



Tarbiat Modares University Press
Entomological Society of Iran

Research Article
Taxonomy

<https://doi.org/10.52547/jibs.9.2.331>

ISSN: 2423-8112

<https://zoobank.org/urn:lsid:zoobank.org:4B33562E-6F5C-4570-AED5-80F5A166498D>

Re-description of *Luciola nicollieri* Bugnion, 1922 (Lampyridae, Luciolinae) in Sri Lanka

Dilshan Ruwansiri De Silva

Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka.

✉ hondhamuni.silva@gmail.com

<https://orcid.org/0000-0002-8846-9203>

Chandana Dammika Wijekoon

Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka.

✉ wijekoon@zoo.ruh.ac.lk

<https://orcid.org/0000-0003-3773-2128>

Hemantha Edirisinghe Wegiriya

Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka.

✉ hemantha@zoo.ruh.ac.lk

<https://orcid.org/0000-0003-1018-1784>

Sandun Nalaka Bandara

Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka.

✉ kvsandun@zoo.ruh.ac.lk

<https://orcid.org/0000-0003-1243-0860>

Thisara Ishan Madushanka

Department of Zoology, Faculty of Science, University of Ruhuna, Sri Lanka.

✉ thisaraishan1@gmail.com

<https://orcid.org/0000-0002-1462-8347>

ABSTRACT. *Luciola nicollieri* Bugnion, 1922 is one of the sixteen originally described Luciolinae from Sri Lanka. Specimens of *L. nicollieri* have been re-discovered in 2022 almost after 100 years of its first description, and their identity was confirmed by comparison with the original description, photos of their type specimen and based on expert's views. Flightless female is associated and described for the first time, males re-described, with details of external morphology, genitalia pattern, flashing behavior and habitat ecology. After examining the types and the generic features of their genitalia, *L. nicollieri* is placed herein to the category of *Luciola* Laporte s. str. transferring from *Luciola* sensu lato. Also a key to the species of *Luciola* recorded from Sri Lanka is provided.

Key words: Luciolinae, Re-discovery, Sri Lanka, taxonomic description

Received:

30 October, 2022

Accepted:

08 February, 2023

Published:

20 February, 2023

Subject Editor:

Lucas Campello

Citation: De Silva, D.R., Wijekoon, C.D., Wegiriya, H.E., Bandara, S.N. & Madushanka, T.I. (2023) Re-description of *Luciola nicollieri* Bugnion, 1922 (Lampyridae, Luciolinae) in Sri Lanka. *Journal of Insect Biodiversity and Systematics*, 9 (2), 331–341.

INTRODUCTION

In the early eighteenth century, large numbers of insects including fireflies were recorded and they were originally described from Sri Lanka by European naturalists like Ernest Olivier, Maurice Pic and Victor Motschulsky. The major portions of their collections, including type specimens are presently stored in European Museums such as Natural History Museums, London (NHML) and National Museum of Natural History, Paris (MNHN). Rests of specimens are lodged in firefly collection at the Department of National Museums, Colombo, Sri Lanka. Hence, the contribution of available firefly repositories at the National Museum, Sri Lanka for current taxonomic studies is little because of non-updated specimens and out dated classifications. The past literature on the Sri Lankan firefly fauna has been initiated with the establishment of British rule. The earliest records of Sri Lankan insects were

Corresponding author: Wijekoon, C.D., E-mail: wijekoon@zoo.ruh.ac.lk

Copyright © 2023, De Silva et al., This is an open access article distributed under the terms of the Creative Commons NonCommercial Attribution License (CC BY NC 4.0), which permits Share - copy and redistribute the material in any medium or format, and Adapt - remix, transform, and build upon the material, under the Attribution-NonCommercial terms.

documented in the “Fauna of British India” Series (Arrow, 1910, 1917, 1931). Findings of the pioneering studies on Sri Lankan firefly fauna have been reported by Olivier (1885), Baker (1937), and Bertrant (1973). McDermott (1964, 1966) listed the fireflies in the world including sixteen species of genus *Luciola* which were originally recorded and described from Sri Lanka. Among them, six species of Luciolinae, *Abscondita perplexa* (Walker) comb. nov. (Ballantyne et al., 2013), *Abscondita promelaena* (Walker) comb. nov. (Ballantyne et al., 2013), *Sclerotia substriata* (Gorham, 1880) (Ballantyne et al., 2016), *Asymmetricata humeralis* (Walker) comb. nov. (Ballantyne & Lambkin, 2009), *Luciola extricans* Walker and *L. horni* Bourgeois were recorded in recent studies (2010–2021) of Sri Lanka (Wijekoon et al., 2021).

Wijekoon et al. (2012) tentatively identified a specimen similar to the *L. nicollieri*, whereas, it was not confirmed because they collected and identified the specimens at night in the field and then released them, so that was impossible to confirm the identifications. Later, authors confirmed that it was misidentifications and that was not *L. nicollieri*. However, the true *Luciola nicollieri* was recently re-recorded by from Sri Lanka (De Silva et al., 2022). After a thorough examination of recorded specimens and comparing them with the original description, photos of their type specimen and expert’s views, collected specimens were confirmed as *L. nicollieri*. In the present paper, we further describe the *L. nicollieri* male and their first recorded flightless female with the notes of habitat ecology and behavior. Hence this paper provides the first detailed systematic description of *L. nicollieri* subsequently to their original brief account done by Bugnion (1922).

MATERIAL AND METHODS

Sampling location and specimen collection. The sampling location was Walasmulla, Southern Province, Sri Lanka (6°14'36.7"N, 80°39'09.1"E, Elevation: 184 m) (Fig. 1). The specimen collection was carried out from 17.30 to 22.00 of each sampling day. Specimens were collected from March–August 2022 using five sampling occasions (sampling dates: 25.III.2022, 28.III.2022, 25.V.2022, 07.VI.2022 and 17.VIII.2022). A line transect of 50 m was selected in the habitat. Fireflies (both males and females) were observed along the transect. Observed flying males were caught using a standard size (30.5 cm/12 inch) insect hand net. Observed flightless female was collected by a fine forceps when it was moving on the ground. Twelve males and a female observed in the selected area were collected. Collected individuals were temporarily put into the transparent polythene bags in the field. Captured individuals were generally identified in the field using their general morphology. Collected males and females were counted. Five males and a female were preserved in plastic vials immersion in 70% ethanol medium and brought to the laboratory for further identification and confirmation. Having considered the expert’s reviews (Dr. Ballantyne, Australia) and original description (Bugnion, 1922) of the type specimen (RMNH), the present specimens were confirmed as *L. nicollieri*.

Abbreviations for the taxonomic characters and Depositories. TBL: Total body length; TBW: Total body width; EL: Elytral length; EW: Elytral width; PL: Pronotum length; PW: Pronotum width; MLOL: Male light organ length; MLOW: Male light organ width; AL: Antenna length. **RMNH:** National Natural History Museum, Leiden, The Netherlands. **DOZUORSL:** Department of Zoology, University of Ruhuna, Sri Lanka.

Morphometric measurements and examination. Five males and a female specimen were measured. Specimens were air dried for 5–10 minutes. Then, each specimen was measured using the Light microscope (Nikon-ECLIPSE-E100) (10×4) (with a ruler-micrometer calibration). Nine measurements of each specimen such as TBL, TBW, PL, PW, EL, EW, MLOL, MLOW and AL were taken for males. In females, TBL, TBW, PL, PW, EL, EW and AL were measured because firefly modern taxonomy is based on their male characters. All measurements were converted to the millimeter units. Genitalia of five males were dissected and both male genitalia and aedeagal sheaths were examined using procedures outlined in Ballantyne & McLean, 1970; Ballantyne & Lambkin, 2009; Ballantyne et al., 2019. Photographs of males and female were taken using a Digital Camera (Nikon D90, 60 mm micro, 12mpxl). Photographs of male genitalia were taken using a Camera Microscope (Optikam PRO6, 4083.B9, x86, Italy).

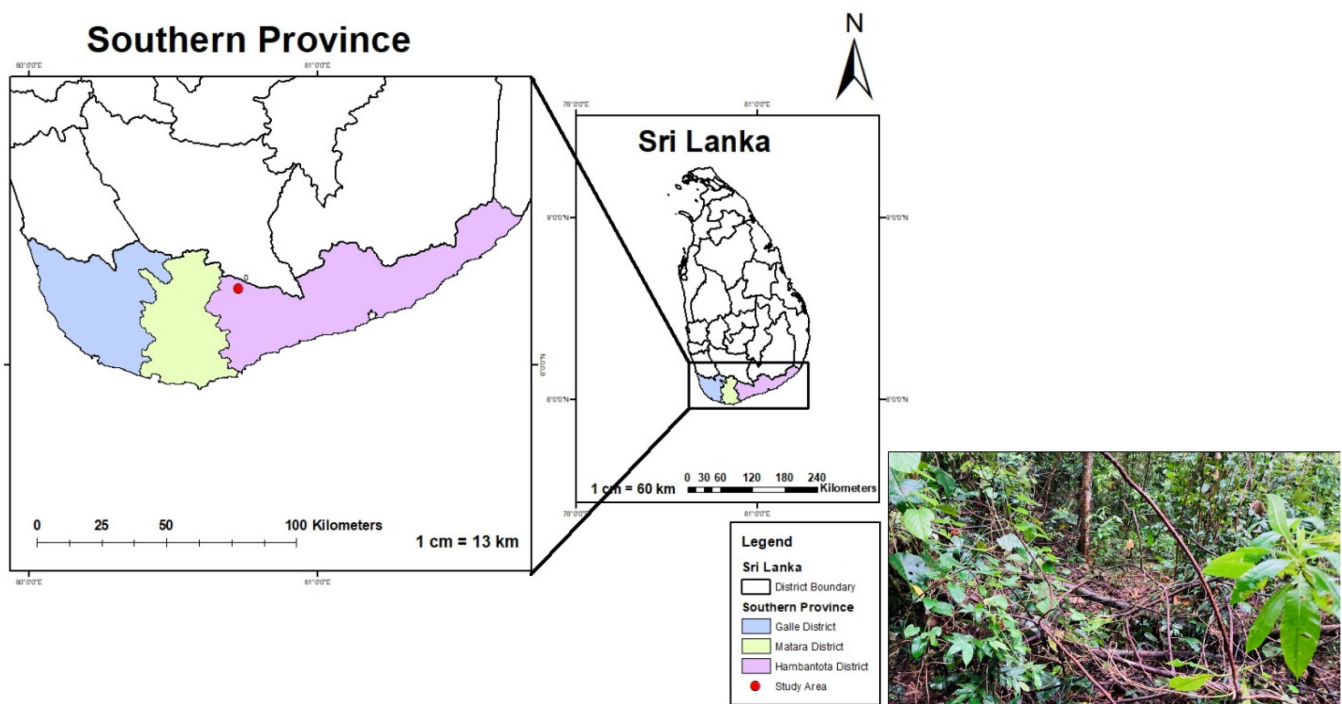


Figure 1. The location of the sampling sites in Sri Lanka.

Ecological and Behavioral study. Ecological data of the habitat such as vegetation cover, availability of the leaf litters on the top of the soil layer, human and animal threats in the habitat were recorded. Physico-chemical parameters of soil samples (Temperature, *pH*, conductivity, salinity, moisture content and organic matter content) taken from the habitat were measured in the laboratory. The soil *pH*, conductivity and salinity were measured using a multi parameter (Apera, EC8500) and temperature was measured using onsite thermometer. The soil moisture content and organic matter content were also calculated. The color of the light emitting by males and female were observed. The most active layer of the vegetation of males and females were recorded.

RESULTS

Taxonomic hierarchy

Class Insecta Linnaeus, 1758

Order Coleoptera Linnaeus, 1758

Suborder Polyphaga Emery, 1886

Family Lampyridae Rafinesque, 1815

Subfamily Luciolinae Lacordaire, 1857

Genus *Luciola* Laporte, 1833

Luciola Laporte, 1833 **s. str.** (*sensu* Ballantyne & Lambkin, 2013:64, Ballantyne et al., 2019:85. Jusoh et al., 2018).

Luciola Laporte, 1833:146. Lacordaire, 1857:335. Motschulsky, 1853:52. Gorham, 1880:99. Olivier, 1902:69; 1907:50.

Lea, 1909:106. Ballantyne & Lambkin, 2013:64. Yiu, 2012:92; 2017:92. Fu, 2014:23. **Type species:** *Luciola pedemontana* Motschulsky, 1853. Designated by Motschulsky, 1853.

Luciola (*Luciola*) Laporte, 1833. McDermott, 1966:103 (**Partim**). Calder, 1998:178.

Bourgeoisia Olivier, 1908:17; 1911:102. McDermott, 1966:117. Deheyn & Ballantyne, 2009:47. Ballantyne & Lambkin, 2013:64. Ballantyne et al., 2019:86. **Type species:** *Luciola antipodum* Bourgeois, 1905. Designated by McDermott, 1966.

Diagnosis. Ballantyne and Lambkin (2013:64) defined *Luciola* s. str. based on specimens of the type species from Pisa, Italy, and gave an extensive diagnosis which included the aedeagal lateral lobes visible beside the median lobe, the strongly curved median lobe of the aedeagus terminating in a pre-apical point, and elongate narrow pointed lobes arising from the inner ventral margins of the lateral lobes (Jeng et al., 2003; Ballantyne et al., 2019).

Remarks. *Luciola nicollieri* has been placed to date in the category of *Luciola* sensu lato defined by Ballantyne et al. (2015). *Luciola* sensu lato placed species still listed are those assigned to *Luciola* in McDermott (1966) for which they currently cannot assign a genus and with future reliable association of males to determination of their generic placement. Many have types although in rather poor condition. In this study, we have confirmed here the generic features of genitalia of *L. nicollieri* (aedeagal lateral lobes visible beside the median lobe, the strongly median lobe of the aedeagus terminating in a preapical point, and elongate narrow pointed lobes arising from the inner ventral margins of the lateral lobes) are identical with *Luciola*. Hence, *L. nicollieri* could be placed to the category of *Luciola* Laporte, 1833 s. str. and as such *L. nicollieri* is described herein under this category.

List of *Luciola* species from Sri Lanka. The records in National Museum, Colombo, Sri Lanka reveal a list of seventeen species of *Luciola* and that includes additional two species such as, *L. nigripes* (Gorham, 1903) and *L. vespertina* (Lacordaire, 1857) to the list of originally described *Luciola* from Sri Lanka by McDermott (1966). However, *L. auritula* (Olivier, 1910) is not included in the list of *Luciola* in National Museum, Sri Lanka through it is listed as one of originally described firefly from Sri Lanka by McDermott (1966) and Ballantyne et al. (2019). Luciolinae fireflies of Sri Lanka that were listed by McDermott (1966) and listed in the National Museum of Sri Lanka are mentioned in Table 1.

Table 1. Luciolinae species that originally reported as genus *Luciola* from Sri Lanka and their present taxonomic placements.

	Species	Present taxonomic position	Reference
1	<i>L. antennalis</i> Bourgeois, 1905*	<i>Incertae Sedis</i>	Ballantyne et al. (2019)
2	<i>L. auritula</i> Olivier, 1910*	Genus <i>Luciola</i> (No revision)	Ballantyne et al. (2019)
3	<i>L. candezei</i> Olivier, 1902*	Genus <i>Luciola</i> (No revision)	Ballantyne et al. (2019)
4	<i>L. chinensis</i> Linnaeus, 1767*	Genus <i>Abscondita</i> (<i>Abs. chinensis</i>)	Ballantyne et al. (2013)
5	<i>L. cingulata</i> Olivier, 1885*	Genus <i>Sclerotia</i> (<i>Scl. substriata</i>)	Ballantyne et al. (2016)
6	<i>L. doriae</i> Olivier, 1885*	Genus <i>Asymmetricata</i> (Synonym with <i>A. humeralis</i>)	Ballantyne et al. (2019)
7	<i>L. extricans</i> Walker, 1858*	Suggested to be transferred to genus <i>Curtos</i>	Ballantyne et al. (2019)
8	<i>L. horni</i> Bourgeois, 1905*	category of <i>Luciola</i> Laporte 1833 s.str.	Ballantyne & Lambkin (2013)
9	<i>L. humeralis</i> Walker, 1858*	Genus <i>Asymmetricata</i> (<i>A. humeralis</i>)	Ballantyne & Lambkin (2009)
10	<i>L. impressa</i> Olivier, 1910*	Genus <i>Asymmetricata</i> (<i>A. impressa</i>)	Ballantyne & Lambkin (2009)
11	<i>L. intricata</i> Walker, 1858*	<i>incertae sedis</i>	Ballantyne et al. (2019)
12	<i>L. melaspis</i> Bourgeois, 1909*	Genus <i>Abscondita</i> (<i>Abs. promelaena</i>)	Ballantyne et al. (2013)
13	<i>L. nicollieri</i> Bugnion, 1922*	Now in the category of <i>Luciola</i> Laporte 1833 s. str.	present work
14	<i>L. nigripes</i> Gorham, 1903	Genus <i>Luciola</i> (No revision)	Ballantyne et al. (2019)
15	<i>L. ochracea</i> Gorham, 1895*	Genus <i>Luciola</i> (No revision)	Ballantyne et al. (2019)
16	<i>L. perplexa</i> Walker, 1858*	Genus <i>Abscondita</i> (<i>Abs. perplexa</i>)	Ballantyne et al. (2013)
17	<i>L. promelaena</i> Walker, 1858*	Genus <i>Abscondita</i> (<i>Abs. promelaena</i>)	Ballantyne et al. (2013)
18	<i>L. vespertina</i> Motschulsky, 1854	Genus <i>Abscondita</i> (<i>Abs. chinensis</i>)	Ballantyne et al. (2013)

* Originally described sixteen (16) Luciolinae from Sri Lanka (as Ceylon).

Table 2. Measurements of male and female of *L. nicollieri* (in mm).

Species	no. specimens	TBL	TBW	PL	PW	EL	EW	MLOL	MLOW	AL
<i>L. nicollieri</i> (♂)	05	7–8	3–4	1.4–1.5	2.5–3.0	5–6	3–4	1–1.5	2–2.5	2.5–3
<i>L. nicollieri</i> (♀)	01	9	3.5	1.5	3	6	1.5		3	3

Note. All 18 species of Luciolinae in Table 1 had previously been described as *Luciola* spp.. Whereas only seven species are still valid under *Luciola*, the others were already assigned or proposed to transfer to other genera with recent taxonomic revisions. Among them, only three (3) species (*L. extricans*, *L. horni* and *L. nicollieri*) have been recorded in recent studies (2010–2022) of Sri Lanka. There are no subsequent records of the rest of the four *Luciola* (*L. auritula*, *L. candezei*, *L. nigripes*, *L. ochracea*) that had been recorded from Sri Lanka after their original description in early eighteenth century. Hence, a key is presented herein based on the identified *L. extricans*, *L. horni* and *L. nicollieri* in recent studies of Sri Lanka.

Key to species of *Luciola* (male) from Sri Lanka

1. Elytra orange with apical 1/3 black, orange mesocutellum, black abdominal ventrites, orange pronotum with a middle black patch, elytral punctures and intestinal lines are distinct, humeral carina absent. *L. extricans* Walker
- Elytra black, orange or yellowish gold mesocutelum and pronotum, black abdominal ventrites, a middle black patch on the pronotum may be present or not, no distinct elytral punctures or intestinal lines, humeral carina absent. 2
2. Elytra entire black, yellowish gold mesocutellum, yellowish gold pronotum with a wide median dark mark. *L. horni* Bourgeois
- Elytra black with narrow orange margins, orange mesoscutellum, orange pronotum, legs mainly orange. *L. nicollieri* Bugnion

***Luciola nicollieri* (Bugnion, 1922)**

Luciola nicollieri Bugnion, 1922; McDermott, 1966:110 (Checklist); Wijekoon et al., 2012:139 (misidentification); Fu, 2014:47; Wijekoon et al., 2016:68 (list), 70 (Checklist); Yiu, 2017:98; Ballantyne et al. 2019:103 (List of Luciolinae).

Material examined. syntype ♂ *Luciola nicollieri*, CEYLON (RMNH) [Photographs]; 12♂♂, 01 ♀, SRI LANKA: Southern Province, Walasmulla (6°14'36.7"N 80°39'09.1"E, 184 m a.s.l.), 25.III.2022, 28.III.2022, 25.V.2022, 07.VI.2022, 17.VIII.2022, Collector: H.S.D.R. De Silva (DOZUORSL).

Note. "Jusoh and Ballantyne (in prep) address features of various Luciolinae types located in RMNH, including a type of *Luciola nicollieri*. Ballantyne confirmed identification of our specimens as *L. nicollieri*, and considered features of the aedeagus we describe consistent with those of the type specimen". There were no reference specimens deposited in National Museum, Colombo, Sri Lanka since no any specimen in the repository collection but the label of the specimen is remain (Wijekoon et al., 2016).

Diagnosis. Male — large exposed head, orange pronotum, orange mesoscutellum, black elytra with narrow orange margins around all margins except across the base, legs mainly orange, basal abdominal ventrites black, white light organ in ventrites VI and VII. *Luciola nicollieri* differs from many other *Luciola* species in that the tip of the aedeagal sheath sternite is folded back over itself (Fig. 3A).

Female — Black elytra have thin orange margins which are narrow than their males, orange median patch with black lateral sides at ventrites II–V, light organ in ventrite VI.

Re-description. Male (Figs 2A, 2B, Table 2) — Body dorsum is black with orange pronotum and mesoscutellum. black ventrites except the light organ in ventrites VI and VII. TBL: 7.0–8.0 mm, TBW: 3.0–4.0 mm. **Head:** Head moderately exposed in front of pronotum. Antennae with 11 antennomeres; filiform shape antennae; all segments slender and elongate; AL: 2.5–3.0 mm. **Pronotum:** orange; median anterior margin broadly rounded; posterolateral corners are broad; PL: 1.4–1.5 mm, PW: 2.5–3.0 mm. **Elytra:**

black; each elytron has narrow orange margins around all margins except across the base; elytra have no distinct intestinal lines or punctures; EL: 5.0–6.0 mm, EW: 3.0–4.0 mm. **Thorax:** Thorax black color ventrally. Femur orange; tibia, tarsus and claws of legs are black. **Abdomen:** Abdominal ventrites II–V black; ventrites VI and VII wholly occupied by white light organs; ventrite VII tapers posteriorly and which covered by transparent tergite VIII. MLOL: 1.0–1.5 mm, MLOW: 2.0–2.5 mm. **Aedeagal sheath** (Figs 3A, 3B, 3C): length 0.7 mm, width 0.2 mm; it enfolds the aedeagus; anterior part of sheath sternite is widest at tergite articulations; very short tergites joins to sternites at both sides and two short posterior projections can be seen; the tip of the aedeagal sheath sternite is folded back over itself (indicates by x in Fig. 3A). **Aedeagus** (Figs 3D, 3E, 3F): length 0.4 mm, width 0.2 mm, strongly curved median lobe of the aedeagus terminating in a pre-apical point, and elongate narrow pointed lobes arising from the inner ventral margins of the lateral lobe; narrowed aedeagal lateral lobe which are widely separated along their mid dorsal line and bear a small hook along the inner margins (indicates by Y in Fig. 3E); aedeagal median lobe strongly expanded in basal area with apical area very much narrowed; the most distinctive feature is the side projections of the median lobe just behind the apex (indicates by Z in Fig. 3E).

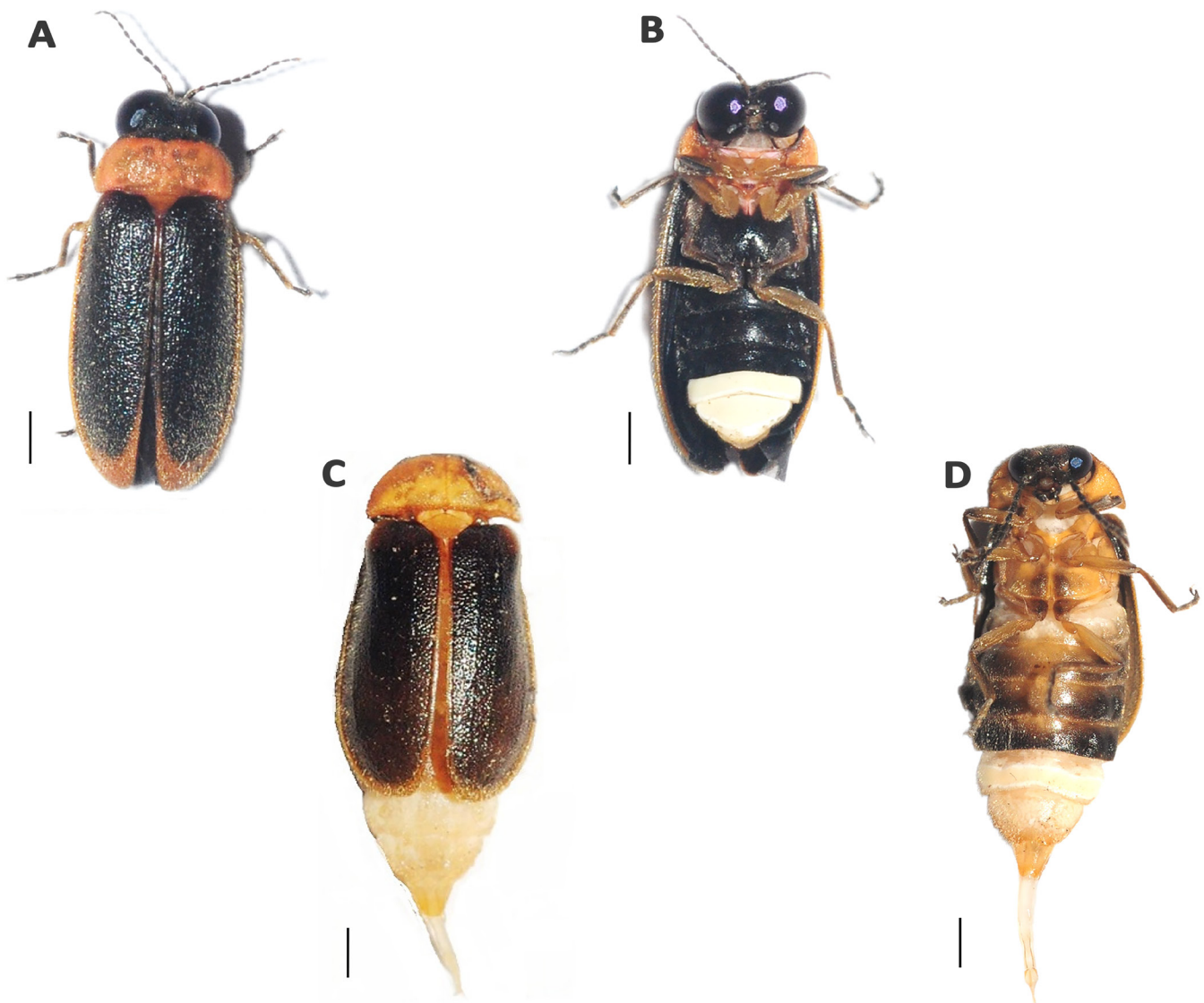


Figure 2. *Luciola nicollieri* Bugnion, 1922. **A.** & **B.** Male; **C.** & **D.** Female. **A.** & **C.** Dorsal view; **B.** & **D.** ventral view (Scale bar = 1 mm).

Female (Figs 2C, 2D, Table 2) — Flightless form, Body dorsum and ventral color almost identical to males, forewings fully developed but hind wings partially developed, TBL: 9.0 mm, TBW: 3.5 mm. **Head:** Head moderately exposed in front of pronotum; Antennae with 11 antennomeres; filiform shape antennae; all segments slender and elongate (AL: 3 mm). **Pronotum:** orange; median anterior margin broadly rounded; posterolateral corners are broad; PL: 1.5 mm, PW: 3.0 mm. **Elytra:** black elytra with narrow orange margins around all margins except across the base; elytra has no distinct intestinal lines or punctures; orange margins not wider as males; forewings fully developed (EL: 6.0 mm, EW: 1.5 mm) and hind wings partially developed (length: 3.0 mm, width: 1.0 mm). **Thorax:** Thorax black ventrally. Femur orange; tibia, tarsus and claws of legs are black. **Abdomen:** Abdominal ventrites II-V; black lateral sides with median orange patch, ventrites VI occupy by creamy white light organ, ventrite VII tapers posteriorly, the end of the ventrite VII bear transparent long ovipositor.

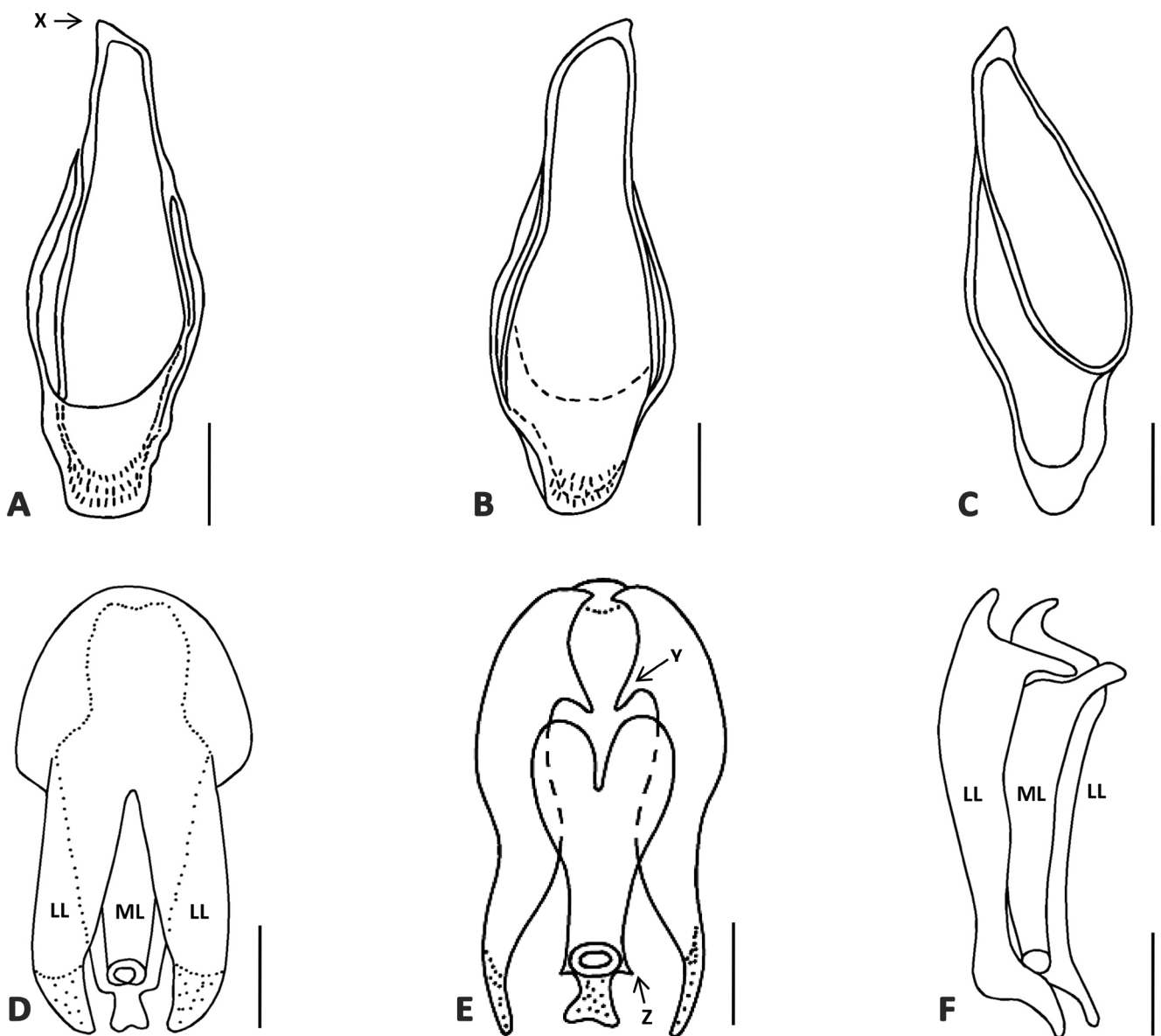


Figure 3. *Luciola nicollieri* Bugnion. **A., B. & C.** Aedeagal sheath; **D., E. & F.** Aedeagus (**A. & D.** Dorsal view; **B. & E.** Ventral view; **C. & F.** Lateral view) (LL: Lateral lobe, aedeagus; ML: Median lobe, aedeagus) (X: the tip of the aedeagal sheath is folded back over itself; Y: A small hook along the inner margins of LL; Z: Side projections of the ML) (Scale bar= 0.1 mm).

Larvae. Not found during the present survey.

Habitat ecology. *L. nicollieri* was recorded in the buffer zone of the Intermediate forest, Ranmale, Walasmulla, Southern, Sri Lanka. The site is densely covered with large trees and moderate ground vegetation layer. Soil characters; silt loam, temperature: 28°C±1, pH: 5.85–5.86, conductivity: 7.45±0.01 µs, salinity: 0 ppt, moisture content: 22.4%, organic matter content: 29.76%. The ground has dense layer of leaf litters and dry leaves. There are surrounding human-made cultivations like cinnamon plantations and home gardens. The habitat has disturbances by humans, cattle and a moderate light pollution.

Behavior. Males — nocturnal, active in middle layer of the vegetation strata (<2.0 m height), emit greenish flash, active flying form. **Female** — nocturnal, found on the ground layer among leaf litters, emit weak green light, less active, move on the ground by legs, incapable of flight. Female was recorded when it was reliably associated with males in the same habitat.

DISCUSSION

The paper provides information of the re-record of *L. nicollieri* almost after 100 years of its first description and of the re-description of their males and female, and their areas of incidence in Sri Lanka with observations of habitat and behavioral ecology. The original description of *L. nicollieri* by Bugnion (1922) consists with brief information of their morphology. In the present re-description of *L. nicollieri*, a detail systematic account of their males and females with some ecological and behavioral remarks are presented. The female *L. nicollieri* is described herein as the first flightless *Luciola* species that recorded from Sri Lanka. In fact that, female *L. nicollieri* is presented for the first time in this paper. We observed that the hind wings of female *L. nicollieri* are partially developed compared to the fore wings, and they showed very slow movements on the ground. According to the Ballantyne et al. (2015, 2019), *L. nicollieri* had been placed under the category of *Luciola sensu lato* until to confirm their generic placement. In the present study, we have described *L. nicollieri* under the category of *Luciola* Laporte 1833 s. str. confirming their placement from *Luciola sensu lato* after thorough examination of their aedeagus and aedeagal sheath pattern as both have generic features of *Luciola*.

In the original description, Bugnion described the last two abdominal ventrites of male *L. nicollieri* are creamy orange. In the present observations, we confirmed that the color of ventrites 6 and 7 is white. *Luciola nicollieri* is one of the two *Luciola* (*L. horni*) having black wings recorded from Sri Lanka. *Luciola nicollieri* differs from *L. horni*, by having narrow orange margins except across the base of each black elytron rather having entire black elytra of *L. horni*. In addition, *L. nicollieri* has orange pronotum, which distinguish from *L. horni* by yellowish gold pronotum with median dark mark. Considering the *Luciola* fireflies in Sri Lanka, Wijekoon et al. (2021) reported three species [*L. extricans* (Walker, 1858), *L. horni* (Bourgeois, 1905) and *L. praeusta* (Kiesenwetter, 1874)] out of the recorded 14 Lampyrids from Sri Lanka during 2010–2015 study period. Among them, identity of *L. praeusta* was confirmed later by authors as *Abscondita perplexa*. *Luciola extricans* and *L. horni* are two other originally described species from Sri Lanka. Further studies are needed to find out the comprehensive biology of these species for their proper taxonomic re-descriptions in future. The re-record of *L. nicollieri* from Sri Lanka and the re-description of their male and female with ecological remarks is vital to fill the gap of taxonomic literature to some extent in the firefly fauna of Sri Lanka.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution in the paper as follows: Silva H.S.D.R and Madushanka A.D.T. collected field specimens, Wijekoon W.M.C.D. analyzed data and wrote the manuscript, Bandara K.V.S.N. analyzed the ecological data and Wegiriya H.C.E. supervised the research and reviewed the manuscript. All authors read and approved the final version of the manuscript.

FUNDING

There was no any external funding source for study and conducted by self-funding.

AVAILABILITY OF DATA AND MATERIAL

Datasets and specimens used to support the findings of this study are available from the corresponding author upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

ACKNOWLEDGMENTS

Authors express their gratitude to Dr L. Ballantyne, Adjunct Research Fellow, School of Agricultural, Environmental and Veterinary Sciences, Charles Sturt University, Australia for her tremendous support for species identification, suggesting edits to the paper and sending pictures of type specimens.

REFERENCES

- Arrow, G.J. (1910–1949) *The Fauna of British India, including Ceylon and Burma*. Coleoptera. Lamellicornia. Taylor and Francis, London. Vol. I (1910) Cetoniinae and Dynastinae xiv, 322 p., 2 col. pl.; Vol. II (1917) Rutelinae, Desmomyrinae and Eucharinae xiv, 387 p., 5 pl.; Vol. III (1931) Coprinae xii, 428 p.
- Ballantyne, L.A. & Lambkin, C. (2009) Systematics of Indo-Pacific fireflies with a redefinition of genus; Luciolinae (Coleoptera, Lampyridae) *Zootaxa*, 1997, 1–188. <https://doi.org/10.11646/zootaxa.3653.1.1>
- Ballantyne, L.A. & Lambkin, C.L. (2013) Systematics and phylogenetics of Indo-Pacific Luciolinae fireflies (Coleoptera: Lampyridae) and the description of new genera. *Zootaxa*, 3653 (1), 1–162. <https://doi.org/10.11646/zootaxa.3653.1.1>
- Ballantyne, L.A. & McLean, M.R. (1970) Revisional studies on the firefly genus *Pteroptyx* Olivier (Coleoptera, Lampyridae, Luciolinae, Luciolini). *Transaction of American Entomological Society*, 96, 223–305.
- Ballantyne, L., Fu, X., Lambkin, C., Jeng, M.L., Faust, L., Wijekoon, W.M.C.D., Li, D. & Zhu, T. (2013) Studies on South-east Asian fireflies: *Abscondita*, a new genus with details of life history, flashing patterns and behaviour of *Abs. chinensis* (Kiesenwetter) and *Abs. terminalis* (Olivier) (Coleoptera: Lampyridae: Luciolinae), *Zootaxa*, 3721 (1), 1–48. <http://dx.doi.org/10.11646/zootaxa.3721.1.1>
- Ballantyne, L., Lambkin, C.L., Boontop, Y. & Jusoh, W.F.A. (2015) Revisional studies on the Luciolinae (Coleoptera: Lampyridae): 1. The firefly genus *Pyrophanes* Olivier with two new species. 2. Four new species of *Pteroptyx* Olivier. 3. *Inflata* gen.nov. Boontop, with redescription of *Luciola indica* (Motsch.) as *Inflata indica* comb. nov. *Zootaxa*, 3959 (1), 1–84. <https://doi.org/10.11646/zootaxa.3959.1.1>
- Ballantyne, L.A., Lambkin, C.L., Luan, X., Boontop, Y., Nak-eiam, S., Pimpasalee, S., Silalom, S. & Thancharoen, A. (2016) Further studies on south eastern Asian Luciolinae, 1. *Sclerotia* Ballantyne, a new genus of fireflies with back swimming larvae, 2. *Triangulata* Pimpasalee, a new genus from Thailand (Coleoptera: Lampyridae), *Zootaxa*, 4170 (2), 201–249. <https://doi.org/10.11646/zootaxa.4170.2.1>
- Ballantyne L.A., Lambkin, C.L., Ho, J.-Z., Jusoh W.F.A., Nada, B., Nak-eiam, S., Thancharoen, Awattanachaiyingcharoen, W. & Yiu, V. (2019) The Luciolinae of S.E. Asia and the Australopacific region: a revisionary checklist (Coleoptera: Lampyridae) including description of three new genera and 13 new species, *Zootaxa* 4687 (1), 001–174. <https://doi.org/10.11646/zootaxa.4687.1.1>
- Baker, J.R. (1937) The Sinharaja rain forest, Ceylon. *The Geographical Journal*, 89 (6), 539–551.
- Bertrand, H.P. (1973) Part xi. Larvae and pupae of water beetles collected from the Island of Ceylon (Lampyridae: 100–111). *Bulletin of the Fisheries Research Station, Sri Lanka (Ceylon)*, 24 (1/2), 95–112.

- Bourgeois, J. (1905) Voyage du D.W. Horn in Ceylon. Malacoderms and Lymexylonides. II. Lampyridini. *Annals of the Entomological Society of France*, 74, 127.
- Bugnion, E. (1922) *Luciola nicollieri* sp. from ceylon. *Spolia Zeylandica*, 12, 1–14. [in French]
- Calder, A.A. (1998) Coleoptera: Elateroidea. In: Wells, A. (ed.) *Zoological Catalogue of Australia* 29.6. CSIRO Publishing, Melbourne, pp. 1–248.
- Deheyn, D.D. & Ballantyne, L.A. (2009) Optical characterisation and redescription of the South Pacific firefly *Bourgeoisia hypocrita* Olivier (Coleoptera: Lampyridae: Luciolinae). *Zootaxa*, 2129, 47–62.
<https://doi.org/10.11646/zootaxa.2129.1.3>
- De Silva, H.S.D.R., Wijekoon, W.M.C.D., Bandara K.V.S.N. & Wegiriya H.C.E. (2022) Re-record of *Luciola nicollieri* (Coleoptera: Lampyridae: Luciolinae) from Sri Lanka. *Proceedings of International Firefly Symposium*, 15–18 June 2022, Gala, Portugal, p. 75.
- Fu, X.H. (2014) *An illustrated handbook of Chinese fireflies*. The Commercial Press, Beijing. 167 p. [in Chinese]
- Gorham, H.S. (1880) Materials for a revision of the Lampyridae. *Transactions of the Entomological Society of London*, 1880, 83–112. <https://doi.org/10.1111/j.1365-2311.1880.tb02023.x>
- Jeng, M.L., Yang, P.S. & Lai, J. (2003) Notes on the genus *Luciola* (Coleoptera, Lampyridae, Luciolinae) of Taiwan. *Special Bulletin of the Japanese Society of Coleopterology*, 6, 247–262.
- Jusoh, W.F.A., Ballantyne, L., Lambkin, C.L., Hashim, N.R. & Wahlberg, N. (2018) The firefly genus *Pteroptyx* Olivier revisited (Coleoptera: Lampyridae: Luciolinae). *Zootaxa*, 4456 (1), 1–71. <https://doi.org/10.11646/zootaxa.4456.1.1>
- Lacordaire, M.T. (1857) Tribe II. Lampyrids. *Natural History of Insects. Genera of the Coleoptera, or Methodical and Critical Explanation of all the Genera Proposed up to now in this Order of Insects*. Roret encyclopedic library, Paris, pp. 304–341. [in French] <https://doi.org/10.5962/bhl.title.8864>
- Laporte, F.L. de (1833) Essay of a revision of the genus Lampyre. *Annals of the Entomological Society of France*, 1833, 122–153. [in French]
- Lea, A.M. (1909) Revision of the Australian and Tasmanian Malacodermidae. *Transactions of the Entomological Society of London*, 1909, 45–251.
- McDermott, F.A. (1964) The taxonomy of the Lampyridae (Coleoptera). *Transactions of the American Entomological Society*, 90, 1–72.
- McDermott, F.A. (1966) Lampyridae. In: Steel, W.O. (ed.) *Coleopterorum Catalogus Supplementa*. Vol. 9. Dr W. Junk, The Hague, pp. 1–149
- Motschulsky, V. (1853) Lampyrides. *Study of Entomology*, 1, 25–58. [in French]
- Olivier, E. (1885) Catalogue des Lampyrides faisant partie des collections du Musée civique de Gênes. *Annali del Museo Civico di Storia Naturale di Genova*, 2, 333–374. [in French]
- Olivier, E. (1902) Catalogue des espèces de '*Luciola*' et genres voisins décrits jusqu'à ce jour. *Revue Scientifique du Bourbonnais et du centre de la France*, 15, 69–88.
- Olivier, E. (1907) Coleoptera, Lampyridae. *Genera Insectorum*, 53, 1–74.
- Olivier, E. (1908) New Lampyrids of the German Entomol. National Museums. (Col.). *German Entomological Journal*, 1908, 491–495. [in German]
- Wijekoon, W.M.C.D., Wegiriya, H.C.E. & Bogahawatte, C.N.L. (2012) Regional diversity of the Subfamily Luciolinae (Coleoptera: Lampyridae) in Sri Lanka, *Lampyrid*, 2, 138–141.
- Wijekoon, W.M.C.D., Wegiriya H.C.E. & Bogahawatte C.N.L. (2016) Systematic revision of the repository collection of Canthoroidea in the Department of National Museums, Colombo, Sri Lanka (Coleoptera: Cantharidae, Lampyridae, Lycidae, Rhagophthalmidae). *Ceylon Journal of Science*, 45 (1), 67–74.
<https://doi.org/10.4038/cjs.v45i1.7365>
- Wijekoon, W.M.C.D., Wegiriya H.C.E. & Bogahawatte C.N.L. (2021) Distribution, diversity and relative abundance of fireflies (Coleoptera; Lampyridae) in three habitat types in Sri Lanka, *Rajarata University Journal*, 6 (1), 10–20.
- Yiu, V. (2012) *Fireflies of Hong Kong. Popular Entomology Book Series No. 7*. Hong Kong Entomological Society, Hong Kong. 96 p.
- Yiu, V. (2017) A Study of Rhagophthalmidae and Lampyridae in Hong Kong with descriptions of new species (Coleoptera): Part 2. *Lampyrid*, 4, 67–119.

بازتوصیف سوسک شب تاب *Luciola nicollieri* Bugnion, 1922 (Lampyridae, Luciolinae) از سریلانکا

دیلشان راوانسیری د سیلوا، چاندرا دامیکا وییکوون*، همانتا ادریسنگ وجیریا، سادون نالاکا باندارا، و تیسارا ایشان مادوشانکا

گروه جانورشناسی، دانشکده علوم، دانشگاه روهونا، ماتارا، سریلانکا.
* پست الکترونیکی نویسنده مسئول مکاتبه: wijekoon@zoo.ruh.ac.lk

تاریخ دریافت: ۰۸ آبان ۱۴۰۱ | تاریخ پذیرش: ۱۹ بهمن ۱۴۰۱ | تاریخ انتشار: ۰۱ اسفند ۱۴۰۱

چکیده: سوسک شب تاب *Luciola nicollieri* Bugnion, 1922 یکی از شانزده گونه توصیف شده زیرخانواده Lucioninae از سریلانکا است. نمونه‌های سوسک *L. nicollieri* پس از گذشت ۱۰۰ سال از زمان توصیف اصلی آنها، مجدد کشف شد و هویت آنها از طریق مقایسه با توصیف اصلی، تصاویر نمونه تایپ و نظر متخصص آن گروه شناسایی گردید. حشره ماده بی‌بال برای اولین بار مشخص و توصیف شد. حشره نر بر اساس جزئیات ریخت‌شناسی خارج، الگوی جنیتالیا، رفتار تورتایی و اکولوژی زیستگاه بازتوصیف شد. پس از بررسی نمونه‌های تایپ و خصوصیات عمومی جنیتالیا گونه *L. nicollieri* از رسته عمومی *Luciola* به گروه *Luciola* Laporte s. str. منتقل شد. کلید شناسایی گونه‌های جنس *Luciola* گزارش شده از سریلانکا نیز تهیه شد.

واژگان کلیدی: زیرخانواده Luciolinae، اکتشاف مجدد، سریلانکا، توصیف تاکسونومیک