

Research Article

## An assessment on dietary patterns of Sri Lanka Leopard (*Panthera pardus kotiya*) in the Eastern Range of the Sinharaja World Heritage Site

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### ABSTRACT

Sri Lanka leopard is considered as the sole apex predator of the terrestrial ecosystems in Sri Lanka which is confined to some scattered forest ecosystems in both dry and wet zones, and has ranked as an Endangered (EN) species. Since the leopard population in the wet zone has not yet been largely acknowledged scientifically, a study was conducted to reveal the dietary pattern of leopard population of the Eastern Range of Sinharaja World Heritage Site. Throughout this five years study, 396 leopard scat samples were collected, washed and remaining bone particles were analyzed to identify its prey species. Samples were categorized in to two categories based on the direct ariel length from the forest boundary to identify any difference in the dietary patterns. The analysis revealed that, 35.85% of the scat samples consisted the bone particles of sambar, proving that the leopards in the Eastern Sinharaja range prefers sambar as its prey. Additionally, a considerable percentage of the scat samples consisted bone particles of dogs, highlighting a triggering factor to a ‘human – leopard conflict’. Further, the direct and indirect evidences collected in the study proved that the leopards prefer forest margins, grasslands or marshy areas than the dense forest.

**Key words:** Scat analysis, Prey species, Conservation, Human – leopard conflict

### INTRODUCTION

*Panthera pardus kotiya*, the endangered leopard subspecies endemic to Sri Lanka, shows a distribution in a variety of habitats from dry zone to wet zone in Sri Lanka (Miththapala *et al.*, 1996; MOE, 2012). Being the sole apex predator in terrestrial habitats of Sri Lanka (Kittle *et al.*, 2018), leopard plays the role of a keystone species, helping to determine the balance of the ecosystem, as well as the population density of prey species (Yapa & Ratnawira, 2012).

Most of the studies on Sri Lanka leopard have largely focused on populations in dry zone protected areas such as Yala and Wilpattu National Parks (Kittle, Watson & Fernando, 2017; Kittle, Watson & Samarayake, 2021). But in recent past, several studies have been initiated targeting wet zone leopard populations, especially in Central Highlands (Kittle *et al.*, 2012, 2014). But still, the status of the leopard in the wet zone is largely unknown. Though the literature evident that the Sri Lankan Leopard showed a wide distribution in wet zone in the beginning of 20<sup>th</sup> Century, the remaining wet zone leopard population has restricted to the forest areas in Central Highlands and to the Sinharaja World Heritage Site due to a variety of reasons (Yapa & Ratnawira, 2012).

Though a majority of Sinharaja World Heritage Site (WHS) consists lowland habitats, a small proportion with a significant ecosystem spread across higher altitudes. To be more precise, the Eastern part of the Sinharaja WHS reserve falls within the Rakwana mountains, which is considered a part of the Sabaragamuwa Mountain range, lies through the Ratnapura district, margining Matara district region of Sri Lanka (IUCN, 1993).

Eastern part of Sinharaja harbors a significant faunal diversity and endemism. 65 mammal species including 12 endemics (Yapa & Ratnawira, 2012) are recorded from Eastern Sinharaja. Further, the Eastern Sinharaja is known as one of the remaining hunting grounds of the wet zone population of Sri Lankan leopard.

The situation of the wet zone leopard is further exacerbated by the growing human population and their unsustainable land uses. Recent records of leopard human interactions around tea estates in Central Highlands strongly suggest human and leopard conflict would be a concern to address in the near future (DWC, 2020).

A systematic study to identify the dietary pattern of the leopard population in the Eastern Sinharaja area was initiated in 2015 and expanded for 5 consecutive years up to 2020.

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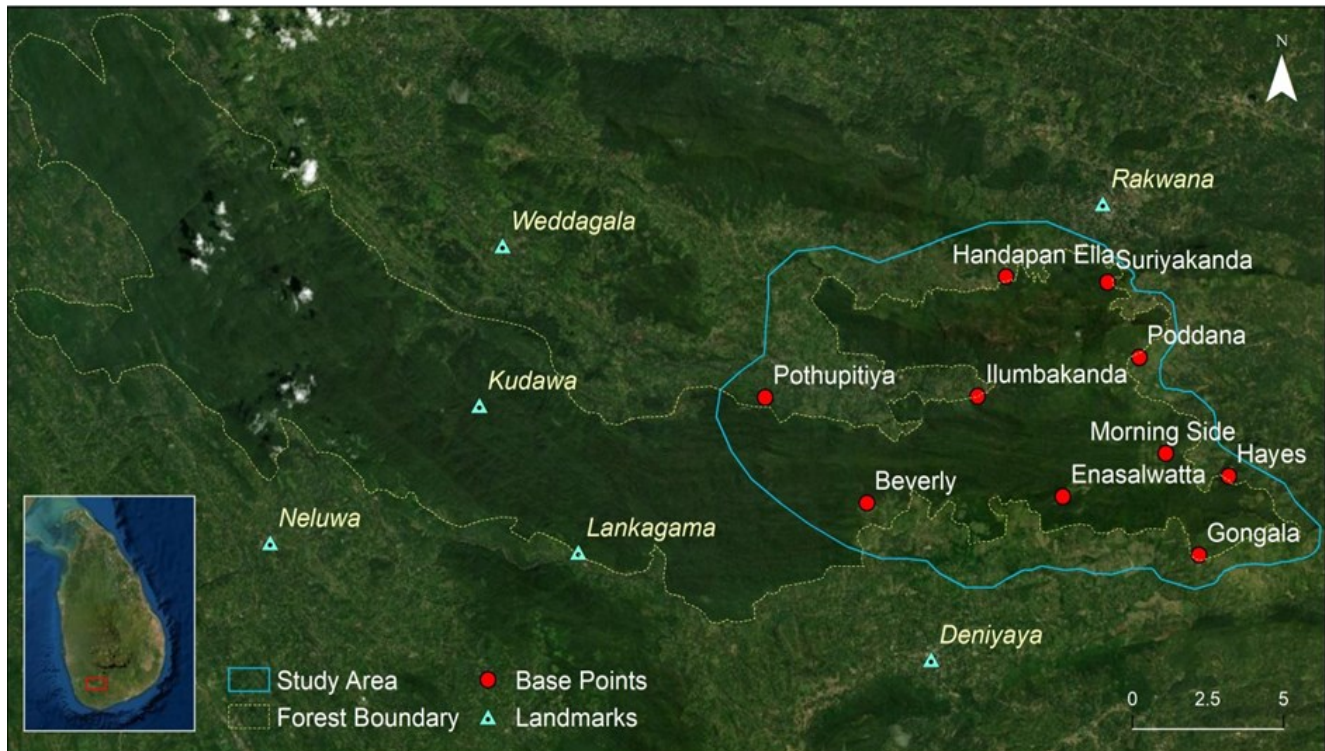
## MATERIALS AND METHODS

Ten base points were selected from Eastern part of Sinharaja WHS and the marginal villages / tea estates (Figure 1). Each base point was periodically visited once two weeks and leopard scat within a radius of 2 km from the point were collected. Each sample was separately numbered, GPS tagged, washed and remaining bone particles were analyzed to the species level to reveal dietary patterns.

In order to distinguish from Fishing Cat (*Prionailurus viverrinus*), scat samples with bolus width larger than 25 mm were only collected (Henschel &

Ray, 2003). When scat samples contained bone particles of more than one species, bone particles were separated as possible according to the species, the dry weight of each portion was measured and the species which had the highest weight was selected. Apart from the scat samples, data on carcasses remained by leopard were also counted.

Location of each scat sample was mapped using ArcGIS 10.7 software package. Direct areal length from each location to the forest boundary was measured and scat samples were divided to two categories as ‘village & vicinity’ (if the areal length < 1 km) and ‘dense forest’ (if the areal length > 1 km).



**Figure 1.** Map showing the study area

## RESULTS

A total of 396 leopard scat samples were collected. 142 (35.85%) scat samples containing bone particles of sambar was found throughout the study, proving that the leopards in the Eastern Sinharaja Area prefer sambar as its prey. Results of 5 years' study further revealed that the leopards in South-Western slopes of the Eastern Sinharaja Range are not only living in dense forests but in marginal villages also. While dietary preference of leopards recorded from dense forest in Eastern Sinharaja ranges from mouse / rat species to sambar, 41% of scat samples from ‘village & vicinity’ constituted bone particles of dogs. The overall scat analyses are summarized at Table 01. In one scat sample, particles of freshwater crabs were also observed. But it was unclear that, either

the leopard directly fed on the freshwater crabs or fed on an otter which already had consumed freshwater crabs. Hence, that sample was categorized under unidentified category.

## DISCUSSION

The results proved that wet zone leopard in Eastern Sinharaja area also feeds on a range of preys from small rodent species to large mammal species such as sambar and wild boar (Figure 2 & 3). Sambar was identified as the most preferred prey species and it may be caused by high availability of sambars in the area or the ease of hunting. Fresh / decayed carcasses found by estate workers or cardamom pluckers evidenced that a majority of sambars was hunted down in forest margins,

**Table 1.** Dietary Preferences of the leopards in Eastern Sinharaja Area

Mammal species (Ascending to the average body weight)		No of scat samples (with %)	Village vicinity	& Total
		Dense Forest		
1.	<b>Sambar</b> ( <i>Cervus unicolor unicolor</i> )	<b>107</b> (37.93)	<b>35</b> (30.70)	<b>142</b> (35.85)
2.	<b>Wild boar</b> ( <i>Sus scrofa cristatus</i> )	<b>42</b> (14.89)	<b>9</b> (18.42)	<b>78</b> (12.87)
3.	<b>Barking deer</b> ( <i>Muntiacus muntjak</i> )	<b>23</b> (8.15)	<b>9</b> (7.89)	<b>32</b> (8.08)
4.	<b>Dog</b> ( <i>Canis lupus familiaris</i> )	<b>26</b> (9.21)	<b>47</b> (41.22)	<b>73</b> (18.43)
5.	<b>Indian porcupine</b> ( <i>Hystrix indica</i> )	<b>19</b> (6.73)	<b>05</b> (4.38)	<b>24</b> (6.06)
6.	<b>Purple faced leaf langure</b> ( <i>Semnopithecus vetulus vetulus</i> )	<b>05</b> (1.77)	<b>0</b>	<b>05</b> (1.26)
7.	<b>Eurasian otter</b> ( <i>Lutra lutra nair</i> )	<b>02</b> (0.71)	<b>0</b>	<b>02</b> (0.51)
8.	<b>Yellow-striped mouse deer</b> ( <i>Moschiola kathygre</i> )	<b>27</b> (9.57)	<b>04</b> (3.50)	<b>31</b> (7.82)
9.	<b>Palm civet species</b> ( <i>Paradoxurus</i> spp)	<b>04</b> (1.41)	<b>0</b>	<b>04</b> (1.01)
10.	<b>Mongoose species</b> ( <i>Herpestes</i> spp)	<b>03</b> (1.06)	<b>0</b>	<b>03</b> (0.75)
11.	<b>Ring tailed civet</b> ( <i>Viverricula indica mayori</i> )	<b>05</b> (1.77)	<b>0</b>	<b>05</b> (1.26)
12.	<b>Bandicoot species</b> ( <i>Bandicota</i> spp)	<b>02</b> (0.71)	<b>01</b> (0.88)	<b>03</b> (0.75)
13.	<b>Small rodent species</b> ( <i>Mus/Rattus/Srilankamys</i> spp)	<b>04</b> (1.41)	<b>01</b> (0.88)	<b>05</b> (1.26)
14.	<b>Unidentified</b>	<b>14</b> (4.96)	<b>03</b> (2.63)	<b>17</b> (4.29)
<b>Total</b>		<b>282</b>	<b>114</b>	<b>396</b>

grasslands or marshy areas, not in dense forest.

Indirect evidences (i.e.: pug marks) proved that the leopards in the study site are sharing the habitat with two other feline species, fishing cat (*P. viverrinus*) and rusty spotted cat (*P. rubiginosus*). However, scat samples containing bone particles of any feline species were not found in the study.

One of the key objectives in this study was to identify possible causes to a human – leopard conflict in Eastern Sinharaja Range. Being a highly adaptive predator (Macdonald *et al.*, 2010), leopards show a behavior to depend on easy preys such as dogs in the forest fringed villages as result of expansion of human settlements into their habitat. This could be identified as the triggering factor for the emerging human – leopard conflict.

As per the existing records, several man-eating leopards have been documented from dry zone areas, specifically from the Northern and Eastern Provinces of Sri Lanka. Still, a confirmed man-eater is not recorded from wet zone areas other than some random, defensive attacks by leopard against humans (Kumara *et al.* 2020). But the competition between human and leopard for the same habitat for a long time may probably make right grounds the emergence of man-eater from wet zone areas also.

Under the Extraordinary Gazette No 2151/31 dated November 20, 2019, several surrounding forest patches, which includes some forest fragments in Eastern Sinharaja, were annexed to Sinharaja Forest Reserve. But still, a considerable area remains unprotected, allowing the destruction of this precious ecosystem. Hence, it is suggested for the policymakers to take necessary actions to declare the concerned sites as protected areas. In many cases, human encroachments to the natural habitats, which may intensify human-leopard conflict, were observed. This would also lead the endangered wet zone leopard population to be restricted to the Sinharaja World Heritage Site, adjoining forest fragments and surrounding area and extinction due to inbreeding, resulting in reduced reproductive fitness.

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**Figure 2.** Scat containing particles of various prey species (a) Sambar, (b) Wild boar, (c) Indian porcupine, (d) dog



**Figure 3.** Partially eaten carcass of a ring-tailed civet

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