

A new species of *Lyriothemis* Brauer, 1868 (Odonata, Libellulidae) from the Western Ghats of Peninsular India

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ABSTRACT: A new species of phytotelma-breeding dragonfly, *Lyriothemis abrahami* **sp. nov.**, is described from the Western Ghats of Peninsular India. The new taxon was previously misidentified as *L. flava* Oguma, 1915 (= *L. tricolor* Ris, 1916). In contrast to *L. flava*, the new species is sexually dimorphic, with males easily identified based on the characteristic shape of the hamules. Females are identified by their jet-black and yellow colour with triangular yellow streaks on the dorsum of the abdomen and the distinct triangular shape of the vulvar lamina. Photographs of mature adults, teneral, hamules, illustrations of vesica seminalis, vulvar lamina, and a key to *Lyriothemis* of the Indian subcontinent are provided.

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KEY WORDS: Anisoptera, new taxon, taxonomy, dragonfly, phytotelmata, Kerala

INTRODUCTION

The genus *Lyriothemis* Brauer, 1868 comprises approximately 18 species of dragonflies distributed from Sri Lanka and Peninsular India to Northeast India (NE India), Tibet, Myanmar (Burma), and parts of Southeast Asia in the Oriental region,

Palaearctic East Asia, Sulawesi and New Guinea in the Australasian region (Fraser, 1936; Van der Poorten, 2009; Paulson *et al.*, 2025). The Indian region hosts *L. acigastra* (Selys, 1878), *L. bivittata* (Rambur, 1842), *L. cleis* Brauer, 1868, and *L. flava* Oguma, 1915 (= *L. tricolor* Ris, 1916), all recorded from NE India; *L. murtoni* Ris, 1919 from

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Myanmar (Fraser 1936); *L. defonsekai* van der Poorten, 2009 from Sri Lanka (van der Poorten, 2009); and the recently described *L. lucifera* Seehausen & Dawn, 2024 from the Andaman Islands (Seehausen and Dawn, 2024). The distribution of this genus in Peninsular India was not mentioned in any previous literature (Fraser, 1936) until Das *et al.* (2013) reported the presence of *L. tricolor* and Emiliyamma *et al.* (2013) recorded *L. acigastrea* from the state of Kerala. According to the latest review of Odonata in Kerala by Nair *et al.* (2021), only records of *L. tricolor* and *L. acigastrea* are available from the state. Asahina (1961) treated *L. tricolor* Ris, 1916 as a synonym of *L. flava* Oguma, 1922, which was also followed by van der Poorten (2009). However, according to Paulson *et al.* (2025), *L. tricolor* should be considered a synonym of *L. flava* Oguma, 1915, since the name appeared originally in Oguma (1915). Therefore, *L. flava* Oguma, 1915, should be prioritised over *L. tricolor* Ris, 1916. During our studies on the odonates of Kerala, we encountered libellulid larvae in a phytotelma within a homestead in Pooyamkutty, central Kerala, India. The larvae were then collected and reared under laboratory conditions. Larval rearing since 2021 yielded adults morphologically similar to *L. flava* but differed in the structure of male hamules. This prompted us to conduct a detailed morphological examination of freshly collected mature insects. A thorough study, including dissection of males, revealed that the species is new to science and is described herein.

MATERIALS AND METHODS

The collected insects were preserved in absolute alcohol in plastic vials. Morphological terminology follows Garrison *et al.* (2006) and Chao (1990) for genitalia. The standardised species nodal index (SSNI) concept follows Sadasivan *et al.* (2023). The known distribution of species in the WG follows Nair *et al.* (2021). Measurements and morphological details of all species mentioned in the text are based on specimens in the voucher collection of the TORG and those deposited in the ZSI, Kozhikode, Kerala, India. Field photographs were taken using a Canon 70D Digital SLR camera,

Canon 180 mm macro lens, and MPE 65 f 2.8 1–5x macro lens. Morphological studies were conducted, and measurements were taken using a HEADZ Model HD81 stereomicroscope. The genitalia and anal appendages were dissected, studied under a stereo-zoom microscope, and preserved in glycerol. The illustrations were hand-drawn and digitised by KS. The larvae collected from phytotelmata were photographed, collected using an insect net, reared, allowed to harden for a week, and then preserved in absolute ethanol. The distribution map was prepared using Apple Maps © Apple Inc.

Abbreviations used

AL	Abdominal length, including the appendages
ASL	Above sea level
Ax	Antenodal crossveins
FW	Forewing
FL	Forewing length
HL	Hindwing length
HW	Hindwing
Pt	Pterostigma
Px	Postnodal crossveins
S1–S10	Abdominal segments
SSNI	Standardised Species Nodal Index
TNHS	Travancore Nature History Society
TORG	TNHS Odonate Research Group
WG	Western Ghats
WLS	Wildlife Sanctuary
ZSI	Zoological Survey of India

RESULTS

Systematic account

Genus *Lyriothemis* Brauer, 1868

Type species *Lyriothemis cleis*, Brauer, 1868

Diagnosis of the genus: Vertex with tubercle bifid; eyes contiguous for a moderately long space; prothorax with small posterior lobe; thorax robust; abdomen rather broad, triquetral, of nearly uniform

width, much shorter than HW, base not thickened, segments 2, 3 carinated, segments slightly perfoliate in female, wings broad, especially HW, moderately long, obtusely rounded at tip, Pt moderate; FW with 16–20 Ax, 9–12 Px, first two Px not continuous, cells of lower postcostal area usually more or less bisected towards apex, beyond Pt, triangle rather short, traversed, on a level with that of HW, outer side generally very oblique, followed first by three rows of cells, then by several rows of two, then by three and more, subtriangular space consisting of three cells, sectors of arculus stalked, one supratrangular nervure before triangle, lower basal cell with two or three cross nervures, nodal sector only slightly waved towards base, cells between nodal and subnodal sectors simple, or only last bisected, these sectors, as well as those of arculus, nearly continuous, but towards extremity very strongly curved downwards to hind margin, almost at a right angle, lower sector of triangle nearly as long as upper, slightly and regularly undulating; HW considerably broader than FW, with 12–13 Ax, 10 Px, first two or three Px not continuous, triangle traversed, followed by two rows of cells, its base corresponding with arculus, one supratrangular nervure occasionally present, three or four nervures in lower basal cell; anal appendages of usual libelluline type nearly as long as eighth segment, lower appendage broad, triangular; genitalia with lamina hood shaped, projecting, foliate with very short inner spine, lobe small, ungulate constricted at base (Kirby, 1889; Fraser, 1936).

***Lyriothemis abrahami* Sadasivan, Jose, Nair & Palot, sp. nov.**

LSIDurn:lsid:zoobank.org:act:A25F1985-E013-4332-8D34-24FB764EB87A

(Figs. 1, 2, 3B, C, E, F, 4A, E, F, 5A, C, E)

Material studied:

Holotype: **TORG # 1053:** ♂, Aaralam WLS, Kannur district, Kerala State; 90m ASL; 20. iv. 2025, K. Sadasivan leg., ex. flight, will be deposited at ZSI Kozhikode, Kerala, India, under the accession number ZSI/WGRC/IR/INV.29705.

Paratypes (3 ♂♂ and 3 ♀♀). **TORG # 1054:** ♂,

Ponmudi, Thiruvananthapuram District, Kerala State; 700m ASL; 17. v. 2025; K. Sadasivan leg. ex. flight, will be deposited at National Centre for Biological Sciences (NCBS), Bengaluru, Karnataka, India. **TORG # 1055:** ♂, bearing the same collection details as TORG # 1054, will be deposited in the voucher collection of the TORG, Thiruvananthapuram, Kerala, India. **TORG # 1056:** ♀, bearing the same collection details as TORG # 1054, will be deposited at ZSI Kozhikode, Kerala, India, under the accession number ZSI/WGRC/IR/INV.29706. **TORG # 1057:** ♂ (teneral) and **TORG # 1058:** ♀ (teneral): Pooyamkutty, Ernakulam district, Kerala; 150m ASL; 15. iv. 2025; K. Sadasivan and J. Jose leg., ex larvae, will be retained as voucher specimens in the collection of TORG, Thiruvananthapuram, Kerala, India. **ZSI/WGRC/IR-INV-2659:** ♀ teneral: Anachathapara, Salim Ali Bird Sanctuary, Thattaekkad, Ernakulam District, Kerala, India; 68m ASL; 03. iv. 2013; M.J. Palot leg., deposited at the ZSI Kozhikode, Kerala, India.

Description of the holotype male:

Head (Figs. 2A, B, C, D, E). Labium black, marked with a large yellow spot on antero-superior aspect; labrum, anteclypeus, postclypeus, antefrons yellowish-white, postfrons with squarish patch of metallic dark greenish-black, its sides narrowly yellow; vertex metallic black with metallic blue lustre, with two small sharp tubercles; antennae black; occiput black, suffused with brown posteriorly; labrum, anteclypeus, postclypeus, antefrons, and postfrons medially bearing short brown setae; eyes black with pale yellow-grey patches inferolaterally, dark chestnut-brown dorsally; post-ocular lobe dorsally and posteriorly black, anterolaterally pale yellow with a sharp triangular black extension anteriorly, arising from its thin black posterior border.

Prothorax (Figs. 2A, D, E). Anterior lobe white with a thin black posterior border merging with black middle lobe, whole of posterior lobe black; middle lobe with a pair of paradorsal pale yellow triangular spots; laterally black markings with grey suffusion and a small pale yellow spot on each side.

Synthorax (Figs. 2A, D, E). Black with yellow markings as follows: short, oval antehumeral stripes on mesepisternum not extending halfway up synthorax towards antealar sinus on either side of dorsal carina; large yellow spots on tergum and antealar sinus; mesepimeron with a broad oblong yellow stripe with rounded inferior border, superiorly almost reaching wing base, anterior corner right-angled, posterior angle acutely produced; mesepimeron almost completely yellow with a very thin black border near its anterior suture; legs black, femora with short spines growing progressively longer distally, tibiae with longer black spines near tibiofemoral joint.

Wings (Figs. 3C, E, 4A). Venation as for the genus, HW broad, main veins Riii, IRiii Riv+v, MA curved, hyaline, veins black, bases of FW and HW with mild brown suffusion to the level of arculus. FW with one cubito-anal crossvein, triangle 2-celled, subtriangle 3-celled, discoidal field 3-celled until approximately level of nodus; Pt black, extending 2.5–3 cells, four times longer than wide. HW membranule black-grey, 2 cubito-anal crossveins, triangle 3-celled, supratriangle 12-celled, a well-developed 20-celled anal loop, nodal index of Fw: Ax 17–18, Px 9–10; Hw: Ax 13–14, Px 11–12; SSNI 17.5:9.5/13.5:11.5. Pt black, covering 3–3.5 cells, four times longer than wide.

Abdomen (Figs. 2A, F, G). In dorsal view, thinner than thorax, broadest at S3; ground colour orange-red with each segment delineated with jet-black dorsal, intersegmental and lateral carinal lines; S1 with mid-dorsal crescentic yellow spot, laterally black; S2 black, near its posterior end with a pair of paradorsal triangular orange-brown spots, within it a thin transverse black streak on either side; S3–S7 marked similarly with black dorsal, intersegmental, lateral carinal black lines, rest of segment orange-red, suffused with brown laterally near carina and black colour of each intersegmental line in S5–S8 extending into orange of each segment on their posterior for a variable distance; mid-dorsal black lines spindle-shaped, broader at midsegment, expand as short black transverse streaks near posterior one-fourth of segment; S8 yellow-orange; black dorsal carinal marking wine-glass shaped, black posterior intersegmental border broader

compared to previous segments; S9, S10 black. In ventral view, ground colour yellow, each segment marked thickly with mid-ventral, intersegmental black lines and lateral carinal lines; distal half of each segment faintly suffused with black; distal half of S8–S10 completely black.

Secondary genitalia (Figs. 2C; 4C, E, F; 5A). Hamulus black, pentagonal in anteroventral view, higher than broad, not depressed in center, hamular inferolateral corner right-angled, well-defined, medial border with a distinct insinuation at junction of its inferior and middle thirds; inferior border straight, recurved, posterolaterally directed, blunt, finely trifid tip on inferomedial angle; superomedial angle curved. Genital lobe slender, tip blunt, about 4 times as long as wide, pale yellow-brown.

Vesica spermalis (Figs. 5E, 5F). Vesicle (segment 1) moderately bulged, length slightly shorter than combined length of stem (segment 2) and median segment (segment 3); stem (segment 2) with inner margin rugose and straight, outer margin concave and bears a prominent blunt tooth-like distal extension; median segment (segment 3) of same length as stem (segment 2) with convex outer and inner border; flagellum short, half the length of posterior lobe, meeting in midline (in ventral view); posterior lobe broad and long, almost length of median segment.

Anal appendages (Figs. 2H, I, 4B). Cerci brown-black, slightly longer than twice length of S10, with a terminal black spine on each side extending posterolaterally slightly beyond epiprocts; subapically bearing 6–7 small black blunt ventral teeth. Epiprocts of normal libellulid type, yellow-brown dorsally with lateral borders, tip suffused with brown, bearing two short dorsally directed brown-black spines at caudal end.

Measurements (in mm). AL: 35, FL: 42, HL: 40, Pt: 4.0

Description of the paratype female TORG #1056:

Head. Markings same as in males.

Prothorax. Marked as male, except laterally,

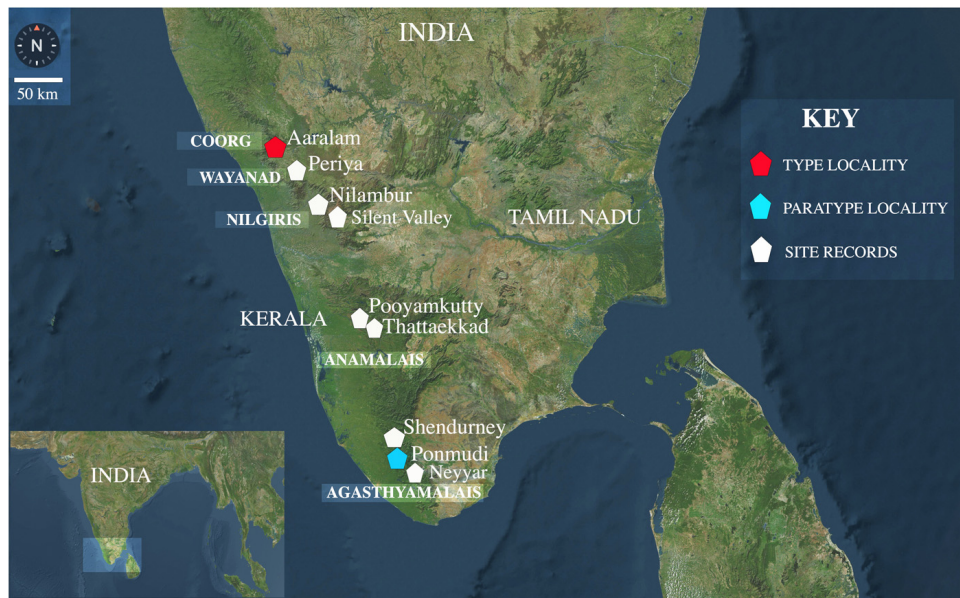


Fig. 1 The site records of *Lyriothemis abrahami* sp. nov. from the Western Ghats of southern India

middle lobe has two small pale yellow spots on each side, instead of one in males.

Synthorax. Similar to that of males, except with yellow markings. Antehumeral stripes on dorsum of mesepisternum long, extending two-thirds up thorax towards antealar sinus on either side of dorsal carina; anterolateral yellow thoracic band as broad as or narrower than black area posterior to it.

Wings (Fig. 3E). Venation as for male, hyaline, veins black, bases of FW and HW with mild brownish suffusion to level of arculus. FW with one cubito-anal crossvein, triangle 2-celled, subtriangle 2-celled, discoidal field 3-celled till a little distal to level of nodus, Pt black extending 2 cells, 4.5 times longer than wide. HW with two cubito-anal crossveins, triangle 2-celled, supratriangle 1-celled, well-developed 20-celled anal loop, nodal index in FW: Ax 16 and Px 9–10; HW: Ax 11–12, Px 10–11; SSNI 16.0:9.5/11.5:10.5; Px 10–11; Pt black, covering 2.5 cells, 4.5 times longer than wide.

Abdomen. In dorsal view, thinner than thorax, broadest at S3; ground colour jet-black, S1 dorsally and inferolaterally yellow, dorsolaterally black; S2 with paradorsal yellow spots, inferolaterally yellow, distolaterally black; S3 with paradorsal yellow spots,

dorsolateral black, anterolaterally yellow; S4–S7 having a pair of paradorsal and lateral yellow triangular spots extending to about middle of segment, paradorsal and lateral spots joined at base in S6–S7, S8–S10 completely black. In ventral view, ground colour yellow, each segment marked thinly with mid-ventral, intersegmental black lines, and lateral carinal lines; distal half of each segment faintly suffused with brown; distal half of S8–S10 black brown.

Vulvar scale (Figs 4D and 5C). Vulvar scale triangular, anterolateral margin straight, posterolateral margin slightly concave, the medial margin notched.

Anal appendages. Cerci brown-yellow basally, distally black; slightly shorter than twice length of S10, with a terminal black pointed spine on each side extending posterolaterally well beyond epiproct. Epiproct basally with a yellow-brown triangular mark on dorsum, with its posterolateral borders yellow; tips bearing pale yellow setae.

Measurements (in mm). AL: 32, FL: 42, HL: 40, Pt: 4.0

Variation. The extent of black markings, especially on the abdomen, varies in males; in some, the

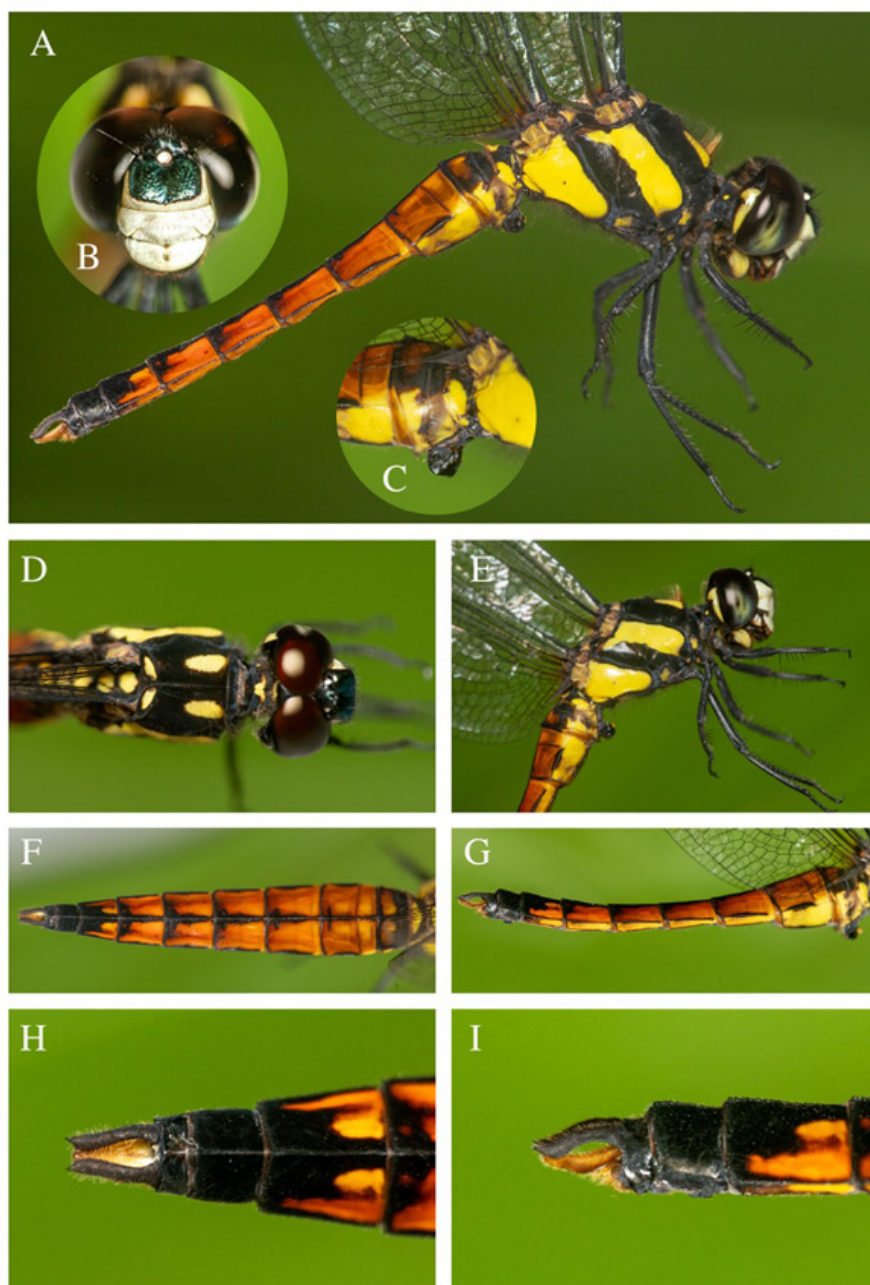


Fig. 2 *Lyriothemis abrahami* **sp. nov.** Holotype TORG # 1053. A–lateral view of the holotype; B–close-up of head; C–lateral view of segment 2; D–dorsal view of head, prothorax and synthorax; E–lateral view of head, prothorax, and synthorax; F–dorsal view of abdomen; G–lateral view of abdomen; H–dorsal view of S8–10, and anal appendages; I–lateral view of S8–10, and anal appendages. © Kalesh Sadasivan

intersegmental lines are thin, while in others, this black extends to a variable distance into the orange of each segment on its posterior part. In heavily marked individuals, the lateral carinal lines are uninterrupted, whereas in less marked individuals, they are interrupted at the intersegmental suture.

With regards to venation, the number of cells in the HW anal loop varies from 17–20, and the extent of Pt from 3–3.5 cells. In females, the colour of dorsal spots on abdomen in S4–S7 varies from deep yellowish-white to bright yellow. The colour of the epiproct may vary from pale yellowish-white to

bright yellow. Teneral are very different in colour (Fig. 3B–E). In terms of venation, the number of cells in the anal loop ranged from 20 to 25. In males, the ante- and postnodal counts may vary, ranging from Ax 17–19, and Px 9–11 in FW and Ax 13–14 and Px 11–12 in HW and females Ax 16–17, Px 9–11 in FW, and Ax 11–13, Px 10–12 in HW. For a detailed description of teneral females, refer to Das *et al.* (2013).

Etymology. The species is named after Dr. Abraham Samuel, a pioneer of odonatology from Kerala, for his contributions to the field and his constant encouragement to the authors. The specific epithet is a noun in the genitive case.

Diagnosis. Males of *Lyriothemis abrahami* **sp. nov.** are identified by the combination of the following characters: two short oval paradorsal streaks on the mesepisternum not extending halfway up the thorax towards the alar sinus; anterolateral yellow thoracic band as broad as or narrower than the black area just posterior to it; in anteroventral view hamule trapezoid, higher than wide; hamular inferolateral angle right-angled and well-defined, medial border with a distinct insinuation at the junction of its inferior and middle third, inferior border straight. The elongated shape of the hamule is a distinct characteristic of the new taxon. Sexual dimorphism is strongly exhibited in *L. abrahami* **sp. nov.**, with the females identified by their jet-black and yellow colour with characteristic triangular yellow streaks on the dorsum of the abdomen and the distinct triangular shape of the vulvar lamina. The new species is endemic to the Western Ghats of Peninsular India, south of Coorg, and its distribution does not overlap with the range of *L. flava*, as far as it is known.

Key to the *Lyriothemis* males of the Indian subcontinent

(excluding Andaman and Nicobar Is., based on Fraser, 1936 and van der Poorten, 2009)

1. Abdomen black, with S2–S5 pruinose bluish white.....*L. mortoni* Ris, 1919
- Abdomen blood-red, more or less marked with

black.....2

2. Nervures Riii, IRiii, Riv+v and MA abruptly curved downwards and then slightly bent basad at their ends.....*L. cleis* Brauer, 1868

– Nervures Riii, IRiii, Riv+v and MA gently curved at their ends.....3

3. Large species with abdomen 30 mm or more in length.....4

– Smaller species with abdomen <30 mm 5

4. Mesepisternum without yellow streaks; inner margin of hamulus distinctly clefted or incised.....*L. bivittata* (Rambur, 1842)

– Mesepisternum with distinct yellow streaks; inner margin of hamulus not clefted or incised, instead may be shallowly insinuated or straight.....6

5. Small species (AL <20 mm); antehumeral stripes broad above, narrow below, and sides with yellow largely obscured.....*L. acigastra* (Selys, 1878)

– Medium-sized species (AL 26 mm); antehumeral stripes broad all along; sides with yellow stripes and spots.....*L. defonsecai* van der Poorten, 2009

6. Paradorsal streaks on mesepisternum long, extending more than half the way up the synthorax towards the alar sinus; anterolateral yellow thoracic band broader than the black area just posterior to it; in anteroventral view hamule rectangular, broader than high, depressed in the centre, inferolateral angle rounded, medial, inferior border straight.....*L. flava* Oguma, 1915 (= *L. tricolor* Ris, 1916)

– Paradorsal streaks on mesepisternum short, extending halfway or less up the synthorax towards the alar sinus; anterolateral yellow synthoracic band as broad as or narrower than the black area just posterior to it; in anteroventral view hamule pentagonal, higher than broad, not depressed in the centre, hamular inferolateral corner right-angled and well-defined, medial border with a distinct insinuation at junction of its inferior and middle third, inferior border straight..... *L.*

abrahami Sadasivan, Jose, Nair & Palot, **sp. nov.**

Distribution: The new species is rare and inhabits semi-evergreen forests, moist deciduous forests, West-coast Evergreen forests, Myristica Swamps, and Subtropical Evergreen forests at elevations of 50–1000 m ASL in Kerala and Karnataka in the southern and central Western Ghats of Peninsular India (Fig. 1). The flight period, based on our observations and fieldwork spanning the last 12 years, is April to December. The regional site records are Kallar Valley (200m ASL), Ponmudi Hills (800–1000m ASL), and Neyyar WLS (500m ASL), in Thiruvananthapuram District, Kerala, and Shendurney Wildlife Sanctuary (50m ASL), Kollam District, Kerala, from Agasthyamalai landscape; Edamalayar-Pooyamkutty Valley (10m ASL) from Lower Periyar landscape; Nilambur (150m ASL), Malappuram District, Kerala, and Silent Valley (900–1000m ASL), Palakkad District, Kerala, in Nilgiri landscape; Periya (550m ASL), Wayanad District, in Wayanad landscape; Aaralam Wildlife Sanctuary (50m ASL), Kannur District, Kerala (Palot and Kiran 2016), and Kakkabe near Madikeri (1100m ASL), Coorg District, Karnataka (KS, per. obs.), in Coorg landscape.

Note on behaviour: In India, *Lyriothemis flava* and *L. bivittata* are reported from heavy jungles near marshes (Fraser 1936). Males are encountered perched on vegetation near phytotelmata, guarding tree holes. They fly when disturbed and return to the same or nearby perch. Females oviposited in the afternoons (Fig. 3F), while males were seen perched and guarding the tree holes (Fig. 3A). We have successfully raised larvae of *L. abrahami* **sp. nov.** collected from phytotelmata and studied their behaviour and ecology since 2022. Larvae of *L. cleis*, *L. magnificata*, and *L. flava* have been reported from phytotelmata (Orr 2003, 2005; Lieftinck *et al.*, 1984). The finer details, including results of phylogenetic analysis, larval morphology, and ecology, will be published elsewhere (in prep.).

DISCUSSION

Notes on previous records of ‘*Lyriothemis tricolour*’ from WG:

The range extension of *L. flava* to the WG was first reported by Das *et al.* (2013) as *L. tricolor* based on the morphology of the larvae, exuvia, and teneral female. The description of the female in Das *et al.* (2013) was based on a teneral specimen, with identification following Fraser (1936). Based on our study of female teneral specimen ZSI/WGRC/IR-INV-2659 used in Das *et al.* (2013) available in ZSI Kozhikode, we confirm that the species mentioned in Das *et al.* (2013) is indeed *L. abrahami* **sp. nov.**, and the lack of male specimens for examination probably led Das *et al.* (2013) to conclude it was *L. tricolor*; even though the larvae they described had some morphological differences from *L. tricolor*. The mature adult female is a very different insect, predominantly black and marked with yellow, compared to males. The new species is sexually dimorphic, with females lacking reddish-orange on the abdomen.

The species groups of *Lyriothemis* of the Western Ghats:

Four species groups were assigned by Ris (1919). Group 1 is characterised by narrow wings, a short and blunt anal loop, many cubital nervures in both wings, and elongated hamules extending horizontally. Group 2 has broader hindwings, longer anal loops, fewer cubital nervures in the forewings (only two), and a discoidal field in the forewings that is wide at the margin. The hamules are similar to those of the next group, but the anterior lamina is distinct. Group 3 is characterised by broad hindwings, a well-developed anal loop, curved main veins (Riii, IRiii Riv+v, and MA), and broader, bowl-shaped hamules. Group 4, the Sino-Japanese group, has broad hindwings, a well-developed anal loop, few cubital nervures, main veins that are not recurved, longer genital lobes, and longer, more angular hamules with a prominent inner yellow membrane. van der Poorten (2009) stated that *L. flava*, *L. cleis*, and *L. bivittata* belong to Group 3, while *L. mortoni*, *L. defonseikai* and *L. acigastra* are assigned to Group 4. *Lyriothemis abrahami* **sp. nov.** fits into Group 3 with its broad hindwings, well-developed anal loop, curved main veins (Riii, IRiii, Riv+v, and MA), and broad hamules.

The description of *L. abrahami* **sp. nov.** brings



Fig. 3 *Lyriothemis abrahami* **sp. nov.** in life. A—mature male from Shendurney Wildlife Sanctuary © Kalesh Sadasivan; B—lateral view of a teneral male © Jebine Jose; C—dorsal view of a teneral male © Jebine Jose; D—lateral view of a teneral female © Jebine Jose; E—dorsal view of a teneral female © Jebine Jose; F—female ovipositing in a phytotelma © Jebine Jose. (B–E, reared from the larvae collected in Pooyamkutty, Ernakulam District, Kerala)

the total number of odonates in Kerala to 191, with 78 endemics. With its wide distribution across all landscapes and elevations, examination of museum specimens, it is concluded that the historical records of *L. flava* (= *L. tricolor*) from Kerala and the

WG, are of *L. abrahami* **sp. nov.** The discovery of *L. abrahami* **sp. nov.**, which was misidentified in previous studies from the region because of its superficial resemblance to *L. flava*, reiterates the need for careful study of the morphology of odonates, which may be further supported by

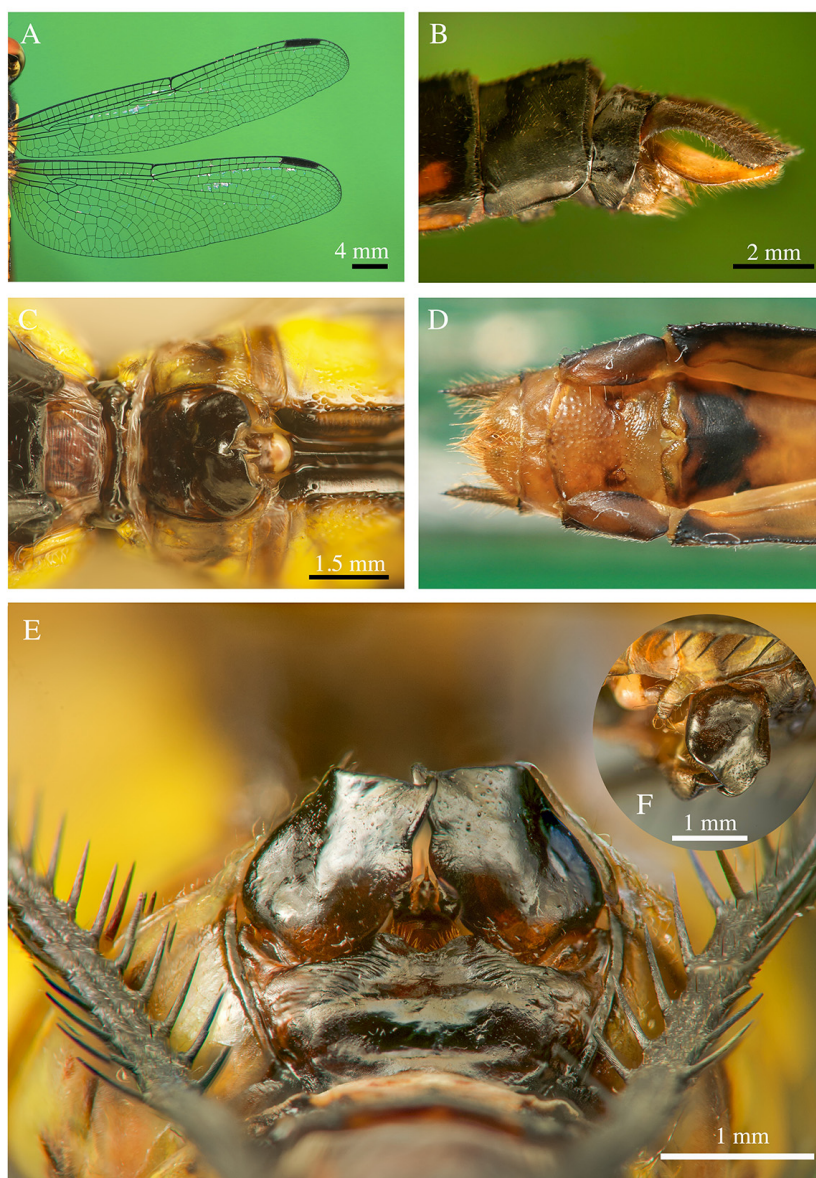


Fig. 4 *Lyriothemis abrahami* **sp. nov.** A–venation of male TORG # 1053 © Kalesh Sadasivan; B–lateral view of male S10 and appendages TORG # 1053 © Kalesh Sadasivan; C–genital fossa of male TORG # 1053 © Kalesh Sadasivan; D–ventral view of female terminal segments showing the vulvar scale © Jebine Jose.; E–inverted anteroventral view of male hamules © Kalesh Sadasivan; F–lateral view of male hamule TORG # 1053 © Kalesh Sadasivan

phylogenetic and larval studies. An integrated approach to taxonomy is needed for the careful species delimitation and description of odonates.

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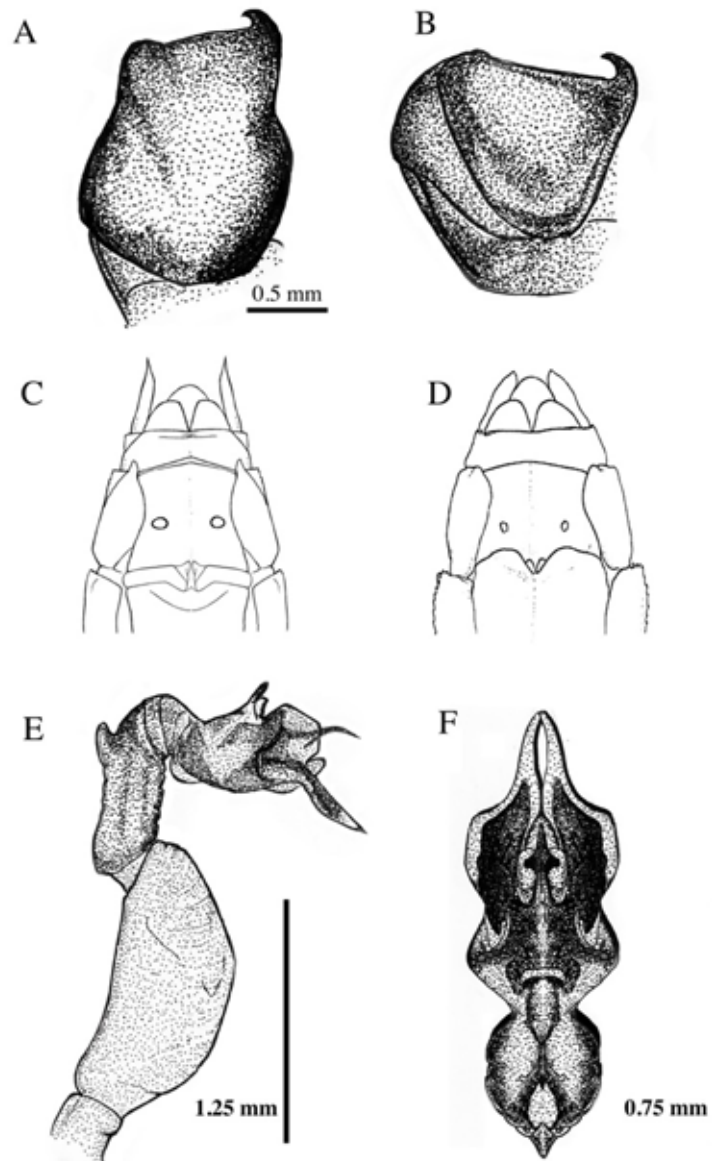


Fig. 5 Comparative illustrations of male and female genitalia of *Lyriothemis abrahami* **sp. nov.** (A, C, E) and *L. flava* (B, D, F). A—hamules of *L. abrahami* **sp. nov.** based on holotype TORG # 1053; B—hamules of *L. flava* redrawn from Kompier (2017) (not to scale); C—vulvar scales of female *L. abrahami* **sp. nov.**; D—vulvar scales of female *L. flava* Oguma, 1915 redrawn from Ozono *et al.* (2021); E—lateral view of vesica spermalis of *L. abrahami* **sp. nov.**; F—dorsal view of segments 3 & 4 of vesica spermalis of *L. abrahami* **sp. nov.** © Kalesh Sadasivan

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