

Regional diversity of fireflies of the subfamily Luciolineae (Coleoptera: Lampyridae) in Sri Lanka

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ABSTRACT According to the documented records of the National Museum of Sri Lanka, 63 species of fireflies belonging to 24 genera were recorded in the eighteenth century. Thereafter, no scientific investigations were conducted on the diversity of firefly fauna across Sri Lanka. The present study was conducted to determine the diversity of fireflies of the subfamily Luciolineae in all provinces in Sri Lanka from January to May 2010. Nine *Luciola* species, namely, *L. chinensis*, *L. melaspis*, *L. humeralis*, *L. nicollieri*, *L. candezei*, *L. horni*, *L. intricata*, *L. antennalis* and *L. vespertina* were identified. *Luciola chinensis* was the most widespread and on the whole the most common lucioline firefly in Sri Lanka, but there were regional differences in the dominant species. *Luciola nicollieri* and *L. antennalis* were the most abundant firefly species in Uva province while *L. melaspis* and *L. candezei* were dominant in Sabaragamuwa province. *Luciola chinensis*, however, was the most abundant firefly species in the Southern, Western, Eastern, and Northern provinces, whereas *L. melaspis* was the most abundant firefly species in the Central province, *L. humeralis* in the North Central province and *L. horni* in the North Western province. Climatic variation in different regions of Sri Lanka may influence the dominant species of fireflies in different regions.

Keywords: Firefly, *Luciola*, distribution, Sri Lanka

INTRODUCTION

Taxonomic studies of Sri Lankan fireflies first started in the early 18th century (Wijesekara & Wijesinghe 2003). A survey of a rainforest in 1937 reported 29 firefly species (Baker 1937). In 1966, McDermott reported 30 species of fireflies. Of these, 16 Lucioline species were found in the Central and Northeast Provinces of Sri Lanka. *Luciola melaspis* and *Luciola cingulata* were found in the Southern Province, and an endemic species, *Harmatelia bilineata* (Ototretinae), was found only in the Central Province. The distribution and abundance of fireflies in Sri Lanka is thought to be influenced by climatic variation (Fernando 1984). This paper presents preliminary results of a long term study on fireflies in Sri Lanka.

Firefly species	Sabaragamuwa	Uva	Eastern	North-Western	North-Central	Northern	Central	Western	Southern
<i>L. chinensis</i> (<i>L. praeusta</i> complex)	84	116	46	30	52	48	24	32	150
<i>L. melaspis</i>	126	0	12	0	0	0	62	0	3
<i>L. humeralis</i>	0	2	0	0	62	0	0	4	12
<i>L. nicollieri</i>	44	124	0	14	0	0	0	0	0
<i>L. horni</i>	0	0	0	122	0	0	0	0	0
<i>L. antennalis</i>	0	146	38	0	0	24	2	0	0
<i>L. vespertina</i> (<i>L. praeusta</i> complex)	48	42	0	0	0	0	0	0	0
<i>L. candezei</i>	112	0	0	0	0	0	0	0	0
<i>L. intricata</i> (<i>L. praeusta</i> complex)	0	4	0	0	0	0	0	0	0
Unidentified species 1	4	0	0	0	0	0	0	0	0
Unidentified species 2	2	0	0	0	0	0	0	0	0
Total no. of individuals	420	434	96	166	114	72	88	36	165
Shannon Diversity Index	1.542	1.426	1.033	0.743	0.689	0.636	0.439	0.349	0.289
Evenness Index	0.860	0.686	0.640	0.677	0.594	0.517	0.585	0.504	0.417

Table 1 Number of individuals collected for each *Luciola* firefly species from nine provinces in Sri Lanka. Diversity indices are also shown for each province.

METHODS

The present study was conducted in grasslands in Uva and Sabaragamuwa, and the Central, North-Central, Western, Southern, Eastern, Northern and North-Western provinces from January to May 2010. There were three sampling periods, with each period covering all provinces over five weeks, and with a two week break between sampling periods. Between 6.30 to 9.30 pm, adult fireflies were collected using hand nets, within a 10×10 m² quadrat in each provincial site. Most captured fireflies were identified to species, and then released. Individuals that could not be identified in the field were brought back to the laboratory and identified to species by comparing with specimens in the firefly reference collection in the National Museum, Colombo. Data on the numbers of each species of firefly collected in each province were analysed to obtain Shannon's Diversity Index and Evenness Index.

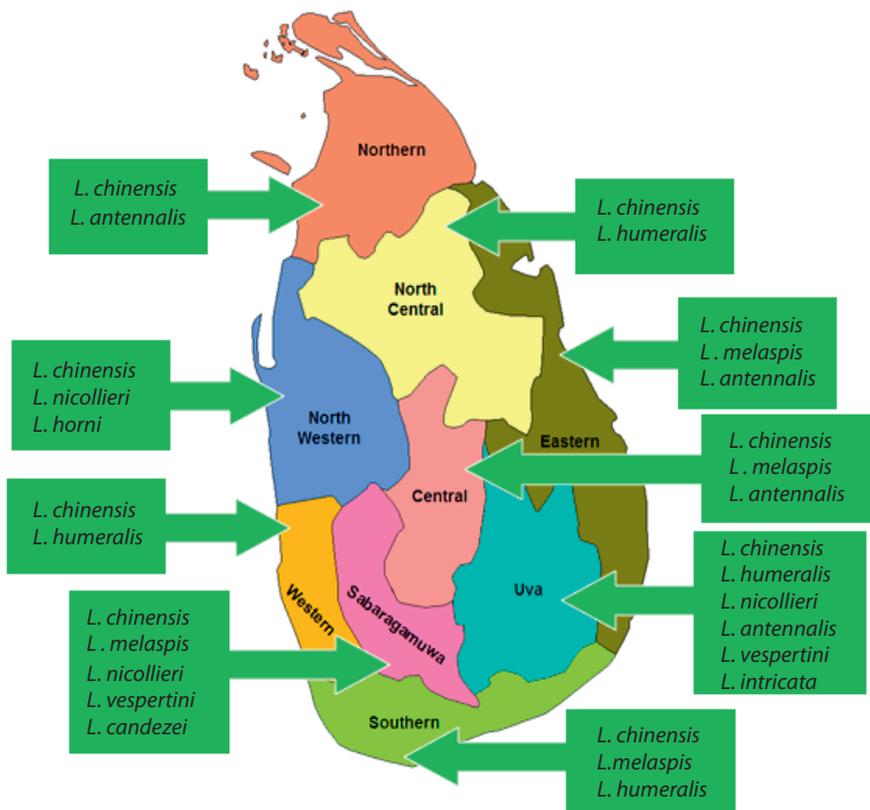


Figure 1 Species of fireflies recorded from nine provinces of Sri Lanka.

RESULTS

A total of 1591 specimens were recorded from grassland habitats in Sri Lanka. Nine *Luciola* species, namely, *L. melaspis*, *L. humeralis*, *L. nicollieri*, *L. candezei*, *L. horni*, *L. antennalis* and 3 species under the *L. praeusta* complex (*L. chinensis*, *L. vespertina* and *L. intricata*), were tentatively identified during the study.

Luciola chinensis (under the *L. praeusta* complex) was a common species in all nine provinces in Sri Lanka. Uva Province had the greatest abundance of fireflies while Sabaragamuwa Province recorded the highest species richness. *Luciola horni* was collected only from the North-Western province, and *L. candezei* only from the Sabaragamuwa region. *Luciola intricata* was recorded only from Uva Province (Table 1).

Luciola chinensis was the most common Lucioline firefly in Sri Lanka and was the most abundant Lucioline in Southern Province and Uva and Sabaragamuwa provinces. However, dominant species varied according to region.

DISCUSSION

Results of this preliminary study indicate fireflies of the subfamily Luciolinae are common in Sri Lanka. The number of species recorded in this study as occurring in Sri Lanka may be inaccurate as species identifications were carried out in reference to specimens collected during the 18th to early 19th century. The difficulties in identification are complicated by the possibility that some firefly species may have disappeared due to drastic habitat changes occurring after the late 18th century.

Although Sri Lanka is a small island, it has considerable climatic variation due to its geography and monsoon rain patterns. Based on climatic and ecological factors, the country can be divided into three zones: wet, intermediate and dry. The Northern and Eastern Province are situated in the dry zone. The Western Province, Sabaragamuwa and Central Province are situated in the wet zone. The Southern, North-Central and North-Western provinces have parts of all three zones, and Uva Province is situated in the wet and intermediate zone. However, ecological conditions in these provinces are further complicated by topographic conditions, which have considerable effect on rainfall and vegetation patterns. Further study is needed to investigate firefly distribution patterns in relation to the different climatic zones in Sri Lanka.

The abundance of *L. chinensis* (under the *L. praeusta* complex) in the Southern Province, Uva and Sabaragamuwa indicate that *L. chinensis* is well suited to a wet climate. However, *L. chinensis* was rare in the wet Western and Central provinces, possibly because these provinces are highly urbanised. Light pollution and lack of larval food are among factors that may contribute to low populations of *L. chinensis* in these areas. Long term surveys are essential in order to find out the relationship between such environmental factors and the abundance of fireflies.

The abundance of *L. nicollieri* in the colder, wet regions in Uva, Sabaragamuwa and the North-Western Province indicates that this species prefers colder climates with high rainfall. Rainfall may have a major influence on the diversity and abundance of firefly species in Sri Lanka. Long term studies on the distribution patterns and abundance of fireflies in relation to ecological factors is essential in order to understand their ecological requirements and provide a scientific basis for implementing future conservation measures.

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