

ON THE GENUS *RHAGOVELIA* MAYR FROM INDIA WITH A NEW
RECORD AND DESCRIPTION OF A NEW SPECIES
(RHAGOVELIINAE : VELIIDAE : HETEROPTERA)

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INTRODUCTION

The knowledge on the genus *Rhagovelia* Mayr from India was based on recording of species from different parts of the country (Distant, 1910 ; Paiva, 1919 ; Hafiz and Mathai, 1938 ; Hafiz and Ribeiro, 1939 ; Pradhan, 1950 ; Thirumalai, 1989). While studying the Rhagoveliinae of Oriental region, Lundblad (1936) described *R. tibialis* from S. India and *R. sumatrensis* from Indonesia and Sikkim, based on few examples with inadequate morphological characters and without detailed figures. In the present study, *R. ceylanica* Lundblad, hitherto, known from Sri Lanka, is recorded for the first time from India and a new species of the genus is described from Western Ghats. Besides, a detailed description of *R. ceylanica* and *R. tibialis* additional taxonomical characters are also figured for the first time in this paper. A key to all the Indian species is also given. The study is based on materials collected by the author from different parts of Eastern and Lower Western Ghats of Tamilnadu and Kerala over a period of eleven years.

The genus *Rhagovelia*, cosmopolitan in distribution, is characterised by the presence of a deep cleft in middle tarsi which possess leaf like claws and plumose hairs, arising from the base. The hind tarsi is three segmented. Both winged and apterous forms are commonly encountered. Out of nearly 150 species of *Rhagovelia* known,

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about 100 of these are new world species. There are 13 Oriental species and three of which so far known to occur in India [includes *R. (R.) nigricans* (Burmeister)]. The members of the genus have been recorded to occur in streams, rivers and springs.

Key to the Indian species of *Rhagovelia*

1. Pronotum long ; mesonotum less exposed ; hind trochanters unarmed. (Subgenus *Rhagovelia*) 2.
- Pronotum short ; mesonotum completely exposed ; hind trochanters armed (Subgenus *Neorhagovelia*) 3.
2. Body length 3·8 mm or more ; hind femora in males distinctly swollen ; two to three & half times as long as wide ; hind femoral spines absent in females *Rhagovelia (R) tibialis* Lundblad.
- Body length less than 3·8 mm ; hind femora in males not so proportionate ; hind femoral spines present in both sexes *Rhagovelia (R) ceylanica* Lundblad.
3. Abdomen more broader than long ; hind femora in males with 4-5 stout marginal spines *Rhagovelia (N) sumatrensis* Lundblad.
- Abdomen narrower and cylindrical ; hind femora in males with 1-2 stout marginal spines *Rhagovelia (N) nilgiriensis* sp. nov.

Rhagovelia (Rhagovelia) tibialis Lundblad

(Fig. 1 a-r)

1936. *R. tibialis* Lundblad, *Arkiv. Zool.*, 28 : 31.

Size	Length of body	Width of head (including eyes)	Width of Pronotum
Apterous male	3·8-4·5 mm	0·95 mm	1·3 mm
Apterous female	3·9-4·7 mm	0·94 mm	1·04 mm
Winged male	4·1-4·2 mm	0·92 mm	1·6 mm
Winged female	4·2-4·7 mm	0·99 mm	1·7 mm

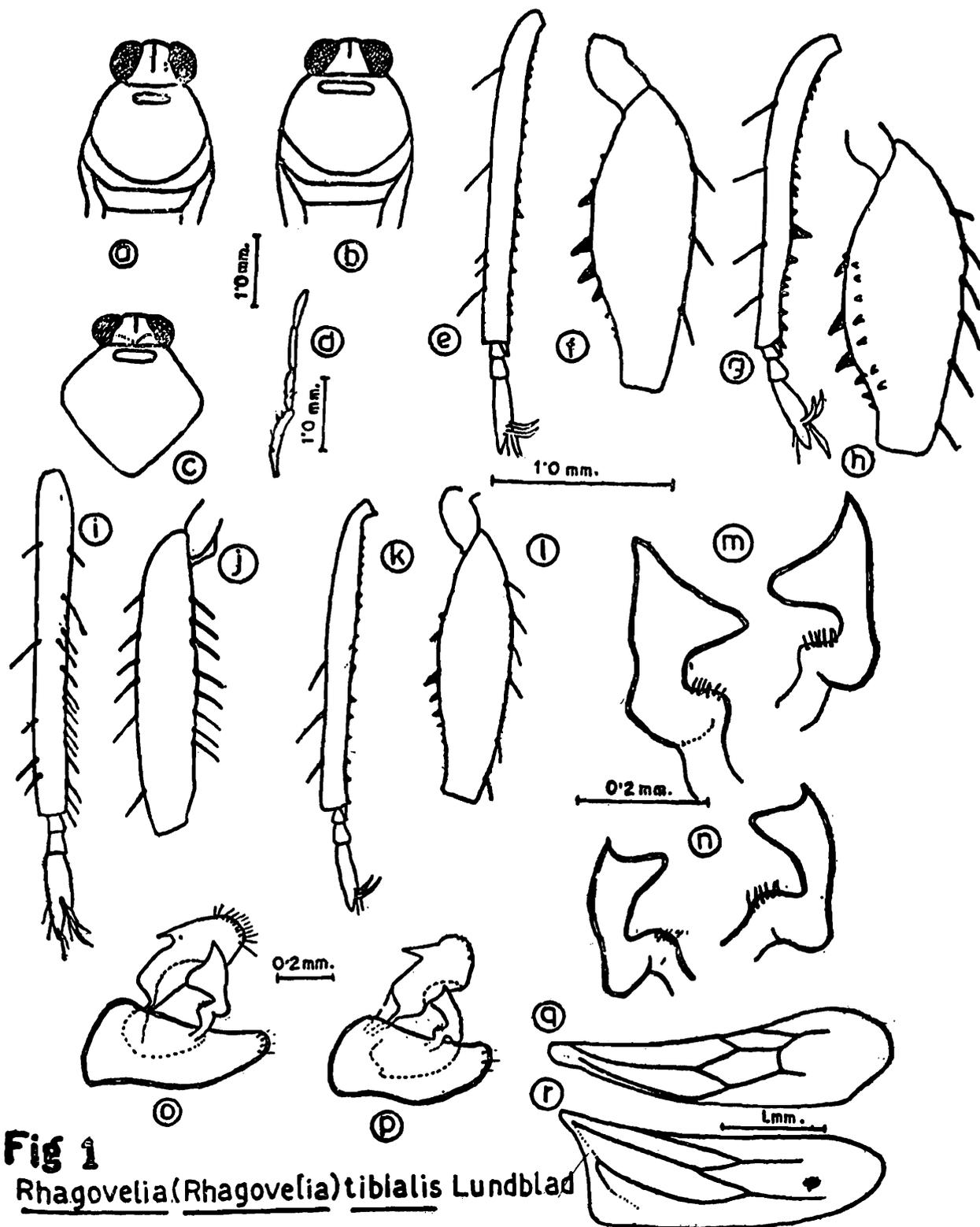


Fig 1
Rhagovelia (Rhagovelia) tibialis Lundblad

Fig. 1 : *Rhagovelia (Rhagovelia) tibialis* Lundblad

- a. Dorsal view of head & thorax apterous male, b. Dorsal view of head & thorax apterous female, c. Dorsal view of head & pronotum winged male, d. Antenna of apterous male, e. g. Hind tibiae & tarsi of apterous males, f, h. Hind femora of apterous males, i. Hind tibia & tarsi of apterous female, j. Hind femur of apterous female, k. Hind tibia & tarsi of winged male, l. Hind femur of winged male, m. Left and right parameres of apterous male, n. Left and right parameres of winged male, o. Lateral view of genital segments of apterous male, p. Lateral view of genital segments of winged male, q. Fore wing, r. Hind wing.

Colour : Robust, black ; basal one-third of 1st antennal segments, all coxae, trochanters, basal half of fore femora, basal one-third of hind femora dark yellow ; antennae, legs, dark shining brown ; fore and hind wings dark brownish black ; pronotum with an orange elongate spot at anterior part below vertex ; lateral sides of thorax, tergites, connexiva with long brown hairs, denser towards connexival apices ; legs longly hairy ; venter black, hairy, genital segments brown.

STRUCTURAL CHARACTERISTICS

Apterous male : Head with a central median impressed line reaching middle of vertex ; a pair of oblique impressed line posteriorly, directed backwards ; rostrum reaching up to anterior coxae. Pronotum much longer than an eye, 1.2 x broader than long ; a little more twice longer than head on middle line ; posterior margin concave, exposing meso and metanota ; mesonotum short ; 2x shorter than metanotum. Abdominal tergites 1.6 subequal in length ; tergite 7 a little broader than long ; first genital segment not carinate ventrally ; connexiva obliquely upturned, without spines ; genital segments cylindrical, longly hairy, viewed laterally as in Fig. 1 o ; parameres symmetrical (Fig. 1 m).

Antennae I longest, curved, III & IV equal, II and shortets, length of antennal segments (mm) I-IV : 0.8, 0.4, 0.5, 0.5. Fore tibia broad, distally with a short tibial comb, I & II tarsi minute ; middle leg longest, hind tibia a little longer than mid tibia ; hind femur swollen, 2-3.5 x as long as broad, a row 4 stout short, thick curved spines below, armed with minute spines and pegs as in (Fig 1.f, h), hind tibia curved, armed with a row of short spines, some times the central one longest (Fig. 1.e, g) ; measurement of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	1.2	1.2	0.03, 0.03, 0.3
Middle leg	1.9	1.7	0.1, 0.7, 0.9
Hind leg	1.7	1.8	0.1, 0.12, 0.4

Apterous female : Similar to apterous male ; fore tibia lacks tibial comb ; hind femur not swollen and without spines (Fig. 1.j) ; hind tibia bare without spines (Fig. 1.i) ; tip of connexiva with a thick tuft of dark hair-like bristles looking like connexival

spines; antennae a little shorter than male, measurement of segments I-IV(mm) : 0.8, 0.43, 0.52, 0.4; measurement of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	1.1	1.1	0.03, 0.03, 0.3
Middle leg	1.7	1.4	0.12, 0.7, 0.8
Hind leg	1.4	1.6	0.1, 0.1, 0.4

Winged male : Pronotum as long as broad, gradually tapering, tip rounded (Fig. 1.c); connexiva broader than apterous forms, not obliquely upturned; femora with spines, same as that of apterous males (Fig. 1.l); hind tibia without a distinct midspine (Fig. 1.k); fore and hind wings as in fig. 1.q & r; paired longitudinal carinae on 2 & 3 abdominal tergites; otherwise similar to apterous male; measurement of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	1.1	1.2	0.03, 0.03, 0.3
Middle leg	1.8	1.4	0.1, 0.7, 0.8
Hind leg	1.5	1.6	0.1, 0.1, 0.4

Winged female : Same as winged male; fore tibia without comb, hind femur and tibia unarmed; hind femur shorter than tibia; measurement of legs (in mm) :

	Femur	Tibia	Tarsi
Fore leg	1.1	1.2	0.03, 0.03, 0.3
Middle leg	1.7	1.4	0.1, 0.7, 0.8
Hind leg	1.2	1.5	0.1, 0.1, 0.4

Material examined : Apterous 10 males, 14 females, winged 3 males, 1 female from Kummatamthodu, Silent valley, Kerala, alt. 910 M, 30. IV. 1960, coll. : R. S. Pillai, apterous 2 males, 9 females from a jungle stream above Singara Power House, Mudumalai Nilgiris, alt. 950—1000 M, 25.II.1988, coll. : M. Vasanth; apterous 4 males, 10 females winged 1 female, 5 immature stages from a jungle stream on the way to Siruvani

Dam site, Siruvani, Coimbatore, alt. 680 M, 11.II.1989 and apterous 2 females from Honnety Gunshola, Kothagiri, Nilgiris, alt. 1740 M, 12.II.1989, coll. : G. Thirumalai.

Distribution : India : Kerala, Tamilnadu.

Remarks : Lundblad (1936) while describing *R. tibialis* from Anamalai, Coimbatore District, Tamilnadu based on one male and two females (apterous) stated that the arrangement of spines in hind femora and a thick distinct spine in the middle portion of hind tibia are the distinguishing characters of the species. However, there was no subsequent report of the species from India or elsewhere. In the present study dealing with a series of specimens from different localities indicates that the presence of a distinct central spine in hind tibia is not a constant character, as different degrees of spine development ranging from total absence to well developed ones are met within apterous males, but absent in winged males. However, the parameres of both forms are similar showing no variation in size or shape. The femora are distinctly swollen in males (two to three and half times as long as wide) and not so in females.

Rhagovelia (*Rhagovelia*) *ceylanica* Lundblad

(Fig. 2 a-r)

1936. *R. ceylanica* Lundblad, *Arkiv. For Zoologi*, 28 : 32.

1979. *R. ceylanica* Polhemus, *Bull. Fish Res. Stn. Sri Lanka*, 29 : 97.

1989. *R. nigricans* Thirumalai, *Rec. Zool. Surv. India Occ. Pap.*, 118 : 51.

Size	Length of body	Width of head (including eyes)	Width of Pronotum
Apterous male	3.0-3.5 mm	0.75 mm	1.1 mm
Apterous female	2.6-3.4 mm	0.7 mm	1.1 mm
Winged male	3.1-3.4 mm	0.75 mm	1.3 mm
Winged female	3.1-3.3 mm	0.7 mm	1.3 mm

Colour : Dull black; basal one third of 1st antennal segment, all coxae, trochanters, basal half of fore femora yellow; legs, tergal segments, antennae brown; last abdominal segments, genital segments dark brown; fore wings brown, hind wings pale; connexivum yellow to dark brown. Pronotum with a pair of elongate yellow marking on anterior part below vertex. Venter black, covered with short silvery hairs, dorsal

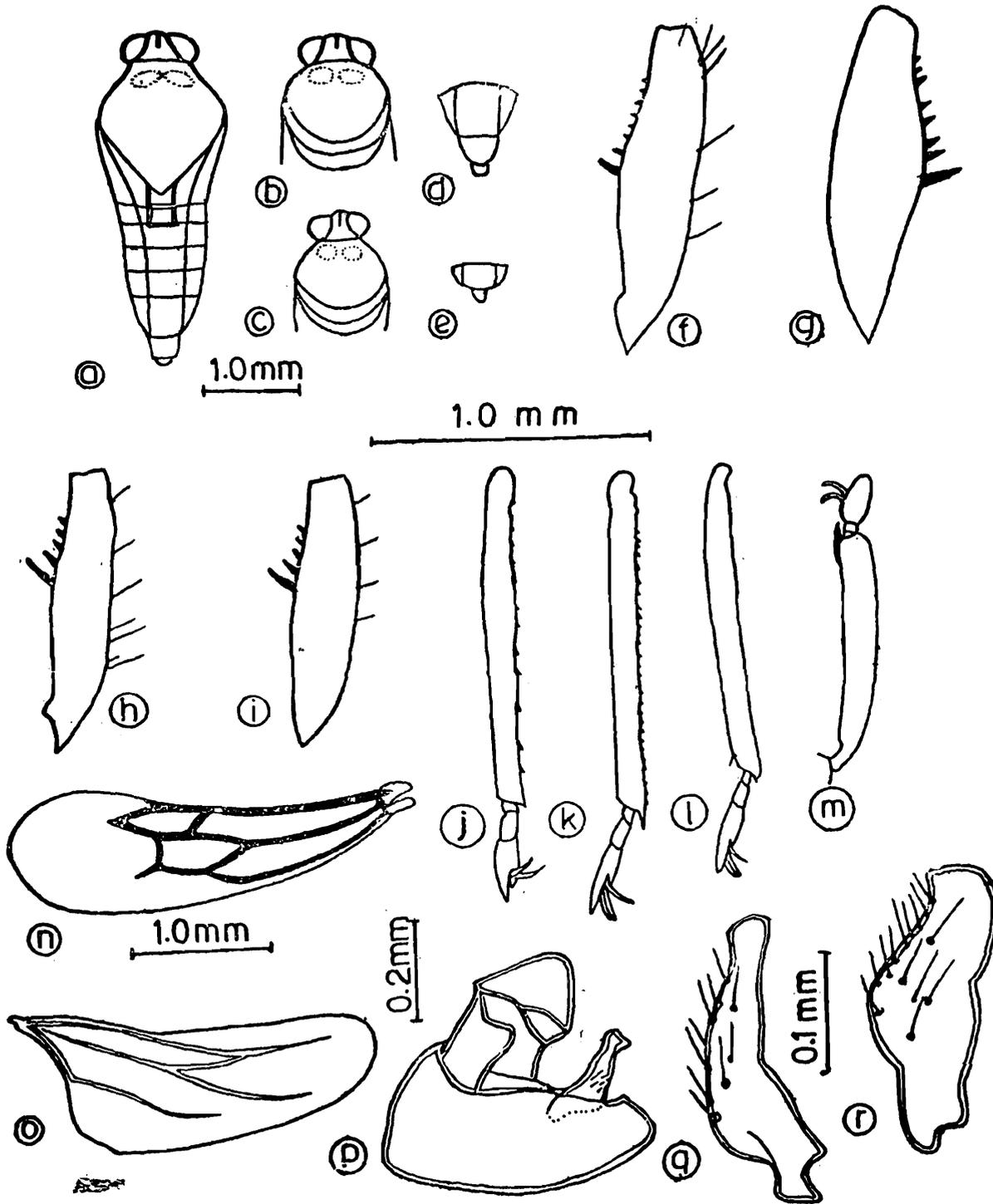


Fig.2

Rhagovelia (Rhagovelia) ceylanica Lundblad

Fig. 2 : *Rhagovelia (Rhagovelia) ceylanica* Lundblad

a. Dorsal view of winged male, b. Dorsal view of head & thorax of apterous male, c. Dorsal view of head & thorax of apterous female, d. Last dorsal abdominal segments of apterous male, e. Last dorsal abdominal segments of apterous female, f. Hind femur of winged male, g. Hind femur of apterous male, h. Hind femur of winged female, i. Hind femur of apterous female, j. Hind tibia & tarsi of apterous male, k. Hind tibia & tarsi of winged male, l. Hind tibia & tarsi of apterous female, m. Fore tibia & tarsi of apterous male, n. Fore wing, o. Hind wing, p. Lateral view of genital segments of apterous male, q. Paramere—lateral view, r. Paramere—dorsolateral view.

side of body with golden pilosity ; lateral sides of thorax, genital segments, apex of connexivua, femora, tibiae with erect brown hairs ; legs longly hairy.

STRUCTURAL CHARACTERISTICS

Apterous male : Head with a central median impressed line reaching middle of vertex ; rostrum reaching up to anterior coxae. Pronotum 1.3 x wider than long, longer than head on middle line ; posterior margin concave, exposing meso- and metanotum ; mesonotum short, 2 x shorter than metanotum. Abdominal tergites 1 to 6 subequal in length ; 7th tergite longer than first genital segment, not carinate ventrally ; connexivum hairy without spines ; genital segments cylindrical, longly hairy ; seen laterally as in Fig. 2.p ; parameres symmetrical, viewed in different angles as in Fig. 2.q, r.

Antennae long, Ist longest, stout, curved, rest slender, III & IV subequal, II shortest, length of segments I-IV (mm) : 0.65, 0.4, 0.55, 0.5. Fore tibia broad distally with a short tibial comb (Fig. 2 m), I & II tarsi minute ; middle leg longest, middle tibia almost equal to hind tibia ; hind femur stout, armed beneath with spines from middle to apex, 7 or 8 in a row, gradually reducing in size, central being the longest and curved (Fig. 2. g), hind tibia armed with a single row of small teeth (Fig. 2. j) ; measurements of legs (in mm) :

	Femur	Tibia	Tarsi
Fore leg	0.8	0.85	0.02, 0.02, 0.2
Middle leg	1.5	1.4	0.1, 0.4, 0.6
Hind leg	1.2	1.3	0.04, 0.1, 0.3

Apterous female : Similar to apterous male, except in the absence of fore-tibial comb, lesser number of spines in hind femur (4-5) (Fig. 2 i), hind tibia unarmed (Fig. 2. l). Connexivua a little more raised than in apterous male, tips with long numerous erect hairs. Antennae a little shorter, measurements of segments I-IV (mm) 0.55, 0.35, 0.5, 0.45. Measurements of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	0.7	0.8	0.02, 0.02, 0.2
Middle leg	1.3	1.1	0.1, 0.4, 0.6
Hind leg	1.1	1.1	0.04, 0.1, 0.3

Winged male (Fig. 2 a) : Pronotum as long as broad, gradually tapering, tip pointed, lateral angles broadly rounded ; connexivum broader than apterous forms, not obliquely curved ; hind femur and tibia as in Fig. 2 f, k ; mid & hind tibia equal in length ; fore and hind wings as in Fig. 2 n, o ; II & III abdominal tergites with paired longitudinal carinae ; tergites dark brown ; rest of the characters same as that of apterous male ; measurements of antennal segments I-IV (mm) : 0.6, 0.35, 0.45, 0.4 ; measurement of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	0.8	0.8	0.02, 0.02, 0.2
Middle leg	1.4	1.2	0.1, 0.4, 0.6
Hind leg	1.2	1.2	0.04, 0.1, 0.3

Winged female : Same as winged male ; fore tibia without tibial comb, mid and hind tibia subequal in length ; margins of last connexivum segments with tufts of long hairs ; VIII tergum broader than long ; hind femur as in Fig. 2 h ; measurements of antennal segments (mm) I-IV : 0.6, 0.35, 0.4, 0.4. Measurements of legs (mm) :

	Femur	Tibia	Tarsi
Fore leg	0.7	0.7	0.02, 0.02, 0.2
Middle leg	1.4	1.0	0.1, 0.4, 0.6
Hind leg	1.0	1.1	0.04, 0.1, 0.2

Distribution : India : Tamilnadu (Present record) ; Sri Lanka.

Material examined : Apterous 8 males, 18 females ; winged 3 males, 1 female from Amirdi, Javadi Hills, Tamilnadu, alt. 240 m, 2. V. 1984, coll. : Thirumalai ; apterous 2 males, 6 females from River Arjuna, Pilavakal Dam site, Tamilnadu, 14. VIII. 1987, coll. : Thirumalai ; apterous 33 males, 37 females, winged 1 male, 4 females & 28 immature stages from Arikkulam, Kanyakumari, Tamilnadu, 14.III. 1989. coll. ; K. V. L. Narayana.

Remarks : The present record of *R. ceylanica* is the first report of the species from India. While studying aquatic and semi-aquatic Hemiptera of Tamilnadu, this species was erroneously identified as *R. nigricans* (Burmeister) (Thirumalai, 1989).

Further, the report of *R. nigricans* from different localities from India by Hafiz & Mathai (1938), Hafiz & Ribeiro (1939) and Pradhan (1950) could also refer to the present species. *R. ceylanica* can easily be differentiated from *R. nigricans* by the absence of stiff blunt spines at the base of middle femur. According to Lundblad (1936), the parameres of *R. ceylanica* is not strongly twisted and not as broad as that of *R. nigricans*, even though the tip is obliquely pointed, thus appearing somewhat similar.

Rhagovelia (Neorhagovelia) nilgiriensis sp. nov.

(Fig. 3. a-p)

Size	Length of body	Width of head (including eyes)	Width of Pronotum
Apterous male	2.1 to 2.5 mm	0.6 mm	0.6 to 1.0 mm
Apterous female	2.2 to 2.8 mm	0.7 mm	1.0 to 1.2 mm
Winged male	2.5 mm	0.6 mm	0.8 mm
Winged female	2.9 mm	0.7 mm	1.1 mm

Colour : Black : a transverse yellow rectangular fascia on anterior margin of pronotum below interocular space of head ; antennae and legs dark brownish black except base of first antennal segments, coxae, trochanters and basal half of front femora, yellow ; thoracic pleura and venter black, covered with frosty grey ; genital segments brown, shining ; body and legs hairy.

STRUCTURAL CHARACTERISTICS (mm)

Antenna : 1 : 2 : 3 : 4 : 0.45, 0.3, 0.35, 0.4 (Fig. 3k)

	Femur	Tibia	Tarsi
Male :			
Front leg	0.6	0.7	0.04 (1+2), 0.15
Middle leg	1.2	0.8	0.08, 0.4, 0.6
Hind leg	0.9	0.9	0.04, 0.04, 0.2

Female :

Front leg	0.65	0.7	0.04 (1+2), 0.15
Middle leg	1.14	0.85	0.08, 0.35, 0.6
Hind leg	0.9	0.9	0.04, 0.04, 0.2

Head including eyes twice wider than long in male, two and a half times wider in female. Pronotum shorter than length of an eye, its rear margin weakly undulate. Mesonotum large, broadly rounded, medially slightly concave, exposing metanotum on sides and rear.

Apterous male (Fig. 3 a): Trochanters armed with very short thornlike spines; fore femur slightly shorter than tibia, armed with minute spines basally (Fig. 3 m); fore tibia broad distally with a longitudinal comb-like ridge at the distal end (Fig. 3 h); first and second tarsi minute; middle femur longest; hind femur armed with spines, the arrangement as in (Fig. 3 d, e); hind tibia incrassate, hind tarsi with third segment longest, first and second being equal. Pronotum at middle three times wider than long: mesonotum wider than long (3:5). Genital segments a little longer than the last abdominal tergite. Connexivum well developed. Black minute spines on the posterior margin on the seventh abdominal segment (Fig. 3.1). Lateral view of genital segments as in (Fig. 3 j); parameres symmetrical, narrowing towards tip, tip bent and pointed (Fig. 3.i).

Apterous female (Fig. 3 b): Fore tibia without comb; hind femur with spines as in (Fig. 3 f,g). Connexivum flat, moderately curved and terminating into a small spine reaching eighth abdominal tergite (Fig. 3 n). Seventh abdominal tergite with its basal width a little shorter than its length. *Winged male*: Pronotum broad wider than long (5:4) broadly rounded, tip triangular (Fig. 3 c). Meso- and metanota completely hidden. Tegmina and wing as in (Fig. 3 o. p). Rest same as that of apterous male. *Winged female*: Same as that of winged male. Pronotum slightly longer than the winged male.

Distribution : India : Tamilnadu.

Material examined : Holotype : Apterous male (pinned), from a mountain stream, foot hills of Kallukothimalai, Siruvani, Coimbatore, Tamilnadu, alt. 400 M, coll. : Thirumalai, 15 Feb, 1989.

Paratype : Apterous 35 males, 51 females; winged 1 male, data same as holotype, apterous 3 males, 3 females, 9 immature stages from a way side running stream, Samyarpallam, Siruvani, Coimbatore, Tamilnadu, alt. 460 M, coll. : Thirumalai, 14 Feb,

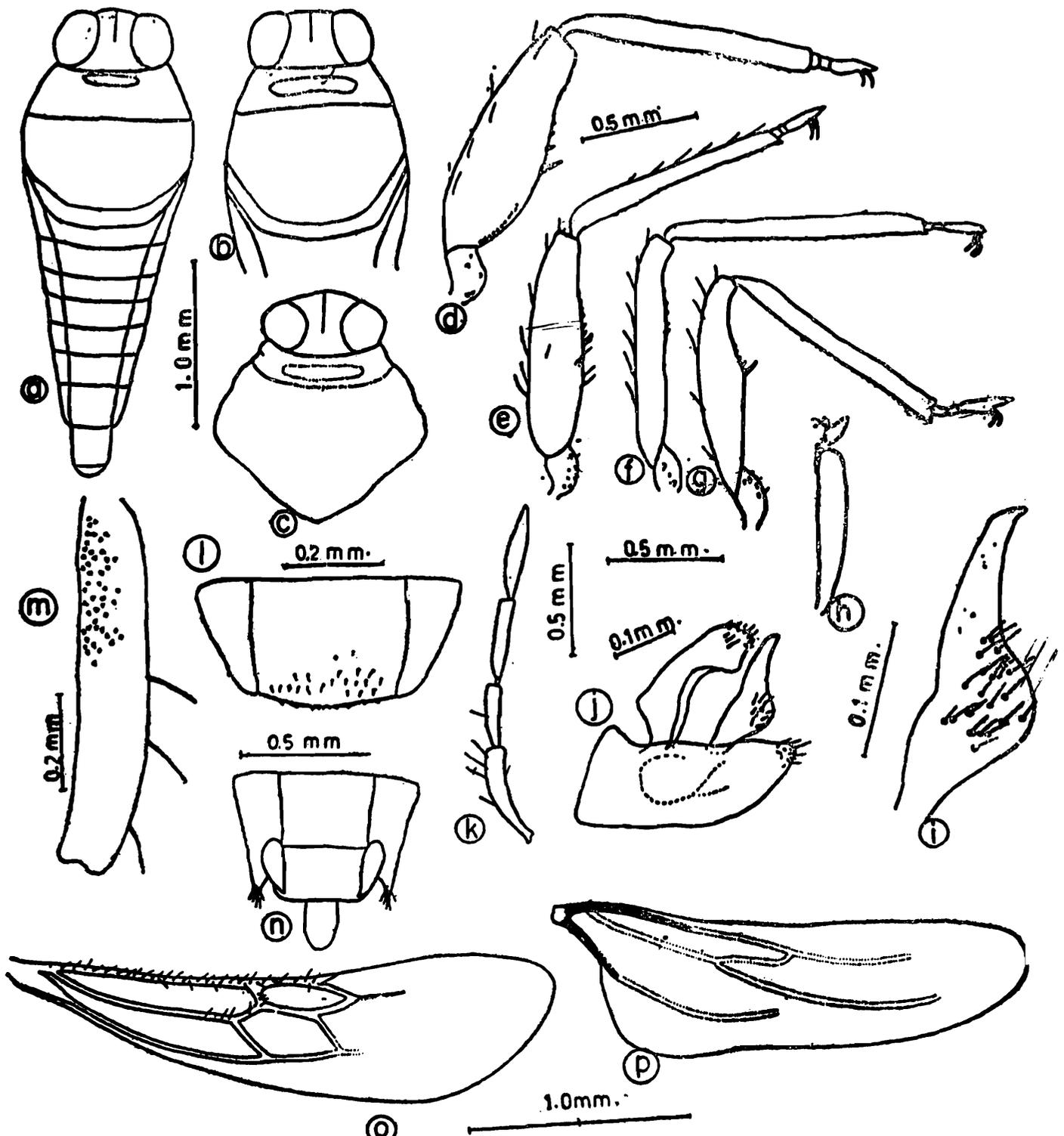


Fig 3

Rhagovelia (Neorhagovelia) nilgiriensis sp. nov.

Fig. 3: *Rhagovelia (Neorhagovelia) nilgiriensis* sp. nov.

a. Dorsal view of apterous male, b. Head & thorax of apterous female, c. Head & pronotum of winged male, d & e. Hind legs of apterous male, f & g. Hind legs of apterous female, h. Fore tibia & tarsi of apterous male, i. Paramere lateral view of apterous male, j. Genital segments lateral view of apterous male, k. Antenna of apterous male, l. Seventh dorsal abdominal segment of apterous male, m. Fore femur of apterous male, n. Last dorsal abdominal segments of apterous female, o. Tegmina, p. Wing.

1989 ; apterous 1 male, 8 immature stages from running stream at Kallukothimalai, Siruvani. Coimbatore, Tamilnadu, alt. 420 M, coll. : Thirumalai, 8 Feb, 1989 ; apterous 15 males, 16 females, 6 immature stages from a mountain stream between Gudalur and Nadugani, Nilgiris, Tamilnadu, alt. 1000 M, coll. Thirumalai, 29 Mar, 1991 ; apterous 1 male from a jungle stream, Siruvani, Coimbatore, alt. 1500 M, coll. : Thirumalai, 6 Feb 1992 ; apterous 1 male, 2 females, winged 1 female from Kovaicourtalam stream, Siruvani, Coimbatore, alt. 600 M, coll. : Thirumalai.

Remarks : This is the first record of the subgenus *Neorhagovelia* from India. From the known species of this subgenus, this species can be differentiated by the structure of paramere, the armed nature of all trochanters, the presence of a small connexival spine in female, the black minute spines on the posterior margin of the male seventh abdominal segment, the character of the fore femur and other characters mentioned in the text.

The type material is deposited in Southern Regional Station of Zoological Survey of India, Madras and will be transferred to the National Collections of ZSI, Calcutta in due course.

SUMMARY

This study reports a new species of the genus *Rhagovelia* and records *Rhagovelia ceylanica* Lundblad and the subgenus *Neorhagovelia* for the first time from India. A detailed description of *R. ceylanica* and *R. tibialis* Lundblad together with many new taxonomical characters are figured for the first time. A key to the Indian species of the genus is also provided.

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