also act as corridors.

Satellite imagery and GIS modeling are essential tools for observing wildlife and identifying corridors. These technologies help in the identification and conservation of critical pathways.

In conclusion, wildlife corridors are crucial for preserving biodiversity and ensuring the long-term survival of many species in Sri Lanka. These corridors allow for movement, breeding, and feeding across landscapes, maintaining genetic diversity and building resilience to environmental changes and diseases. As human activities continue to fragment habitats, the role of wildlife corridors becomes increasingly vital. By safeguarding these pathways, we can mitigate human-wildlife conflicts, protect iconic species, and ensure sustainable ecosystems for future generations.

Nature's Lanterns: The Enchanting Science of Firefly Light

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The firefly is a type of beetle that has luminescent behaviour. It is nocturnal and thrives in damp, warm environments. Fireflies are a group of the Coleoptera order and the Lampyridae family. They are renowned for their enchanting bioluminescence, the ability to produce light. Fireflies use bioluminescence primarily for communication, especially during mating season. Each species has its unique light pattern, allowing males and females to identify and locate each other. This light show is more than just a beautiful display; it's a critical part of their reproductive strategy.

Biochemical Mechanisms of Bioluminescence:

At the heart of the firefly's glow is a sophisticated biochemical process. They produce light through a process called bioluminescence. Bioluminescence is the production and emission of light by living organisms. In fireflies, this light is created through a chemical reaction that involves a molecule called luciferin and an enzyme called luciferase. Luciferin is a light-emitting pigment that undergoes oxidation in the presence of oxygen, producing light. Luciferase is an enzyme that catalyses luciferin's oxidation. It facilitates the chemical reaction

that leads to light production. The light is typically greenish-yellow. This process is highly efficient, with almost all the energy produced during the chemical reaction emitted as light.

Fireflies can turn their lights on and off in rapid succession. This ability is essential for their communication and mating rituals. The control mechanism lies in the regulation of oxygen supply to the light-emitting organs, known as lanterns, located in their abdomen and controls the flow of oxygen to their lanterns using a complex system of tracheal tubes. By opening and closing valves called spiracles, they can regulate the amount of oxygen that reaches the light-producing cells. When the spiracles open, oxygen flows into the lantern cells, triggering the chemical reaction and producing light. When the spiracles close, the oxygen supply is cut off, and the light goes out. The process is also under neural control.

Functions of Bioluminescence:

Fireflies appear to light up for a variety of reasons. The primary function of firefly bioluminescence is to attract mates. Each species of firefly has a unique flashing pattern, which males use to signal to females of the same species. Female fireflies are often perched in vegetation and respond to the males' flashes with their light signals, facilitating mate location and selection.

The light can also serve as a warning signal to potential predators. The bright flash of light is thought to be a defence mechanism which protects from predators. Beyond mating and deterrence, fireflies use their light to communicate with each other.

There are some real-world examples of how firefly bioluminescence is used:

In environmental monitoring, firefly bioluminescence has been harnessed to develop biosensors for detecting pollutants in water. These biosensors use the luciferase enzyme from fireflies to emit light in the presence of specific contaminants, providing a quick and effective way to monitor water quality.

In medical imaging, firefly bioluminescence is used to create imaging tools for detecting diseases like cancer by attaching the luciferase enzyme to antibodies that target cancer cells, Researchers can visualise tumours in living organisms, aiding in the diagnosis and study of cancer.

The food industry uses firefly bioluminescence to detect bacterial contamination in food products. The luciferase enzyme reacts with ATP (adenosine triphosphate) present in bacteria, producing light that indicates the presence of harmful microorganisms.

In public health, firefly bioluminescence has also been used to develop rapid diagnostic tests for infectious diseases. These tests can detect the presence of pathogens in patient samples, providing quick and accurate results for disease management. These examples highlight the diverse and impactful applications of firefly bioluminescence in various fields.

In conclusion, fireflies' bioluminescence is a captivating example of nature's brilliance. Their ability to emit light through a complex chemical reaction, involving luciferin, luciferase, and ATP, showcases a sophisticated adaptation for communication and defence. Beyond its beauty, studying firefly luminescence offers insights into biochemistry, ecology, and potential applications in fields such as medical diagnostics and genetic research. Understanding these tiny creatures illuminates not just the night sky, but also our understanding of the natural world's ingenuity.

Drawing By Safrina Saleem

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Elephants and Empathy: A Review of Cognitive and Social Insights

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The topic of whether animals are capable of empathy has long piqued the interest of scientists. It has long been believed that empathy, which is broadly defined as the capacity to comprehend and experience another person's feelings, is exclusive to humans, or at the very least, higher primates. Recent research on animal behaviour, especially in gregarious, large-brained species like elephants, indicates that empathy might be more common than previously thought. This review explores the research by Bates et al. (2008), which looks into whether African savannah elephants show signs of empathy by providing consolation, safety, and even assistance to their friends who are in need.

Elephants are known for their complex social structures, which are dominated by matriarchal hierarchies and strong familial bonds. Female elephants remain with their family group throughout their lives, and behaviours such as "allomothering" (where females care for another's offspring) are commonplace. These behaviours suggest a level of social awareness and cooperative care that is essential for the survival of calves. Given these dynamics, Bates et al. hypothesise that elephants are likely candidates for demonstrating empathy behaviours.

In discussing elephant empathy, it’s essential to differentiate between various levels of empathy. Bates et al. (2008) use a tiered approach to empathy, beginning with simple emotional contagion (such as mimicking yawns), and advancing to more complex behaviours like consoling others or even engaging in "targeted helping," where one animal assists another in distress. Chimpanzees, another highly social species, have demonstrated such behaviours, leading researchers to classify them as capable of at least basic forms of empathy. The question, then, is whether elephants, with their sophisticated social structures, are similarly capable of not only recognising but responding to the emotional and physical needs of others in their group.

Evidence of Empathy in Elephants: Observational Data

Over a 35-year study of African savannah elephants in Amboseli National Park, Kenya, the researchers recorded 249 instances of behaviours that might indicate empathy. The study relied on observational data collected over this extended period, focusing on interactions between elephants that suggested an understanding of others' emotional and physical states. Some of the behaviours documented include:

1.) Coalition Formation: Elephants often form coalitions in aggressive or hazardous situations, working together to protect or confront others. The decision of an elephant to join a coalition suggests an awareness of both the danger to others and the need for coordinated action to mitigate that threat.

2.) Protection: A significant number of reports involve adult elephants protecting calves or injured adults from harm, often before the individual in danger has exhibited any overt signs of distress. These "preemptive" actions suggest that protecting elephants can anticipate potential danger and act to prevent it.

3.) Comforting: The researchers also observed numerous instances where adult elephants offered comfort to distressed calves by touching them with their trunks or allowing them to suckle for comfort, even when the adult was not the calf's mother.

4.) Helping Mobility: In several cases, elephants assisted calves or injured individuals who had become stuck in the mud or were unable to rise after falling. This helping behaviour suggests an understanding of the physical limitations of others, a key element of empathy.

5.) Removing Foreign Objects: The study documented instances where elephants removed foreign objects, such as spears or veterinary darts, from other elephants' bodies, demonstrating an understanding that these objects were harmful and needed to be removed.

Cognitive Mechanisms Underlying Empathy

Bates et al. (2008) argue that these behaviours go beyond simple conditioned responses or survival strategies. Instead, they propose that elephants are capable of more complex cognitive processes, including the recognition of animacy (the ability to identify living beings), goal-directedness (understanding that certain behaviours have specific outcomes), and even emotional awareness (recognising that others have emotions different from one's own). For example, when an elephant assists a calf stuck in the mud by pushing or pulling it free, the

helper must recognise that the calf is alive, that it wants to escape the mud, and that it cannot do so on its own. This level of understanding requires more than just responding to distress signals; it implies an ability to predict another's goals and intentions.

Empathy vs. Conditioning: A Debate

One of the critical debates in the field of animal cognition is whether behaviours that appear empathic can instead be explained by simpler mechanisms, such as classical or instrumental conditioning. In other words, are elephants truly understanding the needs and emotions of others, or are they merely responding to learned cues that certain behaviours, such as comforting a distressed calf, are rewarded in some way? Bates et al. acknowledge this challenge but argue that the complexity and variety of behaviours observed in elephants go beyond what would be expected from simple conditioning. In many cases, the elephants are not acting in their self-interest or responding to a direct reward but are instead behaving in ways that benefit others in the group, often at some cost to themselves.

Comparison with Other Species

In the discussion of empathy, elephants are often compared to primates, particularly chimpanzees, which have been shown to display empathy in a variety of contexts. However, Bates et al. suggest that elephants may exhibit even more sophisticated forms of empathy than many primates. For example, while chimpanzees often console others after conflicts, elephants appear to anticipate the needs of others, stepping in to offer protection or comfort before distress has even been expressed. In contrast to species like chimpanzees, where social interactions are often driven by complex hierarchies and competition for resources, elephants' social interactions are more cooperative and supportive, especially among females and calves. This difference may explain why empathy is more readily observed in elephant societies.

The Evolution of Empathy

The study by Bates et al. (2008) raises intriguing questions about the evolution of empathy in animals. Why would a species like the elephant, which diverged from humans more than 100 million years ago, develop such complex social behaviours and emotional awareness? One possibility is that empathy is an adaptive trait in species that rely heavily on social bonds for survival. In elephants, individuals live in tightly knit family groups and cooperate for a clear

evolutionary advantage. Empathy facilitates cooperation, strengthens social bonds, and enhances the survival of both individuals and the group as a whole.

Conclusion

Elephants do exhibit empathy, according to the data provided by Bates et al.(2008), especially when interacting with young calves and injured group members. Although further investigation is necessary to completely comprehend the cognitive processes underpinning these actions, the results provide strong proof that empathy is not limited to humans or primates but could also exist in other large-brained, socially sophisticated animals, such as elephants. Elephant empathy may provide insights into the evolution of empathy across species, including our own, as research in this area progresses and illuminates the inner lives of these amazing animals.

Hands for Paws

Animal Rescues

Written By – Pyara Athukorala (S/19/017)

My journey with rescues began unexpectedly, with a lone dog at the Nadan hostel. It was around 2 AM when I first saw him. At first, I was terrified, thinking someone was lurking in the shadows to attack me. But when I looked back, I saw a dog with an uncanny resemblance to a wolf.

Shaken, I called my friend Himashie, who came to investigate what was outside our room. We stared at a skinny figure with a broken leg. He came out of the shadows and looked at us pleadingly. We decided to call him Ash because of his grey fur.

That night, all we had to offer him was bread. He devoured it all like he hadn't eaten in days. From that moment, Ash became a regular visitor, who came looking for us.

Not everyone in the hostel shared our affection for Ash. Many were afraid of him and thought he was a crazy dog. When he begged for food, most people ignored him. But my friend and I couldn't ignore his plight. We never stopped feeding him knowing he is just another soul in need of kindness.

Then, one day, Ash went missing. We thought something terrible had happened to him. Our worry turned to relief when we learned that a veterinary student named Nelumi had taken him to the University vet hospital for treatment. When we visited Ash at the hospital, he recognized us immediately. The vet students were taking good care of him, providing vitamins and medicines he desperately needed. These students called him Trextor.

With care and treatment, Ash became much healthier and more energetic. Seeing this transformation, my friend and I decided to find him a home. After a long search, we were overjoyed when a kind family adopted him. Today, he's leading a happy life instead of roaming the streets without love.

Inspired by Ash's story, my friend and I have been rescuing animals around the university premises, Kandy, and especially in our hometown, Galle.

Trextor (Ash)

Another unforgettable rescue was of a puppy we saw in Haragama. While walking to a friend's house, we saw something that looked like a coconut shell. When we got closer, we saw to our horror, a small, injured puppy. The poor thing's wound was infested with maggots, and crows were pecking at her.

We couldn't leave her there. We took him to our friend's house. Fortunately, my friend's mom and uncle stepped in to help us rescue her. We named her Minnie because of her tiny size. We took Minnie to the vet. She was extremely weak, refusing to drink milk or take medicine. Even though we had university exams during this time, we refused to give up on her and somehow managed to take care of her. Happily, Minnie recovered, and we were able to find her a good home.

Minnie Before & After.

We have managed to not only rescue dogs but cats too. One day, a batch mate told us about a cat in Wijewardhana hostel with a severely injured mouth.

The cat had been in an accident and was very weak. It couldn't eat because its upper jaw was broken. Determined to help, we placed him in a basket and took him to the veterinary hospital. It wasn't easy, but we managed to help it recover.

Another memorable rescue involved Garfield, a well grown cat who had a severe wound from a monkey attack. With the help of friends from our Sanghamitta hostel, we rescued him and provided the care he needed.

There have been many times I wished I was a vet. Even though I'm not, I've been fortunate to have amazing support. Our vet friend, Nelumi, has been a tremendous help. We've also received encouragement and assistance from Dinuka madam in the English Department and Shalika madam in the Zoology Department. Thank you very much for the support.

With their help, and the efforts of many like-minded individuals, a society called "Animal Arc" was formed at the Veterinary Faculty of the University of Peradeniya. This society plays a vital role in covering the expenses of rescues and treatments, ensuring animals in need receive the care they deserve.

Animals can't speak for themselves. They can't ask for help, food, or love. It is our responsibility to care for them, not just the pedigree pets but also the countless street animals that often go unnoticed. These innocent animals deserve kindness and compassion.

My friend Himashie and I have been involved in many rescues, and our journey is far from over. We plan to start a fund to assist with the medical needs of street animals. We hope for your support in making this a reality. Together we can ensure that no animal is left behind.

ZOOLOGISTS' ASSOCIATION

UNIVERSITY OF PERADENIYA

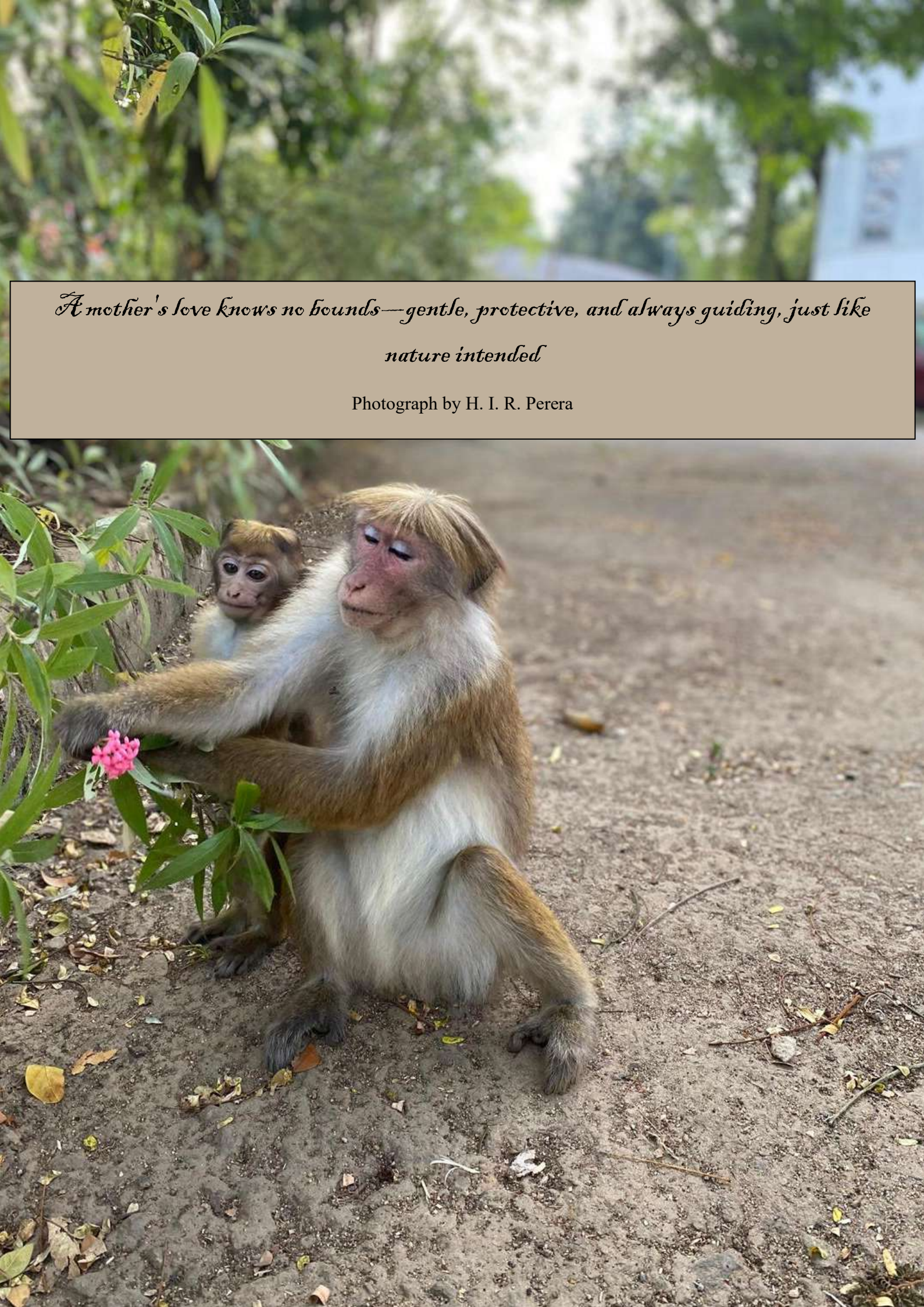
TILUSHA RUPASINGHA

President, Zoologists' Association, University of Peradeniya

The Zoologists' Association of the University of Peradeniya (ZAUP) was established in the early 1990s by dedicated undergraduates under the guidance of the Head of the Department of Zoology. ZAUP is a vibrant community of enthusiastic nature lovers committed to expanding their knowledge in Zoology and related fields, exploring the natural world, and actively contributing to conservation efforts. One of the hallmarks of our society is the exploratory field visits, providing experiences in studying flora and fauna under the guidance of experts. Guest talks and webinars play a crucial role in our annual calendar, fostering connections between alumni, professionals, researchers and students to exchange knowledge and experiences.

Another key initiative of our society is the publication of Protect Nature Sri Lanka, a student journal aimed at spreading awareness about the importance of nature conservation. Through this platform, we strive to inspire individuals to take action in preserving the rich biodiversity of our island. ZAUP continues to grow as a hub for those who are passionate about nature, learning, and making a positive impact on the environment. Together, we explore, educate, and protect the natural world for future generations.

The following are some of the memories of ZAUP in the year 2023/2024



A mother's love knows no bounds—gentle, protective, and always guiding, just like nature intended

Photograph by H. I. R. Perera