https://doi.org/10.3337/entomon.v49i1.1033
ENTOMON 49(1): 01-14
Article No. ent. 49101

Redescription of *Pomponia cyanea* Fraser, 1948 (Hemiptera, Cicadidae) from the Western Ghats, with a note on its junior synonym *P. zebra* Bliven, 1964, *syn. nov.*, and *Terpnosia polei* (Henry, 1931), from Sri Lanka

Kalesh Sadasivan[1,2*], Anzil Shereef[1,3] and Mick Webb[4]

[1]*Travancore Nature History Society, Jyothis, Mathrubhumi Road, Vanchiyoor, Thiruvananthapuram 695035, Kerala, India.*
[2]*Greeshmam, BN439, Bapuji Nagar, Thiruvananthapuram 695011, Kerala, India.*
[3]*Chandini, Padinjattekizhakku, Sooranad, Kollam 690522, Kerala, India.*
[4]*Department of Life Sciences, The Natural History Museum, London, UK.*
Email: kaleshs2002in@gmail.com; anzilshereef77@gmail.com; m.webb@nhm.ac.uk

ABSTRACT: *Pomponia cyanea* Fraser, 1948 from the southern Western Ghats, of peninsular India is redescribed based on the types and fresh specimens with additional data on distribution, morphometrics, and structure of male genitalia. The validity of *P. zebra* Bliven, 1964, originally described from the Anamalai Hills is discussed. A study of fresh specimens and holotype images of *P. zebra* revealed no difference in general morphology, wing venation, or structure of male genitalia so as to separate it from *P. cyanea*, and hence *P. zebra* is treated as a junior synonym of *P. cyanea* Fraser, 1948, **syn. nov.** The taxonomic status of *Terpnosia polei* (Henry, 1931) from Sri Lanka is revised based on male morphology and is transferred to its original genus as *Pomponia polei* Henry, 1931, **comb. nov.** A key to males of known species of *Pomponia* of Western Ghats is provided.

KEY WORDS: Cicada, Auchenorrhyncha, Psithyristriini, Kerala, morphometric index

INTRODUCTION

The genus *Pomponia* Stål, 1866 is a speciose group of cicadas distributed in the Oriental and Palearctic regions (Pham *et al.,* 2015). Ten species of *Pomponia* have been recorded from the Indian territory (Price *et al.,* 2016). Of these, *P. cyanea* Fraser, 1948; *P. zebra* Bliven, 1964; and *P. linearis* (Walker, 1850) were reported from the Western Ghats of Peninsular India (Distant 1906; Price *et al.,* 2016). Sadasivan (2021), established that the records of *P. linearis* from the Western Ghats, were erroneous, and this species in south India was an undescribed one and was recently described as *P. pseudolinearis* Sadasivan 2021. *Pomponia cyanea* Fraser, 1948, was collected by F.C. Fraser from Coorg (Karnataka State) and Munnar Hills (Kerala State), in the Western Ghats. The original description was very brief and there was no information on the structure of the male genitalia. *Pomponia zebra* Bliven, 1964, was a species described from Kadamparai, in Anamalai Hills, Madras State (Tamil Nadu), just north of Munnar (type locality of *P. cyanea*).

* Author for correspondence

During the field survey of *Pomponia* in the Anamalai Hills, collected specimens from type localities of *P. cyanea* and *P. zebra*. A careful analysis of the morphology of type specimens of the two taxa, and that of fresh field specimens collected, revealed no character to separate them, and thus the two species are here synonymised. *Pomponia cyanea* is redescribed based on fresh male specimens with additional data on morphometrics and male genitalia. During our study, it was noted that the holotype of *Terpnosia polei* (Henry, 1931) from Sri Lanka was similar in appearance to *P. cyanea* and subsequent examination indicated that the former should be returned to its original genus, *Pomponia*.

MATERIALS AND METHODS

Three morphotypes of *Pomponia* were collected from the Anamalais and Agasthyamalais in the Western Ghats of Kerala State, in southern India (Fig. 1). The taxon from the low elevation (< 1200 m ASL) was described as *P. pseudolinearis* Sadasivan 2021. Of the high elevation morphotypes collected from near Valparai and high ranges of Munnar, some individuals matched the description of *P. zebra,* while others matched with that of *P. cyanea*. A detailed study of the internal morphology and morphometrics of the specimens was done, and compared with the holotypes and paratypes at the Natural History Museum, London (BMNH) London, and the California Academy of Sciences (CAS), California. Photographs were taken with a Canon 7D Digital SLR, Canon 180 mm macro lens, and MPE 65 f 2.8 1–5x Lens. The morphology was studied and measurements were taken with a HEADZ Model HD81 stereomicroscope.

Terminology for description follows that of Moulds (2005). The taxonomy and placement follows Hill *et al.* (2021) and Dmitriev *et al.* (2021). Morphometric measurements follow Sarkar (2019) and Sadasivan (2021). Illustrations were hand-drawn by KS using the stereomicroscope and then digitalized. The orientation of spines is referred to as 'erect', 'semi-erect', 'semi-decumbent', 'decumbent', and 'appressed'. The male genitalia was studied in-situ for the type specimens, and for detailed illustrations, they were dissected and treated with 10 per cent KOH overnight and later preserved in glycerol. The original descriptions, specimens, and field photographs were analysed for comparison.

Measurements (in millimetres taken in the dorsal view, unless specified) and indices used in descriptions as per Sadasivan (2021) are as follows–

HL—Head length; length of the head in the midline from the anterior-most point of the postclypeus to the mid-posterior margin of the head, measured dorsally.

HW—Head width; width of the head including the compound eye, measured between the lateral-most points of convexity of the compound eye in dorsal view in the transverse plane.

EL—Eye length in dorsal view.

PL—Pronotum length at the mid-dorsal line.

PW—Pronotum width; maximum width, measured in dorsal view.

ML—Mesonotum mid-dorsal length to the cruciform elevation, in dorsal view.

MW—Mesonotal width.

FWL—Forewing length; the maximum expanse of the forewing from its medial most attachment to the mesonotum to the most convex part of its apex.

FWW—Forewing width; distance between the node and the tornus across the forewing.

HWL—Hindwing length; the maximum expanse of the hindwing from its medial most attachment to the mesonotum to the most convex part of its apex.

AL—Abdomen length; mid-dorsal length of the abdomen measured from the posterior-most point on the cruciform elevation to the tip of the pygofer or anal style, whichever is the farthest, in the freshly killed insect.

AW—Abdomen width; the maximum width measured in the transverse plane in dorsal view, in the freshly killed insect.

OPL—Operculum length, in lateral view.

RL—Rostrum length.

ABL—Anterior body length; length of the

specimen from the anterior tip of postclypeus to the posterior of scutellum in the midline, HL + PL + ML.

TL—Total Length; HL + PL + ML + AL.

CI—Cephalic Index; (HW/HL) × 100.

OI—Ocular Index; (EL/HW) x 100.

PI—Pronotal Index; (PW/PL) × 100.

MI—Mesonotal Index; (MW/ML) × 100.

OPI—Opercular Index; (OPL/ABL) × 100.

API—Anteroposterior Index; ABL/AL × 100.

RI—Rostral Index; (RL/ABL) × 100.

FAR—Forewing Aspect Ratio; high aspect ratio indicates long, narrow wings and a low aspect ratio indicates short, wide wings (FWL/FWW) × 100.

FI—Forewing Index; (FWL/ABL) × 100.

IWR—Inter-Wing Ratio; (FWL/HWL) × 100.

GI—Gastral Index; AW/AL x 100, high index value indicates a relatively wider abdomen.

RESULTS

Systematics

Family Cicadidae Latreille, 1802; **Subfamily** Cicadinae Latreille, 1802; **Tribe** Psithyristriini Distant, 1905

Genus *Pomponia* Stål, 1866

Diagnosis. Vertex of head narrower and somewhat equal to the distance between eyes; posterior pronotal collar broad; broad pale transverse band across the postclypeus; lateral margin of pronotum dentate. Wings hyaline; forewing basal vein of apical cell 1 extremely short; forewing apex sharp; costal margin of forewing hardly concave. Metanotum entirely concealed at the midline. Male operculum small, scale-like; male opercula wider than long and nearly contiguous to each other; male operculum broader than long, nearly touching each other. The larger part of the timbal concealed with the timbal covering. Large-sized, male body longer than 35mm; male abdomen gradually tapering to apex; lateral surfaces of male 3rd and 4th abdominal sterna without tubercle-like projections; male 8th abdominal tergum with no or little white pollinosity. Acute lateral pygofer lobes, a trapezoid uncus with medial incision suggesting the fusion of two short, broad lobes, and a pair of claspers, each with two spines protruding from below the uncus and distinctly protruding paramedian basal pygofer lobes or lobes that are placed laterally adjacent to the sides of the pygofer (Distant, 1906; Lee and Hayashi 2003; Duffels and Hayashi 2006; Pham *et al.,* 2015).

Pomponia cyanea Fraser, 1948 (Figs. 2–7)

Pomponia cyanea Fraser, 1948: 184–185 (Original Description); Duffels & Hayashi 2006: 197 (brief note on species group and male genitalia).

Material examined (type locality of *P. cyanea*) (n = six males). Three males, Rajappara, Munnar, Idukky District, Kerala, May 2019, 1800m ASL, THRG 0035 (Coll. Kalesh Sadasivan); Two males, Mangulam Reserve Forest, Idukki District, Kerala, 900 m ASL May 2022 (KS); and one male, Shantanpara, Idukky District, Kerala, 1200 m ASL, 19th May 2012 (Coll. Prathapan K.D). Two male specimens each will be subsequently deposited in National Centre for Biological Sciences, Bengaluru, Karnataka, and Zoological Survey of India, Calicut, Kerala.

Fresh material collected from Anamalai Hills (type locality of *P. zebra*): 4 Males, Valparai slope of High Range, Munnar, Idukky District, 2200m ASL, May 2022 (KS).

Type specimens studied: Five males. BMNH (E) #1009395, BMNH (E) #1009396**,** BMNH (E) #1009397, BMNH (E) #1009398 **(**all male syntypes of *P. cyanea*) Munnar, Anamalai Hills, Travancore (Coll. Fraser F.C.,1933), and BMNH (E) #1009394 male, Munnar, Anamalai Hills, Travancore (Coll. Fraser F.C., date of collection unknown).

Field observations (Not collected). *Agasthyamalais*: 5 males and 3 females, Shendurney Wildlife Sanctuary, Kollam District, 1200m ASL, May 2018 (KS & AS). *Anamalais:* 15 males and 3 females, Pampadum Shola National Park, Idukky District, 2300 m ASL, May 2019 (KS & AS); 5 males and 3 females, Eravikulam National Park, Idukky District, 2200 m ASL, May 2019 (KS

& AS); 6 males and 2 females, Shantanpara, Idukky District, Kerala, 1300m ASL May 2019; 3 males and 2 females (KS & AS); Mangulam Reserve Forest, Idukky District, Kerala, 900m ASL May 2022 (KS); 3 males, Valparai slopes, Eravikulam National Park, Idukky District, 2200m ASL, May 2019 (KS & AS).

Measurements from fresh material collected from Anamalai Hills from the type locality of *P. cyanea*): Males (n=six): FWL–50.75±5.06; FWW–16.50±1.29; HWL–27.75±2.22; HL–3.13±0.63; HW–9.75±0.96; EL–2.94±0.13; PL–4.88±0.25; PW–13.50±1.00; ML–10.00±0.82; MW–10.50±1.29; AL–24.50±2.52; AW–16.75 ±2.06; OPL–6.44±0.66; RL–11.00±1.41; ABL–18.00±1.47; TL–42.50±3.54; CI–317.08±37.28; OI–30.29±2.48; PI–276±6.67; MI–105.05±10.07; OPI–40.5±6.17; API–73.85±7.19; RI–61.32±8.75; FAR–307.61±19.80; TI–282.69±29.02; IWR–182.70±4.95, GI–68.41±5.49.

Measurements from fresh material collected from Anamalai Hills near the type locality of *P. zebra*: Males (n=2 males): FWL–50.75±5.06; FWW–16.50±1.29; HWL–27.75±2.22; HL–3.13±0.63; HW–9.75±0.96; EL–2.94±0.13; PL–4.88±0.25; PW–13.50±1.00; ML–10.00±0.82; MW–10.50±1.29; AL–24.50±2.52; AW–16.75 ±2.06; OPL–6.44±0.66; RL–11.00±1.41; ABL–18.00±1.47; TL–42.50±3.54; CI–317.08±37.28; OI–30.29±2.48; PI–276±6.67; MI–105.05±10.07; OPI–40.5±6.17; API–73.85±7.19; RI–61.32±8.75; FAR–307.61±19.80; TI–282.69±29.02; IWR–182.70±4.95, GI–68.41±5.49.

Description of the male (Figs. 2–7)

Head (Figs. 2–3, 6–7). In dorsal view, head is small, triangular, postclypeus anterior margin rounded, but not prominently protruding anteriorly; head much wider than long (CI–317.08±37.28); head bright green with brown markings; ocelli bright pink and ocular tubercles surrounding the ocelli greenish-brown; distance between lateral ocelli and medial margin of eyes twice the distance between the two lateral ocelli; postocular long golden hairs present, medial part of epicranial suture brown and its anterior arms inconspicuous; eyes dark amber brown; pedicel and rest of the flagellum amber brown; frons green; supra-antennal plate dark greenish-black; frontoclypeal suture bordered with brown; dorsum of postclypeus dark green with transverse rudimentary dark greenish-black lines in the transverse grooves. In anterior view, eyes prominent, its inferior edge bordered in chrome yellow; scape of antenna greenish-brown; postclypeus squarish, swollen, and its inferior aspect triangular and tapering towards the anteclypeus; postclypeus fully green without any broad pale greenish-yellow transverse band; genae turquoise green; groove below supra-antennal plate green; lorum yellowish green; anteclypeus wholly green with its basal tip yellow; whole of the rostrum bluish-white with the brown central groove and distal-most tip (one-eighth) black; labrum bordered with brown and mentum tipped with brown; labium pale brown with median groove dark brown, rostrum reaches distal border of sternite I, at the level of the distal margin of the operculum (RI–61.32±8.75).

Pronotum (Figs. 2–3, 6–7). Pronotal width almost thrice its length (PI–276±6.67); lateral margin of pronotum dentate; lateral angle of pronotal collar broad and rounded and its postero-lateral margin well-developed; rest of the collar thinner. The anterior borders of pronotum with the head bear a thin dark greenish-black band, which joins median hourglass-shaped green mark; paramedian and lateral pronotal lobes prominent and coloured bluish-green. The general colour of the pronotum is dark green; paramedian and lateral fissures not conspicuously marked; ambient fissure marked in black; the pronotal collar green, the region of the lateral spine greenish-brown, a small median black line on the dorsum present as a continuation of the hourglass mark.

Mesonotum (Figs. 2–3, 6–7A, B). In dorsal view, the mesonotum is marginally wider than its length (MI–105.05±10.07); submedian sigillae (ssig), bluish-green to violet-blue with regular borders, much shorter than half of the length of the mesonotum, black, and bordered with dark brown laterally; lateral sigillae (lsig) greenish-blue, with regular borders, and distal end reaches the anterior arms of the scutellum; distal ends of sigillae are not

Fig. 1 Map showing the type locality and spot records of *Pomponia cyanea* and *P. zebra* from the Western Ghats

connected; scutal depression is black and this region has prominent golden pilosity; (scutellum) sap green and lateral depressions greenish-blue. In ventral view, green with pollinosity mostly in the mid-ventral aspect; meracanthus (mc) very short and reaches distal border of hind coxae; wing grooves and postero-lateral aspect of mesonotum are turquoise blue.

Operculum (Fig. 3C). Broad, short (OPI–40.5±6.17), almost semi-circular with the medial margin angulated; operculum does not meet the opposite one; distally it reaches the sternite posterior margin of II. Colour is light opalescent green with pollinosity on its surface.

Wings (Figs. 2, 4A, 7A). Wings hyaline, forewing long and apex sharp; transparent with an amber tint all over, with infuscations as follows – basal veins of all apical segments except distal half of spaces 3, 6, and 8; at nodal line intersection and intersections of CuA_2; distal half of all veins RA_2, RP, M_1–M_4 and CuA_2; Pterostigma and wing margins faintly infuscated; veins bordering the clavus and cubital cell of forewing line by red; rest of the veins yellow, but lined in black around the joints; anterior wing margin till the node is dark bluish brown to black. Hindwing with 6 apical spaces; and 10 minor transparent veinlets/folds in the anal lobe space between veins 3A and 2A on magnification.

Legs (Figs. 3D, 7A, C). Forelegs with coxae dark green; femur pale green with black lower third; primary (long, blunt-tipped almost appressed to the femoral surface) and secondary spines (long as the primary, but sharp) present and small spine one-third of the primary spine present distal to secondary spine; tibiofemoral joint black, tibia shiny black; meso-metatarsus, pretarsus, and claws black; middle legs with same color scheme as forelegs; hind legs with coxae paler green, femur greenish; upper tibia black and rest of it pale green; tibiotarsal joint region very pale brown; tibial spines and combs brown; claws black at the tip.

Abdomen (Figs. 2, 3A, D, 6, 7A). Slightly longer than head and thorax put together (API–73.85±7.19); widest at the distal end of the sternite II; sides uniformly tapering till 8; color bright greenish-blue to blue with posterior third of each segment thinly lined with black and the adjoining part of the tergite violet-blue for about its distal third.

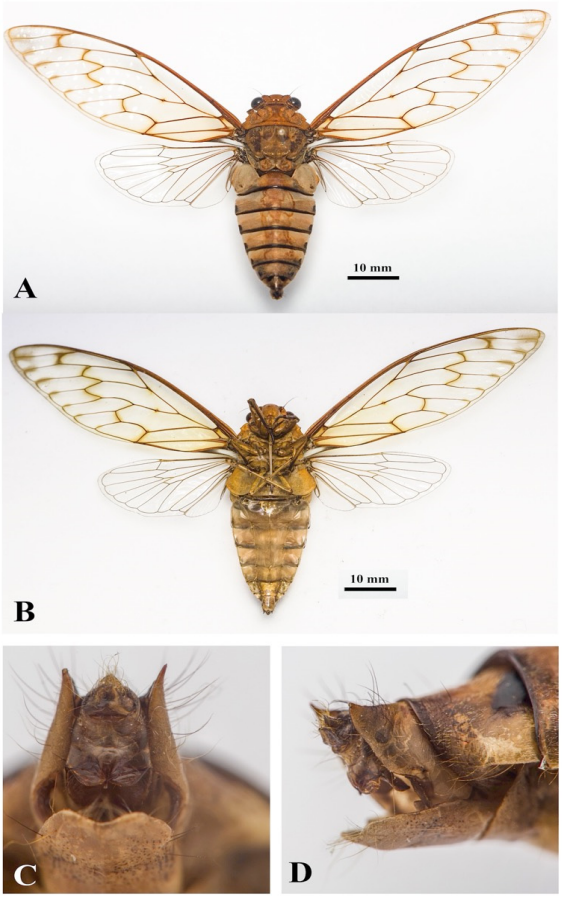

Fig. 2 *Pomponia cyanea* Fraser, 1948 male from the type locality Munnar, Anamalais. A–dorsal view of pinned insect; B–ventral view of pinned insect; C–ventro-posterior view of anal appendage; D–lateral view of the anal appendage. Images by Kalesh Sadasivan

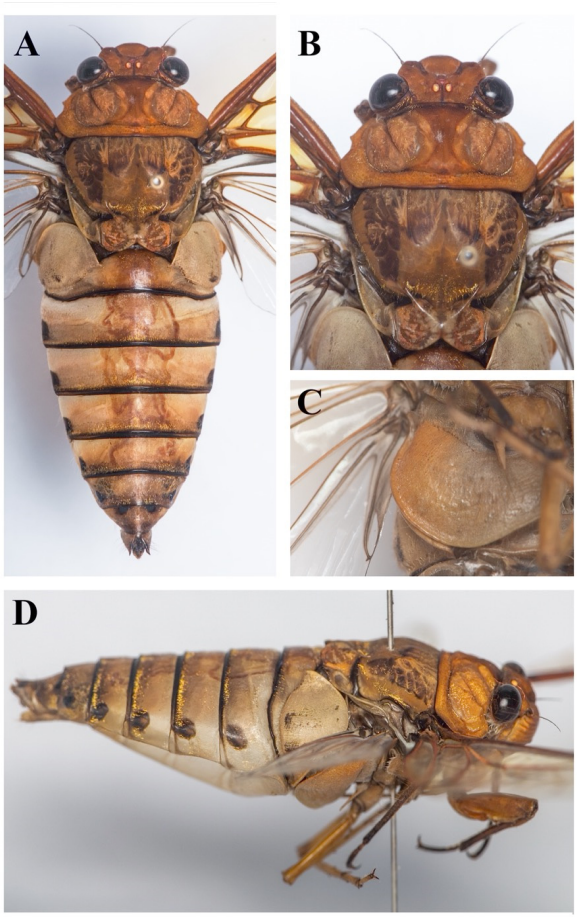

Fig. 3 *Pomponia cyanea* Fraser, 1948. Images of dry pinned insect from the type locality Munnar, Anamalais. A–dorsal close-up of the head and body; B–dorsal close-up of the head, pronotum, and mesonotum; C–ventral view of operculum; D–lateral view of the body. Images by Kalesh Sadasivan

The middle third violet-blue; anterior aspect of each segment on its mid-dorsum has a thin violet-blue transverse margin, which is thicker mid-dorsum. On the second and third tergite, the anterior and posterior violet margins are linked by a central dorsal band, which is thick in segment 2 and much thinner in segment 3. All tergite bears on its dorsolateral aspect a small dark violet-blue spot, this may be absent in some specimens on the basal segments. No tubercles.

Genitalia (Fig. 5). The lateral lobe of the pygofer acute, with the apex sharp and directed posteriorly, its inferior margin irregularly curved; pygofer near the apex bears sparse hairs; medial lobe of the uncus trapezoid with a median incision at its tip suggests a fusion of lobes, tip notched at the exit of the aedeagus; clasper protruding from below uncus broad rounded; upper basal lobe of pygofer well-developed and prominent than basal lobes; distinctly protruding short paramedian pygofer basal lobes with apices directed posterolaterally; gutter between the lower basal lobes on each side is U-shaped, deep and divergent (Fig. 5A); aedeagus thick with its proximal half wider, rest is gently curved, tapering finely to its tip. Basal plate as shown in figure 8D. On, the dorsal view the apex of the lateral lobe of the pygofer reaches height of anal styles;

dorsal beak is well-developed and extends as a small lingula (Fig. 5D).

Variation. There was significant variation in the size and color of the specimens studied. While some were bright blue, others were turquoise green (Figs. 6A–D). Dry preserved specimens had shades of browns instead of blues (Fig. 2). The total length of the insect varies with a range of 42.00±4.34 mm. The wing lengths were slightly variable (FWL–50.75±5.06), while the rostral lengths were relatively constant (RL–11.00±1.41). The dorsal beak of the lateral pygofer lobe in male genitalia is well-developed as a lingular extension, but the length may vary.

Current distribution. Coorg, Karnataka (Fraser 1948); Munnar (Fraser 1948), Mangulam Reserve Forest, Idukky District, Kerala, 900m ASL May 2022 (KS). Eravikulam (KS & AS), Mathikettan Shola National Park (KDP), Pampadum Shola National Park (KS & AS), in Idukky District Kerala, Shendurney Wildlife Sanctuary, Kollam District, Kerala (KS & AS); Valparai and Indira Gandhi Wildlife Sanctuary, Tamilnadu (KS & AS). Hence, the species is endemic to the Western Ghats South of Coorg (Fig. 1).

Ecological Notes. The species is a resident of the temperate sholas and subtropical evergreen forests of the southern Western Ghats (600–2300m ASL). They call mostly throughout the day, especially when overcast and the sun is down. The calls come as crops and the individuals may be seen moving from one tree trunk to another as a loose group inside the sholas. They seem to be present on tree trunks from the base up to 8–10m. The single call is a quick crescendo followed by a series of notes in decrescendo.

Remarks on the synonymy of *P. zebra* Bliven, 1964 (Fig. 9)

Pomponia zebra Bliven, 1964: 99–100, Fig. 6 (Original Description); Sanborn (2014): 349 (mentions about the type material listed); Price *et al.* 2016: 94 (Type locality and distribution in Southern India).

Material examined (from images)**:** Holotype *Pomponia zebra* Bliven, 1964, CASTYPE13809, labeled 'S. India, Madras State, Anamalai Hills, Kadamparai 3000'. P.Susai Nathan, v. 63'.

Pomponia cyanea Fraser, 1948, was described from Coorg (Karnataka State) and Munnar Hills, Travancore (Kerala State), in the Western Ghats, with a very brief original description, and with no details about the structure of the male genitalia. *Pomponia zebra* Bliven, 1964, was described from Kadamparai, in Anamalai Hills, Madras State (Tamil Nadu). The type locality of the latter is just north of Munnar (type locality of *P. cyanea*) in the same landscape (Fig. 1). This species has not been reported since its very short original description and vague illustration of the male genitalia in Bliven (1964). Comparison of original descriptions of *P.*

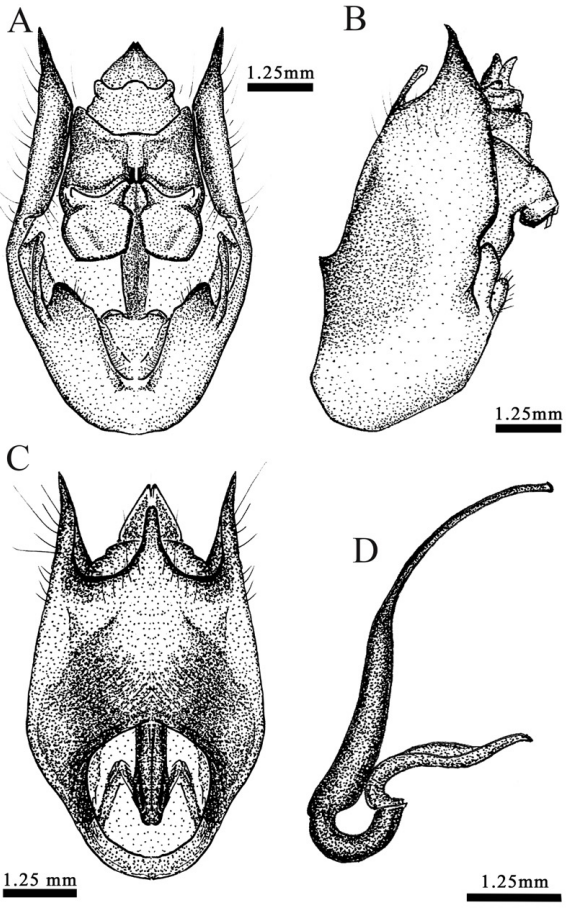

Fig. 4 *Pomponia cyanea* Fraser 1948, male genitalia treated with 10% KOH overnight, cleaned, and preserved in glycerol, darker shades represent sclerotized parts. A–ventroposterior view; B–lateral view; C–dorsal view and D–close-up of aedeagus. Illustration by Kalesh Sadasivan

Table 1. Comparison of morphometric characters of *P. zebra* based on Bliven (1964) and study of type specimens and *P. cyanea* based on Fraser (1948) as well as fresh specimens from the field

No.	Character	*P. cyanea*	*P. zebra*
1	Size (TBL) mm	36.50–47.00	42.00–45.00
2	Head Width (HW) mm	8.00–11.00	10.25
3	Forewing length (FWL) mm	45.00–57.00	57.00
4	Forewing width (FWW) mm	15.00–18.00	17.00
5	Cephalic Index (CI)	275.00–360.00	360.00
6	Ocular Index (OI)	27.27–33.33	27.77
7	Pronotal Index (PI)	266.67–280.00	260.00
8	Mesonotal Index (MI)	90.00–111.11	110.00
9	Opercular Index (OPI)	27.27–33.33	27.77
10	Anteroposterior Index (API)	66.00–83.33	70.00
11	Rostral Index (RI)	51.43–72.73	57.14
12	Forewings (FAR)	288.89–335.29	329.80
13	Tegmen Index (TI)	257.14–316.67	300.00
14	Inter-Wing Index/Ratio(IWR)	179.31–190.00	184.21
15	Gastral Index (GI)	62.96–76.00	64.00

zebra in Bliven (1964) and *P. cyanea* from Fraser (1948), they appeared to be very similar in most aspects. Moreover, both species were described from the same mountain range, elevation, and habitat, which demanded revalidation with the comparison of types and the structure of male genitalia.

According to Bliven (1964), *P. zebra* differs from *P. cyanea by* the following features 'larger size', 'normally sized head', 'strongly dentate margins of pronotum', 'remarkably narrow forewings', and 'white banded abdomen'. On careful study of the types and freshly collected specimens we found that the morphometrics of *P. zebra* falls within the range for those of *P. cyanea* (Table 1). The head is relatively of the same size range, forewings are narrow and long in both and the abdomen has each segment base marked with a white pruinose fascia, which is variable amongst individual specimens in its strength, and fades on preservation. Detailed comments are given below.

Head: As per the original description by Bliven (1964), *P. zebra* has a head including eyes subequal in width to the base of the mesonotum, while *P. cyanea* has it small and much narrower than the base of the thorax (prothorax), as seen in Fig. 1 in Fraser (1948), but the Travancore population of *P. cyanea* has relatively larger head than Coorg ones as per Fraser (1948). The original description (OD) states that the "head is very small, much narrower than the base of the thorax and quite out of proportion to the rest of the body". In the type specimens, of both *P. zebra* and *P. cyanea* in our examination, the width of the head including the eyes is smaller than the width of the base of the mesonotum, and the lateral border of the eyes reaches short of the level of the lateral margin of the lateral lobes of the pronotum on a dorsal view (Fraser, 1948). The rostrum extends well beyond the posterior coxae in *P. cyanea,* the extent of the rostrum is not mentioned in the OD of *P. zebra.* However, the examination of types at CAS revealed

Fig. 5 *Pomponia cyanea* Fraser, 1948, field images of live male insects. A–dorsal view of *P. cyanea* male from Munnar, Anamalais; B–lateral view of *P. cyanea* male from Munnar, Anamalais; C–dorsal view of *P. cyanea* male from Shendurney, Agasthyamalais; D–lateral view of *P. cyanea* male from Shendurney, Agasthyamalais. Images A&B by Kalesh Sadasivan, and C&D by Manoj.P

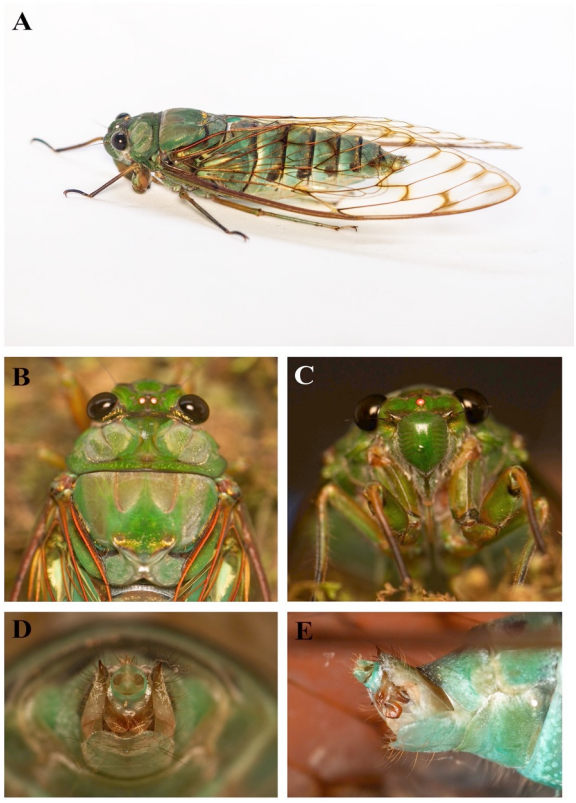

Fig. 6 *Pomponia cyanea* Fraser, 1948. Images of live male insect from the type locality Munnar, Anamalais. A–dorsolateral view of the whole insect; B–dorsal close-up view of the head, pronotum, and mesonotum; C–anterior view of head and postclypeus; D–posterior view of anal appendages; E–lateral view of anal appendages. Images by Kalesh Sadasivan

that the rostrum extends well beyond the posterior coxae in *P. zebra*, as seen in *P. cyanea.*

Pronotum: Bliven (1964), states that *P. zebra* has pronotum humeral angles rectangular, sub-truncate, posterior margin sinuate, lateral margins strongly toothed, and anterior angles prominent as per the OD. Fraser (1948), wrote that the pronotum has the lateral border notched, posterior margin straight and outer angles rounded in *P. cyanea*. Examination of type specimens revealed that both species have the pronotal angles rectangular with rounded edges, posterior margin shallowly sinuate, and lateral margins toothed. This is reaffirmed on the examination of fresh field specimens as well.

Wings*:* Forewings fusiform in *P. zebra*, more than three times as long as wide, without any hint of the anal angle. Fraser (1948), did not mention this character but an examination of the types in BMNH revealed that the wings in *P. cyanea,* were almost three times as long as their width. Bliven (1964), stated 'remarkably narrow forewings' for *P. zebra* while stating the differences from *P. cyanea.* But it is not the case, The FAR high aspect ratio indicates long, narrow wings and a low aspect ratio indicates short, wide wings as per Sadasivan (2021). *P. zebra* type specimen has a similar forewing (FAR 329.80) as *P. cyanea* (FAR 288.89–335.29) (Table1).

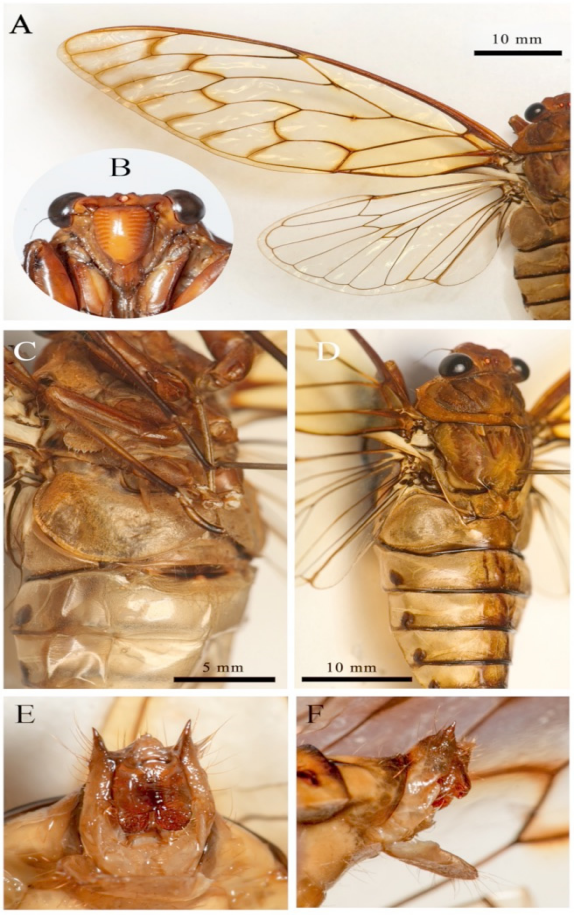

Fig. 7 *Pomponia cyanea* Fraser, 1948. Images of dry pinned insect from Valparai Slopes near the type locality of *P. zebra*, High Ranges of Munnar, Anamalai Hills. A–dorsal close-up of the wings; B–anterio-ventral view of head and postclypeus; C– inferolateral view of operculum; D–dorso-lateral view of the head, pronotum, mesonotum, and anterior abdomen; E–ventro-posterior view of anal appendages; E–lateral view of anal appendages. Images by Kalesh Sadasivan

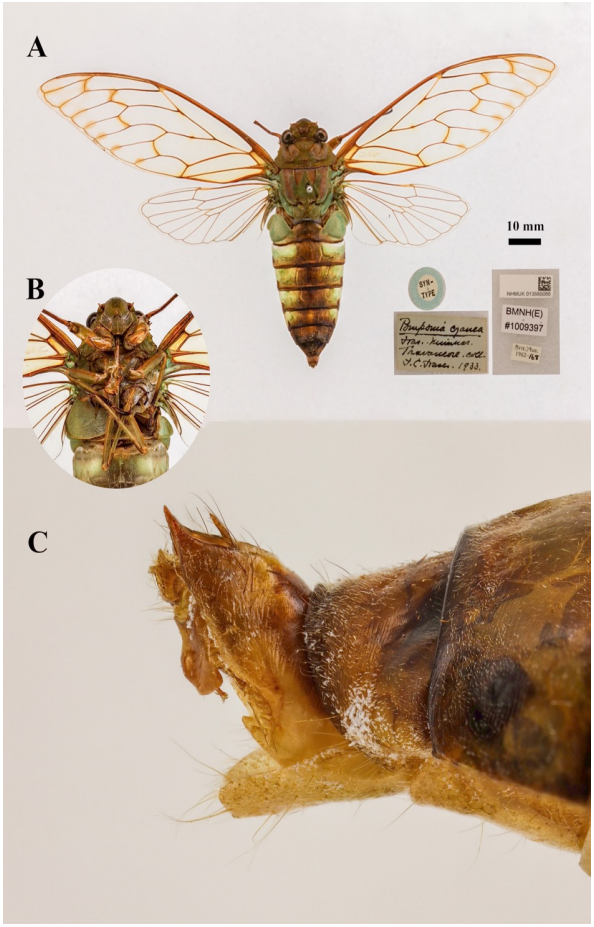

Fig. 8 *Pomponia cyanea* Fraser, 1948. Images of syntype BMNH (E) #1009397, Munnar, Anamalai Hills, Travancore. A–dorsal view of the whole insect; B–ventral view of head and postclypeus, and operculum; C–lateral view of anal appendages. Images © The Trustees of the Natural History Museum, London

Coloration: The head of *P. zebra* is light olive green with linear fuscous spots, bearing long golden hairs, behind each eye (Bliven, 1964). It was described as olive green in *P. cyanea* by Fraser (1948). In both, the head was light olive green with long postocular golden hairs and ocular tubercles surrounding the ocelli being greenish-brown. Pronotum light olive green with anterior border infuscated and a large oval patch on either side covering the region of lateral fissures, greyish pruinose in *P. zebra* (Bliven, 1964). Disc and the anterior border (the latter more noticeable) are sparsely clothed with deciduous linear golden scales. The extreme edge of the posterior margin is infuscated (Bliven 1964). Pronotum olive green as per Fraser (1948). Mesonotum light green of a slightly darker shade than head and pronotum, without, definite maculation, the usual obconical spots being evident only as vague discolorations (Bliven, 1964). Mesonotum with four purplish-

brown triangular spots (ssig & lsig), posterior border bright verdigris (greenish-blue), and with bright golden hairs (Fraser 1948). Examination of type specimens revealed no difference in coloration except those arising due to drying and fading on preservation. The color is greenish-blue with scattered short golden hairs in both species with the submedian sigillae and lateral sigillae. Abdomen and opercula bright verdigris (greenish-blue) with diffuse and poorly defined blackish-brown markings on dorsum. Each segment with a narrow mid-dorsal fascia that splays out posteriorly along the apical border, beneath hyaline and transparent (Fraser 1948). Abdomen castaneous above becomes green laterally with a series of ovoid fuscous spots on either side. Posterior margins of segments are narrowly black, the anterior margin of each segment marked by a conspicuous white pruinose fascia. Abdomen entirely whitish pruinose, apically and sparsely covered with short golden linear scales which tend to aggregate along the posterior border of each tergite except the terminal ones' (Bliven 1964).

Analysis of type and fresh specimens revealed no difference in colour between them. The colour was bluish-green with ovoid fuscous spots on the lateral aspect, each segment in mid-dorsum with the brown fascia laterally on the apical border, each segment base with conspicuous white pruinose fascia, and sparsely covered with short golden linear scales which tend to aggregate along the posterior border. The white pruinose fascia may lose prominence in preserved specimens. As per Bliven (1964), 'basal membranes, tympanum covers, and foliaceous postero-lateral margins of mesonotum greyish, spotted with small flecks of green pigment; basal membranes appearing pale blue by transmitted light. Thoracic region and opercula whitish pruinose'. But, examination of the types and fresh specimens of *P. cyanea*, offered no significant difference, except for the loss of bluish-green color in preservation. The legs are green, front and middle pair with a brownish suffusion on coxae, trochanters, and femora with tibiae, distally and tarsi, apically infuscated. Hind legs, including tarsi, are almost entirely pale green (Bliven, 1964). In *P. cyanea* legs are ochreous (Fraser, 1948). In the observation, the legs are marked in green and brown with green on the flexor aspect and brown on the extensor aspect. On preservation the green colour fade to light brown and brown becomes ochraceous.

***Venation**:* The venation and infuscations are the same in *P. cyanea* and type of *P. zebra*. No appreciable difference noted in them (see above for a detailed description of venation).

Genitalia: Fraser (1948) and Bliven (1964), do not provide any detailed descriptions of male genitalia, however, the latter has a basic and non-informative lateral view far from reality. A comparison of the male genitalia of types of *P. cyanea* and *P. zebra* revealed no difference in the structure (see above for a detailed description).

DISCUSSION

Pomponia cyanea Fraser, 1948, syntypes from Anamalai Hills, Travancore at BMNH were studied and compared with images of *P. zebra* Bliven, 1964 (holotype CASTYPE13809) Kadamparai, Anamalai Hills at CAS. This detailed morphological study of *P. cyanea* and *P. zebra* revealed no difference in general morphology, wing venation, or structure of male genitalia, hence *P. zebra* is proposed as a junior synonym of *P. cyanea* Fraser, 1948, **syn. nov**. A key to males of known species of *Pomponia* of Western Ghats is provided.

The taxonomic findings of the paper highlights the need to study the male genitalia in cicadas for species determination. The morphological indices developed by Sadasivan (2021) were found to be useful in species comparison. The name *Pomponia linearis* group is proposed by Duffels and Hyashi (2006) for the *Pomponia* species with the following characteristics: 1) a broad pale transverse band across the postclypeus, 2) acute lateral pygofer lobes, 3) a trapezoid uncus with medial incision suggesting the fusion of two short, broad lobes, and 4) a pair of claspers, each with two spines, protruding from below the uncus. Within the *linearis* group Duffels and Hayashi (2006) distinguished the *linearis* species complex with the distinctly protruding paramedian basal pygofer lobes. *Pomponia cyanea* has only two features out of

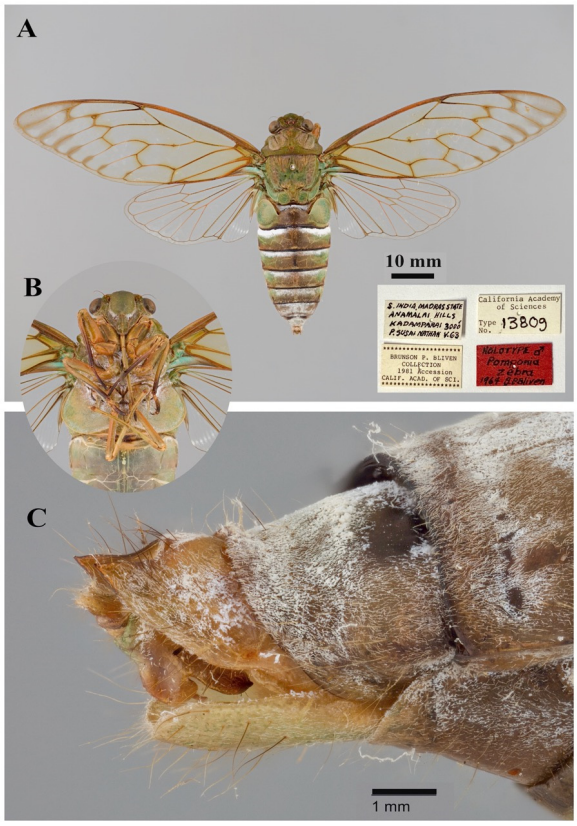

Fig. 9 Holotype images of *Pomponia zebra* Bliven, 1964. Holotype CASTYPE13809 labeled S. India, Madras State, Anamalai Hills, Kadamparai. A–dorsal view of the whole insect; B–ventral view of head and postclypeus, and operculum; C–lateral view of anal appendages. Images by Christopher C. Grinter

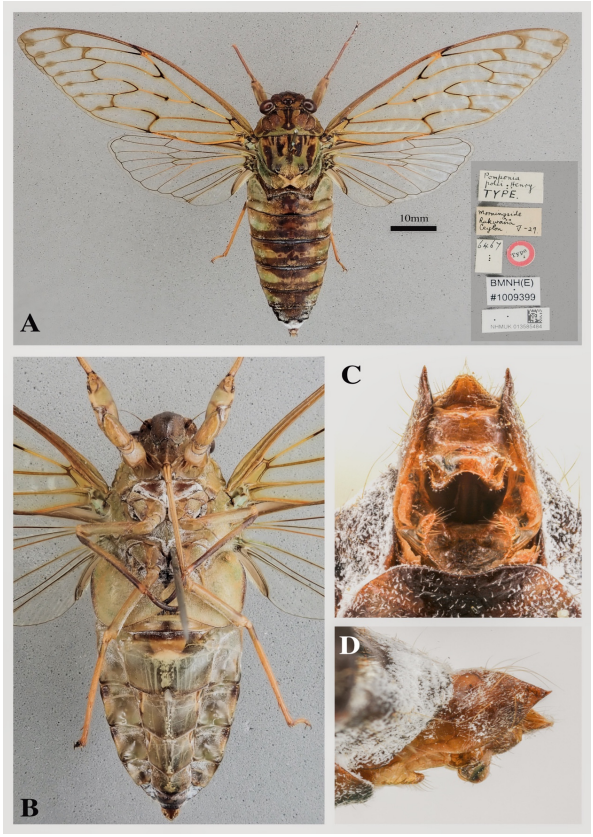

Fig. 10 *Pomponia polei* Henry, 1931. Images of holotype BMNH(E) # 1009399. A–dorsal view of the whole insect; B–ventral view of head and postclypeus, operculum, and abdomen; C–ventral view of anal appendages.; D–lateral view of pygofer. Images © The Trustees of the Natural History Museum, London

the four described for the *P. linearis* species group, and it lacks broad pale transverse band across the postclypeus and claspers with spines. Thus, *P. cyanea* is an aberrant inside the *P. linearis* species group and might eventually need a separate species group for placement.

On the generic placement of *Pomponia polei* Henry, 1931, comb. nov.

Pomponia polei Henry, 1931: 118–120, Plate XXVII.

Terpnosia polei (Henry), Lee, 2012: 257.

The species *Pomponia polei* Henry, 1931 was described from Sri Lanka, and later transferred to *Terpnosia* Distant, 1892 by Lee (1912). During this work, examined the holotype male of *Terpnosia polei* (Henry, 1931) at the Natural History Museum, London, BMNH(E) # 1009399 (Figs. 10 A–D).

Lee (2012), established that *Terpnosia* is possibly polyphyletic based on morphology and redefined *Terpnosia* by the following characters: pronotum lateral margin dentate; forewing basal portion of vein RA2 extremely short; forewing with broad, transparent infuscations on crossveins r, r-m, and m; elliptical infuscation present on each hind margin of veins RA2, RP, M1–4, and CuA1; male operculum broader than long with apex roundish, reaching or extending just beyond posterior margin of sternite II; male abdomen cylindrical, long, much longer than head and thorax together; timbal cover

well-developed, covering most of timbal; male abdominal sternites without tubercle-like projections; male pygofer with a pair of triangular claspers behind uncal lobes; uncal lobes bifurcate, long; and distal shoulder of pygofer rounded, not acutely pointed. Lee (2012), based on the OD and illustrations of *P. polei,* transferred it to the genus *Terpnosia.*

The authors examined the type specimen of *P. polei,* and the OD in Henry (1931) and observed that the species is closely allied to *P. cyanea* from the adjacent Western Ghats of India and has the following differences from *Terpnosia*: forewing apex comparatively acute (Fig. 10A), not roundish as in *Terpnosia*; forewing infuscations smudged, with no distinctive borderline as in *Terpnosia* (Fig. 10A); uncal lobes of male genitalia fused (Fig. 10C), not bifurcate and long as in *Terpnosia*; distal shoulder of male pygofer broad, prominent and acutely pointed (Fig. 10D), not rounded as in *Terpnosia.* All the above characters of *P. polei* are in agreement with the findings in *P. cyanea* as well. Hence, in the light of the above findings, we return *Terpnosia polei* (Henry, 1931) to its original genus *Pomponia* reinstating the original combination as *Pomponia polei* Henry, 1931, **comb. nov.**

Key to *Pomponia* Stål, 1866 of Western Ghats of India

1. Both sexes with postclypeus bearing a pale transverse band; operculum triangular with medial angle produced to distinctly overlap the opposite operculum across the midline; male genitalia with each clasper bearing a pair of spines and of them the medial spine distinctly longer than lateral .....*P. pseudolinearis* Sadasivan, 2021

2. Both sexes with postclypeus lacking the pale transverse band; operculum semi-circular with medial angle not produced to cross the midline, and does not meet or overlap the opposite operculum; male genitalia with claspers broad and rounded, bearing no spines ..... *P. cyanea* Fraser, 1948 (=*P. zebra* Bliven, 1964)

The taxonomic confusion that existed in two species of *Pomponia* of the Western Ghats of India is resolved. The taxon *P. zebra* is synonymised with *P. cyanea* based on the study of the original descriptions, types, and freshly collected specimens from type localities. The species *P. cyanea* is redescribed with additional morphometric data and its male genitalia illustration. Thus, as far as it is known, the Western Ghats has only two valid species of *Pomponia,* namely *P. cyanea* Fraser, 1948, and *P. pseudolinearis* Sadasivan 2021. It is hoped that the resolution of the taxonomic confusion in *Pomponia* of Western Ghats would lead to the description of new taxa based on the detailed study of morphometrics and male genitalia. In addition, the taxonomic status of *Terpnosia polei* (Henry, 1931), from Sri Lanka, is revised based on male morphology and is transferred back to its original placement as *Pomponia polei* Henry, 1931.

ACKNOWLEDGEMENTS

Authors thank Allen Sanborn for his encouragement and are grateful to Christopher C. Grinter, California Academy of Sciences, and Elliott Smeds who examined the *P. zebra* type specimens and provided expert opinions. Prathapan K.D., Sandeep Das, Nihal Jabin, Yeshwanth H.M., I.P. Yadev, and members of Travancore Nature History Society (TNHS), Trivandrum are gratefully acknowledged for their help in the field.

REFERENCES

Bliven B.P. (1964) Concerning cicadas: notes and descriptions of new species. Occidental Entomologist (1): 90–102.

Dmitriev D., Sanborn, A. and Takiya D. (2021) 3i Auchenorrhyncha: World Auchenorrhyncha Database (version Nov 2017). In: Catalogue of Life [author list in alphabetical order] (ed.) (2021). Species 2000 & It is Catalogue of Life, 2021-05-07. Digital resource at www.catalogueoflife.org. Species 2000: Naturalis, Leiden, the Netherlands. ISSN 2405–8858.

Distant W.L. (1905) Rhynchotal notes -XXXI. Annals and Magazine of Natural History, London (Ser. 7) 15: 379–387. doi. 10.1080/03745480509443064.

Distant W.L. (1906) The fauna of British India, Including Ceylon and Burma. Rhynchota. Vol. III.

Heteroptera-Homoptera. Taylor and Francis, London. 526pp.

Duffels J.P. and Hayashi M. (2006) On the identity of the cicada species *Pomponia picta* (Walker) (= *P. fusca* (Olivier)) and *P. linearis* (Walker) (Hemiptera, Cicadidae). Tijdschrift voor Entomologie 149: 189–201.

Fraser F.C. (1948) A new cicada (Hemipt.) from the Western Ghats of India. The Entomologist's Monthly Magazine, London 84: 184–185.

Henry G.M. (1931) New Ceylonese Rhynchota. Spolia Zeylanica 16: 115–121, pls. 25–27.

Hill K.B.R., Marshall D.C., Marathe K., Moulds M.S., Lee Y.J., Pham T., Mohagan A.B., Sarkar V., Price B.W., Duffels J.P., Schouten M.A., De Boer A.J., Kunte K. and Simon C. (2021) The molecular systematics and diversification of a taxonomically unstable group of Asian cicada tribes related to Cicadini Latreille, 1802 (Hemiptera: Cicadidae). Invertebrate Systematics 35. doi:10.1071/IS20079.

Latreille P.A. (1802) Famille troisième. Cicadaires; cicadariae. Histoire naturelle, générale et particulière de Crustacés et des insectes. Ouvrage faisant suite à l'histoire natarelle générale et particulière, composée par Leclerc de Buffon, et rédigée par C. S. Sonnini, membre de plusieurs Sociétés savants. pp256–263. doi: 10.5962/bhl.title.15764

Lee Y.J. (2012) Resurrection of the genus *Yezoterpnosia* Matsumura (Hemiptera: Cicadidae: Cicadini) based on a new definition of the genus *Terpnosia* Distant. Journal of Asia-Pacific Entomology 15: 255–258. doi:10.1016/j.aspen.2011.12.006.

Lee Y.J. and Hayashi M. (2003) Taxonomic Review of Cicadidae (Hemiptera, Auchenorrhyncha) from Taiwan, Part 2. Dundubiini (A Part of Cicadina) with two new species. Insecta Koreana 20: 359–392.

Moulds M.S. (2005) An appraisal of the higher classification of cicadas (Hemiptera: Cicadoidea) with special reference to the Australian fauna. Records of the Australian Museum (57): 375–446. doi: 10.3853/j.0067-1975.57.2005.1447.

Pham T., Lee Y.J and Constant J. (2015) Cicada genus *Pomponia* Stål, 1866 (Hemiptera: Cicadidae) from Vietnam and Cambodia, with a new species, a new record, and a key to the species. Zootaxa 3925: 562–572. doi:10.11646/zootaxa.3925.4.5.

Price B., Allan E., Marathe K., Sarkar V., Simon C. and Kunte K. (2016) The cicadas (Hemiptera: Cicadidae) of India, Bangladesh, Bhutan, Myanmar, Nepal, and Sri Lanka: an annotated provisional catalogue, regional checklist, and bibliography. Biodiversity Data Journal 4: e8051. doi: 10.3897/BDJ.4.e8051.

Sadasivan K. (2021) A new species of *Pomponia* Stål, 1866 (Hemiptera: Cicadidae) from the Western Ghats, with notes on the status of *P. linearis* (Walker, 1850) from southern India. Zootaxa 5040(3): 388–403. doi: 10.11646/zootaxa.5040.3.4.

Sanborn A.F. (2014) Catalogue of the Cicadoidea (Hemiptera: Auchenorrhyncha). Academic Press, London, 1001pp. doi: 10.1016/B978-0-12-416647-9.00001-2.

Sarkar V. (2019) A note on the taxonomy and natural history of the Summer Clicker *Lahugada dohertyi* (Distant, 1891) (Insecta: Hemiptera: Cicadidae) along with its distribution in northern West Bengal, India. Journal of Threatened Taxa 11(9): 14128–14136. doi: 10.11609/ jott.3193.11.9.14128-14136.

Stål C. (1866) Hemiptera Homoptera Latr. Hemiptera Africana 4: 1–276.

Walker F. (1850) List of the specimens of Homopterous insects in the collection of the British Museum, Part I. Edward Newman, London. 260pp.

(Received November 18, 2023; revised ms accepted January 26, 2024; published March 31, 2024)