



# Collembolan fauna of Duars region of Northern West Bengal and Shola grassland of Western Ghats

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## Abstract

The present work is based on extensive survey made by the authors during November, 2015 to December, 2017, in plains of Darjeeling district, the whole of Jalpaiguri district and the upper region of Cooch Behar district in West Bengal state and Shola forests of Kalpetta range, Thirunelli range, Brahmagiri Peak, Chembra Peak, Banasura hills, Wayanad Wild Life Sanctuary, Kurchemala peak, Manikunnamala hills of Wayanad district, Malabar Wild Life Sanctuary of Kozhikode district, Shola grassland of Ponmudi forest, Trivandrum district and Shola grass lands of Palghat districts of Kerala state. Collembolans commonly called spring-tails are entognathous, wingless hexapods. A total of 45 species of Collembola belonging to 23 genera under 9 families have been recorded from Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala. All the species from Duars region of West Bengal are recorded for the first time from the state. Out of 30 species recorded from Shola grassland of Western Ghats, Kerala, 19 species are endemic to Kerala state.

**Keywords:** Hexapoda, Kerala, Spring-tails, West Bengal

## Introduction

The collembolans commonly called “spring-tails” are small, entognathous, wingless hexapods possessing a spring-like forked jumping organ, the furcula underneath the fourth abdominal segment. The main objective of this study was to explore the knowledge of the collembolan fauna of Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala. Extensive survey was made in plains of Darjeeling district, the whole of Jalpaiguri district and the upper region of Cooch Behar district in West Bengal. A comparison study was made in the Shola grassland of western ghats, Kerala state and survey made covering areas- Kalpetta range, Thirunelli range, Brahmagiri Peak, Chembra Peak, Banasura hills, Wayanad Wild Life Sanctuary, Kurchemala peak, Manikunnamala hills of Wayanad district and Malabar Wild Life Sanctuary of Kozhikode district, shola grassland of Ponmudi forest, Trivandrum district and Shola grass lands of Palghat districts of Kerala.

Review of literature reveals that Collembola fauna of West Bengal was first initiated by Imms (1912) from

Indian Botanical Garden and Indian Museum Campus, Calcutta. Thereafter, Mukherjee (1932), Choudhuri & Roy (1965), Hazra & Choudhuri (1981), Hazra *et al.* (2007), Mandal (2011), Mitra (1966, 1974), Mitra *et al.* (1977) studied collembola from different ecosystems of West Bengal. Mandal (2011) recorded 16 species of collembola from Bibhuti Bhushan Wildlife Sanctuary, Parmadan, West Bengal. Mandal & Suman (2013) recorded 9 species of collembola under 8 genera of 5 families for the first time from Sajnekhali Wildlife Sanctuary, West Bengal. Recently, Roy & Mandal (2017) recorded 25 species under 20 genera belonging to 13 families of Collembola from different habitats of Indian Botanic Garden. Mandal *et al.* (2018) published an updated checklist of Collembola from West Bengal. So far no previous records of collembolan fauna from Duars region of North West Bengal were made. Pertaining to Shola grassland of Western Ghats of Kerala, Prabhoo (1971) and Salmon, (1965) has described and recorded twenty species of Collembola from different tea estate of Kerala, but no earlier records of collembolan fauna from Shola grassland of Kerala.

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Altogether forty five species was recorded from Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala respectively. From Duars Region of Northern West Bengal, sixteen species under eleven genera and five families were collected and all those species were first time recorded. Thirty species of Collembola belonging to eighteen genera under eight families have been recorded from Shola grassland of Kerala. Out of 30 species recorded, 19 species are endemic to Kerala. One new species, *Lepidocyrtoides malabaricus* Mandal, Suman and Bhattacharya, 2019 was described and published from Shola grassland of Western Ghats, Kerala during this period.

In the world, Collembola fauna is represented by more than 9000 described species (Bellinger *et al.*, 1996–2019). A total of 342 species of Collembola fauna under 113 genera and 20 families are represented in India (Mandal, 2018).

## Material and Methods

Collembola specimens were collected from Shola forests of Kalpetta range, Thirunelli range, Brahmagiri Peak, Chembra Peak, Banasura hills, Wayanad Wildlife Sanctuary, Kurchermal peak, Manikunnamala hills, of Wayanad district, Malabar Wildlife Sanctuary of Kozhikode district, Ponmudi forest of Trivandrum district and Shola grass lands of Palghat districts of Kerala State. From duars regions, collembola specimens were collected from Alipurduar, Cooch Behar, Jalpaiguri and foot hills of Darjeeling district of Northern West Bengal.

A white enamel tray and aspirator were used for collection of collembola. An amount of alcohol was used in the tray or the large petridish during beating the bushes, mosses or forest litters for collections collembolans in order to induce the insects to jump on these objects. Thereafter, they were picked up with fine brush and preserved in 70% alcohol. Fresh specimens were 'explode' for displaying chaetotaxy. Dark specimens were kept in Nesbitt solution for softening the chitin. Hoyer's mounting medium was used for slide-mounting of the specimens. Specimens were mounted under a coverslip in Hoyer's solution, and were studied under a Leica Digital Module (DM 2500) microscope. Identification of specimens was done using a phase contrast compound microscope following Christiansen, and Bellinger; (1998). All collected and identified collembolan specimens were deposited in the Apterygota section of Zoological Survey of India, Kolkata.

## Results

As a result of extensive survey, a total of forty five species was recorded from Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala respectively. From Duars Region of Northern West Bengal, sixteen species under eleven genera of five families were collected and all those species were first time recorded. Thirty species of Collembola belonging to eighteen genera under eight families have been recorded from Shola grassland of Kerala. Out of 30 species recorded, 19 species are endemic to Kerala. One new species, *Lepidocyrtoides malabaricus* Mandal, Suman and Bhattacharya, 2019 was described and published from Shola grassland of Western Ghats, Kerala during this period.

### Systematic Account

Family NEANURIDAE Börner, 1913

Subfamily NEANURINAE Börner, 1901, *Sensu* Cassagnau, 1989

Genus *Lobella* Börner, 1906

Subgenus *Lobella* Cassagnau, 1983

#### 1. *Lobella* (*L.*) *maxillaris* Yosii, 1966

1966. *Lobella maxillaris* Yosii, *Res. Kyoto Univ. Sci. Exp. Karakoram and Hindukush*, 1955, **8**: 351.

*Material examined*: 2 ex. on slide, 8 ex. in alcohol, India: West Bengal: Jhamapara Tea Estate, Plantation near Alipurduar Parade Ground, Alipurduar dist., 27.viii.2016, 26°39.083'N 88°36.651'E, coll. G.P. Mandal, (2294/H14); 27 ex. in alcohol, India: West Bengal: Chilapata, Jaldapara NP, Alipurduar dist., 01.x.2015, 26.549443°N 89.393614°E, coll. G.P. Mandal, (2295/H14); 7 ex. in alcohol, India: West Bengal: Plantation near Alipurduar Parade Ground, Alipurduar dist., 15.ix.2014, 26.500499°N 89.532660°E, coll. G.P. Mandal, ZSI Regn. No. 2296/H14; 10 ex. in alcohol, India: West Bengal: Mahakal temple, Gorumara NP, Jalpaiguri dist., 24.viii.2016, 26°46.187'N 88°47.601'E, coll. G.P. Mandal, (2297/H14); 20 ex. in alcohol, India: West Bengal: Entry point, Lataguri from Chalsa, Gorumara NP, Jalpaiguri dist., 18.ix.2014, 26.714822°N 88.763829°E, coll. G.P. Mandal, (2298/H14); 5 ex. in alcohol, India: West Bengal: Mahananda WLS, North range, Darjeeling dist., 23.ix.2014, 26.900914°N 88.513014°E, coll. G.P. Mandal, (2299/H14); 3 ex. in alcohol, India: West Bengal: Rajabhatkhawa FRH, BTR, Alipurduar dist., 26.ix.2015,

26.615998°N 89.532393°E, coll. G.P. Mandal, (2300/H14); 40 ex. in alcohol, India: West Bengal: Hamiltonganj Range Jalpaiguri dist., 13.ix.2014, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2301/H14); 38 ex. in alcohol, India: West Bengal: Chilapata, Jaldapara NP, Alipurduar dist., 01.x.2015, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2302/H14); 38 ex. in alcohol, India: West Bengal: Chilapata, Jaldapara NP, Alipurduar dist., 01.x.2015, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2302/H14); 7 ex. in alcohol, India: West Bengal: Embankment of Bala river, Mendabari Forest, J.N. Park Alipurduar dist., 16.ix.2014, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2303/H14); 1 ex. in alcohol, India: West Bengal: 26 miles Rajabhatkhawa (west) Range, BTR Alipurduar dist., 16.ix.2014, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2304/H14); 9 ex. in alcohol, India: West Bengal: Majherdabri Tea Estate, Alipurduar dist., 14.ix.2014, 26.533652°N 89.523811°E, coll. G.P. Mandal, (2305/H14); 3 ex. in alcohol, India: West Bengal: Garden of inspection camp, BTR(W), Rajabhatkhawa, Alipurduar dist., 7.x.2015, 26.645924°N 89.54900°E, coll. G.P. Mandal, (2306/H14); 6 ex. in alcohol, India: West Bengal: Gorumara N. Park, Chapramari Beat Jalpaiguri dist., 25.viii.2016, 26°54.898'N, 88°51.439'E, coll. G.P. Mandal, (2307/H14); 30 ex. in alcohol, India: West Bengal: Roadside Buxa Duar, B.T.R Alipurduar dist., 25.viii.2016, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2308/H14).

*Distribution:* India (Duars: West Bengal).

Genus *Inameria* Cassagnau, 1983

**2. *Inameria corallina*** (Imms, 1912) Cassagnau, 1983

1912. *Neanura corallina* Imms, *J. Zool. (Proc. Zool. Soc. London)*, **4**: 85-86.

1983. *Inameria corallina*: Cassagnau, *Nouv. Rev. Ent.*, **13**(1): 18.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Punmudi forest, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Genus *Hyperlobella* Cassagnau, 1988

**3. *Hyperlobella kraepelini*** (Borner, 1906) Cassagnau, 1988

1906. *Protanura kraepelini* Börner, *Beiheft zum Jahrbuch der Hamburgischen Wissenschaftlichen Aualten. XXIII.* 1905: 169.

1988. *Hyperlobella kraepelini*: Cassagnau, *Trav. Lab. Ecobiol. Arthr. Edaph.*, Toulouse, **5**(4): 24.

*Material examined:* From Literature (Cassagnau, 1988)

*Distribution:* Shola Grasslands, Wayanad, Western Ghats, Kerala, Arunachal and Mizoram. *Elsewhere:* Singapur.

Subfamily PSEUDOCHORUTINAE Borner, 1906

Genus *Pseudachorutes* Tullberg, 1871

**4. *Pseudachorutes ponmudiensis*** (Prabhoo, 1971)

1971. *Megachorutes ponmudiensis* Prabhoo, *Oriental Insects*, **5**: 17, figs. 76-80.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Punmudi, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

**5. *Pseudachorutes periyarensis*** (Prabhoo, 1971)

1971. *Megachorutes periyarensis* Prabhoo, *Oriental Insects*, **5**: 19, figs. 81-86.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Vandiperiyar, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Genus *Cephalochorutes* Bedos and Deharverg, 1991

**6. *Cephalochorutes pillaii*** (Prabhoo, 1971) Bedos & Deharverg, 1991

1971. *Arlesia pillaii* Prabhoo, *Oriental Insects*, **5**: 19-21, figs. 87-91.

1991. *Cephalochorutes pillaii*: Bedos and Deharverg, *Tijdschrift voor Entomologie*, **134**: 147.

*Material examined:* From Literature (Prabhoo, 1971)

*Distribution:* Shola Grasslands, Vandiperiyar, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Family HYPOGASTRURIDAE Borner, 1906

Genus *Xenylla* Tullberg, 1869

**7. *Xenylla reducta*** Prabhoo, 1971

1971. *Xenylla reducta* Prabhoo, *Oriental Insects*, **5**: 7-9, fig. 28-32.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Wayanad, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

### 8. *Xenylla* sp.

*Material examined:* 101 ex. in alcohol, India: West Bengal: Bima river embankment, Mendabari forest, J N Park, Alipurduar dist., 16.ix.2014, 26.690534°N, 89.280461°E, coll. G.P. Mandal, (2334/H14); 4 ex. in alcohol, India: West Bengal: Hamiltonganj Range, BTR Jalpaiguri dist., 13.ix.2014, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2335/H14); 1 ex. in alcohol, India: West Bengal: Teesta river bed, Sevoke, Mahananda, Darjeeling dist., 22.ix.2014, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2336/H14).

*Distribution:* India (Duars: West Bengal).

Genus *Willemia* Borner, 1901

### 9. *Willemia delamarai* Prabhoo, 1971

1971. *Willemia delamarai* Prabhoo, *Oriental Insects*, 5: 9-11, figs. 38-44.

*Material examined:* From Literature (Prabhoo, 1971)

*Distribution:* Shola Grasslands, Wyanad, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala

### 10. *Willemia setonychia* Prabhoo, 1971

1971. *Willemia setonychia* Prabhoo, *Oriental Insects*, 5: 11, figs. 45-50.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Vandiperiyar, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Family TULLBERGIDAE

Genus *Paratullbergia* Womersley, 1930

### 11. *Paratullbergia indica* Salmon, 1965

1965. *Paratullbergia indica* Salmon, *Trans. Royal Soc. New Zealand*, 5(16): 225, figs. 1-7.

*Material examined:* From Literature (Salmon, 1965).

*Distribution:* Shola Grasslands, Wayanad, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

### 12. *Paratullbergia salmoni* Prabhoo, 1971

1971. *Paratullbergia salmoni* Prabhoo, *Oriental Insects* 5: 3, figs. 2-5.

*Material examined:* From Literature (Salmon, 1971).

*Distribution:* Shola Grasslands, Vandiperiyar, Western Ghats, Kerala: Vandiperiyar

*Remarks:* Endemic to Kerala.

### 13. *Prabhergia nayarii* Salmon, 1965

1965. *Prabhergia nayarii* Salmon, *Trans. Royal Soc. New Zealand*, 5(16): 228, figs. 8-17.

*Material examined:* From Literature (Salmon, 1965).

*Distribution:* Shola Grasslands, Wayanad, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Genus *Mesaphorura* Borner, 1901

### 14. *Mesaphorura intermedia* Prabhoo, 1971

1971. *Mesaphorura intermedia* Prabhoo, *Oriental Insects*, 5: 5, figs. 10-15.

*Material examined:* (if available): From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Ponmudi, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Family ONYCHIURIDAE Borner, 1901

Genus *Thalassaphorura* Bagnall, 1949

### 15. *Thalassaphorura ghatensis* (Prabhoo, 1971) Pomorski, 2002

1971. *Protaphorura ghatensis* Prabhoo, *Oriental Insects*, 5: 7, figs. 22-27.

2017. *Thalassaphorura ghatensis*: Sun, Bedos and Deharveng, *Zootaxa*, 4338(2): 329.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Punmudi forest, Western Ghats, Kerala.

*Remarks:* Endemic to Kerala.

Family BRACHYSTOMELLIDAE

Genus *Superodontella* Stach, 1949

**16. *Superodontella macronychia*** (Prabhoo, 1971)

1971. *Odontella trispina macronychia* Prabhoo, *Oriental Insects*, 5: 13, figs. 57-61.

*Material examined* (if available): From Literature (Prabhoo, 1971).

*Distribution:* India: Shola Grasslands, Ponmudi, Western Ghats, Kerala; Ceylon.

*Remark:* Endemic to Kerala

Family ISOTOMIDAE Schaffer, 1896

Genus *Folsomia* Willem, 1902

**17. *Folsomia baijali*** Prabhoo, 1971

1971. *Folsomia baijali* Prabhoo, *Oriental Insects*, 5: 25, figs. 110-115.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* India: Shola Grasslands, Wyanad, Ponmudi, Vandiperiyar, Western Ghats, Kerala.

Genus *Isotomodes* Axelson, 1907

**18. *Isotomodes dagamae*** Prabhoo, 1971

1971. *Isotomodes dagamae* Prabhoo, *Oriental Insects*, 5: 22-23, figs. 102-109.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* India: Shola Grasslands, Western Ghats, Kerala, West Bengal.

Genus *Isotomurus* Börner, 1903

**19. *Isotomurus balteatus*** (Reuter, 1876) Handschin, 1929

1876. *Isotoma balteata* Reuter, *Meddelanden Af Societas Pro Fauna Et Flora Fennica*, 1: 86.

1929. *Isotomurus balteatus*: Handschin in Dahl, *Tierwelt Deutschlands und der angrenzenden Meeresteile*, 16: 73.

*Material examined:* 5 exs. in alcohol, India: Kerala: Banasurmal, Meenmutti Falls, Wayanad district, 19.ii.2016, 11.67807°N 75.93171°E, coll. G.P. Mandal, (2076/H14).

*Distribution:* India: Shola Grasslands, Kerala, Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Manipur, Mizoram, Tripura, Uttarakhand, West Bengal.

**20. *Isotomurus jharkhandensis*** Mandal, Suman and Bhattacharya, 2017

2017. *Isotomurus jharkhandensis* Mandal, Suman and Bhattacharya, *Rec. zool. Surv. India*, 117(2): 103, pl. 4, figs. 1-20.

*Material examined:* 2 ex. in alcohol, India: West Bengal: Embankment of Bala river, Buxa Duar, BTR, Alipurduar dist., 13.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2337/H14); 2 ex. in alcohol, India: West Bengal: Sevak Bridge, Hill slope, Duars, Jalpaiguri dist., 30.viii.2016, 26°52.504'N 88°28.094'E coll. G.P. Mandal, (2338/H14); 3 ex. in alcohol, India: West Bengal: Bichabhanga beat, Lataguri, Gorumara NP, Jalpaiguri dist., 28.ix.2016, 26.756357°N 88.797479°E, coll. G.P. Mandal, (2339/H14); 20 ex. in alcohol, India: West Bengal: Chilapata, Jaldapara NP, Alipurduar dist., 1.x.2015, 26.549443°N 89.393614°E, coll. G.P. Mandal, (2340/H14); 1 ex. in alcohol, India: West Bengal: Mendabari beat, Chilapata range, Jaldapara NP, Alipurduar dist., 1.x.2015, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2341/H14); 1 ex. in alcohol, India: West Bengal: Sankos beat, Hati nullah, Kumargram range BTR, Alipurduar dist, 1.x.2015, 26.611012°N 89.829431°E, coll. G.P. Mandal, (2342/H14).

*Distribution:* India (Duars: West Bengal, Jharkhand).

Family ENTOMOBRYIDAE Schaffer, 1896

Subfamily LEPIDOCYRTINAE Wahlgren, 1906 *Sensu* Stach, 1955

Genus *Lepidocyrtoides* Schött, 1917

**21. *Lepidocyrtoides malabaricus*** Mandal, Suman and Bhattacharya, 2019

2019. *Lepidocyrtoides malabaricus* Mandal, Suman and Bhattacharya, *Fauna of Malabar Wild Life Sanctuary, Conservation*

*Area Series, Zool. Surv. India*, 62: 18.

*Material examined:* 13 ex. in alcohol, India: Kerala: Banasurmal, Meenmutti Falls, Wayanad dist., 19.ii.2016, 11.67814°N 75.93185°E, coll. G.P. Mandal, (2059/H14).

*Distribution:* Shola Grasslands, Kerala.

*Remarks:* Endemic to Kerala.

**22. *Lepidocyrtoides quatuordecimocellata*** Prabhuo, 1971

1971. *Lepidocyrtoides quatuordecimocellata* Prabhuo, *Oriental Insects*, 5: 29-31, figs. 141-144.

*Material examined*: From Literature (Prabhuo, 1971).

*Distribution*: Shola Grasslands, Punmudi, Western Ghats, Kerala.

*Remarks*: Endemic to Kerala.

Genus *Acanthurella* Börner, 1906

**23. *Acanthurella satkosiaensis*** Mandal, Suman and Bhattacharya, 2019

2019. *Acanthurella satkosiaensis* Mandal, Suman and Bhattacharya, *Journal of Entomology and Zoology Studies*, 7(6): 552.

*Material examined*: 5 ex. in alcohol, India: West Bengal: Baikunthapur forest, Jalpaiguri dist., 27.viii.2016, 26°40.764'N 88°35.889'E, coll. G.P. Mandal, (2509/H14); 9 ex. in alcohol, India: West Bengal: Nullah from 20 km away from Alipurduar B.T.R, Alipurduar dist., 12.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2510/H14); 4 ex. in alcohol, India: West Bengal: Khunia beat, Gorumara NP, Jalpaiguri dist., 25.viii.2016, 26°52.333'N 88°51.220'E, coll. G.P. Mandal, (2511/H14); 1 ex. in alcohol, India: West Bengal: Khunia beat, Gorumara NP, Jalpaiguri dist., 25.viii.2016, 26°47.191'N 88°49.993'E, coll. G.P. Mandal, (2512/H14).

*Distribution*: India (Duars: West Bengal; Satkosia, Odisha).

Genus *Lepidocyrtus* Bourlet, 1839

Subgenus *Acrocyrtus* Yosii, 1959

**24. *Lepidocyrtus (Acrocyrtus) malayanus*** Yosii, 1959

1959. *Lepidocyrtus (Acrocyrtus) malayanus* Yosii, *Contr. Biol. Lab. Kyoto. Univ.*, 10: 28.

*Material examined*: 3 ex. in alcohol, India: West Bengal: Kumargram nr. FRH BTR Alipurduar dist., 27.ix.2015, 26.615423°N 89.827601°E, coll. G.P. Mandal, (2353/H14); 1 ex. in alcohol, India: West Bengal: Entry point, Lataguri, nr. Chalsa, Gorumara NP, Jalpaiguri dist., 18.ix.2014, 26.714822°N 88.763829°E, coll. G.P. Mandal, (2354/H14); 6 ex. in alcohol, India: West Bengal: Nilpara forest, Hasimara Airforce Station, Jaldapara NP, Alipurduar dist., 27.ix.2015, 26.709850°N 89.348779°E, coll. G.P. Mandal, (2355/H14); 4 ex. in alcohol, India: West Bengal: Embankment of Bala river, Buxa Duar, BTR, Alipurduar

dist., 13.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2356/H14); 1 ex. in alcohol, India: West Bengal: Chilapata, Bania Beat, Jaldapara NP Alipurduar dist., 13.ix.2014, 26.549443°N 89.393614°E, coll. G.P. Mandal, (2357/H14); 4 ex. in alcohol, India: West Bengal: Hollong beat, Jaldapara NP (W), Alipurduar dist., 1.x.2015, 26.690534°N, 89.280461°E, coll. G.P. Mandal (2358/H14).

*Distribution*: India (Duars: West Bengal, Maharashtra, Uttar Pradesh, Uttarakhand, Mizoram, Arunachal Pradesh, Manipur, Nagaland, Sikkim, Tripura, Andhra Pradesh, Andaman and Nicobar Islands).

**25. *Lepidocyrtus (Acrocyrtus)* sp.**

*Material examined*: 1 ex. in alcohol, India: West Bengal: Rajabhatkhawa near FRH, BTR, Alipurduar dist., 26.ix.2015, 26.617454°N 89.528204°E, coll. G.P. Mandal, (2359/H14); 1 ex. in alcohol, India: West Bengal: Garden of inspection camp, BTR(W), Rajabhatkhawa, Alipurduar dist., 26.ix.2015, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2360/H14); 2 ex. in alcohol, India: West Bengal: Newlands tea garden, Kumargram range, BTR (E), Alipurduar dist., 28.ix.2015, 26.661102°N 89.808350°E, coll. G.P. Mandal, (2361/H14); 2 ex. in alcohol, India: West Bengal: Dumurgora, Hollong beat, Jaldapara NP (W), Alipurduar dist., 2.x.2015, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2362/H14); 5 ex. in alcohol, India: West Bengal: JP 5, Hollong beat, Jaldapara NP (W), Alipurduar dist., 2.x.2015, 26.690534°N, 89.280461°E, coll. G.P. Mandal, (2363/H14).

*Distribution*: India (Duars: West Bengal).

Genus *Dicranocentrus* Schött, 1893

**26. *Dicranocentrus cercifer*** (Imms, 1912) Mari Mutt, 1979

1912. *Heteromuricus cercifer* Imms, *Proc. Zool. Soc. London*: 92.

2014. *Dicranocentrus cercifer*: Mandal, and Suman, *Rec. zool. Surv. Ind.*, 114(3): 523-524.

*Material examined*: 5 ex. in alcohol, India: Kerala: Chembra peak, lake embankment, Wayanad dist., 18.ii.2016, 11.54729°N 76.08357°E, coll. G.P. Mandal, (2064/H14); 4 ex. in alcohol, India: Kerala: Brahamagiri Hills, Thirunelly, Wayanad dist., 18.ii.2016, 11.92865°N 75.98193°E, coll. G.P. Mandal, (2065/H14).

*Distribution*: India: Shola Grasslands, Kerala, West Bengal (Kolkata), Jharkhand, Tamil Nadu (Nilgiris).

Family PARONELLIDAE Börner, 1913

Subfamily PARONELLINAE Börner, 1913 *sensu* Soto-Adams *et al.*, 2008

Genus *Salina* MacGillivray, 1894

### 27. *Salina bengalensis* Mitra, 1973

1973. *Salina bengalensis* Mitra, *Oriental Insects*, 7(2): 164-165.

*Material examined*: 12 ex. in alcohol, India: West Bengal: Embankment of Bala river near Buxaduar BTR, Alipurduar dist., 13.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2198/H14); 1 ex. on slide, 58 ex. in alcohol, India: West Bengal: Alipurduar Garden near court, Alipurduar dist., 14.ix.2014, 26.501663°N 89.528788°E, coll. G.P. Mandal, (2199/H14); 3 ex. in alcohol, India: West Bengal: Tista river bed, Jalpaiguri dist., 20.ix.2014, 26.601385°N 88.786761°E, coll. G.P. Mandal, (2200/H14); 20 ex. in alcohol, India: West Bengal: Lataguri range, near Mahakal Temple, Gorumara N.P, Jalpaiguri dist., 18.ix.2014, Lat and Long, 26.770432°N 88.792899°E, coll. G.P. Mandal, (2201/H14); 20 ex. in alcohol, India: West Bengal: Hamiltonganj Range, Jalpaiguri dist., 13.ix.2014, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2202/H14); 20 ex. in alcohol, India: West Bengal: Tista River bed, Sevoke, M.W.L. Sanctuary, Darjeeling dist., 22.ix.2014, 26.900914°N 88.513014°E, coll. G.P. Mandal, (2203/H14); 3 ex. in alcohol, India: West Bengal: Chilapata forest, near Nal Raja's fort, Jaldapara NP, Alipurduar dist., 16.ix.2014, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2204/H14); 10 ex. in alcohol, India: West Bengal: Under planted trees NJP near Railway store, Jalpaiguri dist., 28.ix.2014, 26.685414°N 88.444566°E, coll. G.P. Mandal, (2205/H14); 4 ex. in alcohol, India: West Bengal: 3 km away from Jayanti, BTR, Alipurduar dist., 12.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2206/H14).

*Distribution*: India (Duars: West Bengal, Maharashtra).

### 28. *Salina indica* (Imms, 1912)

1912. *Cremastocephalus indicus* Imms, *Proc. Zool. Soc. London*: 104, pl. 9, figs. 58, 59.

1957. *Salina indica*: Salmon, *Acta. Zool. Cracov.*, 11(14): 331-333 (in Part).

1973. *Salina indica*: Mitra, *Oriental Insects*, 7(2): 162-164.

*Material examined*: 1 ex. on slide and 1 ex. in alcohol, India: West Bengal: Khunia beat, Gorumara NP,

Jalpaiguri dist., 25.viii.2016, 26°52.333'N 88°51.220'E, coll. G.P. Mandal, (2269/H14); 12 ex. in alcohol, India: West Bengal: Murty river bed, Murty beat, Gorumara NP, Jalpaiguri dist., 24.viii.2016, 26°50.546'N 88°49.631'E, coll. G.P. Mandal, (2270/H14); 17 ex. in alcohol, India: West Bengal: Gorumara Beat, Gorumara NP, Jalpaiguri dist., 24.viii.2016, 26°47.174'N 88°47.785'E, coll. G.P. Mandal, 2271/H14; 2 ex. in alcohol, India: West Bengal: Karala river bed, Malivita, Baikunthapur, Jalpaiguri dist., 27.viii.2016, 26°39.074'N 88°35.279'E, coll. G.P. Mandal, (2272/H14); 10 ex. in alcohol, India: West Bengal: Mahananda WLS, North range, Jalpaiguri dist., 01.ix.2016, 26°49.070'N 88°27.164'E, coll. G.P. Mandal, (2273/H14); 6 ex. in alcohol, India: West Bengal: Gorumara subrange, LTG, Jorabridge, Jalpaiguri dist., 28.viii.2016, 26°43.622' N 88°46.888' E, coll. G.P. Mandal, (2274/H14).

*Distribution*: India (Duars: West Bengal, Uttar Pradesh, Maharashtra, Uttarakhand, Himachal Pradesh, Andaman and Nicobar Islands).

### 29. *Salina striata* (Handschin, 1928) Mitra, 1973.

1928. *Cremastocephalus striatus* Handschin, *Treubia*, 10: 257.

1973. *Salina striata*: Mitra, *Oriental Insects, Delhi*, 7(2): 173-175.

*Material examined*: 5 ex. in alcohol, India: Kerala: Brahamagiri Hills, Thirunelly, Wayanad dist., 16.ii.2016, 11.92555°N 75.98661°E, coll. G.P. Mandal, (2476/H14).

*Distribution*: Shola Grasslands, Kerala, Andaman and Nicobar Islands, Arunachal Pradesh, Jharkhand, Meghalaya, Nagaland, Tamil Nadu, Uttarakhand, Uttar Pradesh.

Genus *Callyntrura* Börner, 1906

### 30. *Callyntrura lineata* (Parona, 1892)

1892. *Entomobrya lineata* Parona, *Atti. Soc. Ital., Milano*, 34: 132-134.

1912. *Paronella borneri* Imms, *Proc. Zool. Soc. London*: 106-108, new synonymy.

1912. *Paronella phanolepis* Imms, *Proc. Zool. Soc. London*: 110-112, new synonymy.

1957. *Handschinphysa lineata*: Salmon, *Acta. Zool. Cracov.*, 11(14): 322.

1974. *Callyntrura (Handschinphysa) lineata*: Mitra, *Rev. Ecol. Biol. Sol.*, 11(3): 399.

*Material examined*: 1 ex. on slide, 10 ex. in alcohol, India: West Bengal: Hamiltonganj Range, Jalpaiguri dist.,

13.ix.2014, 26.690071°N 89.400768°E, coll. G.P. Mandal, (2197/H14); 1 ex. on slide, 2 ex. in alcohol, India: West Bengal: North Murty beat, Gorumara NP, Jalpaiguri dist., 24.viii.2016, 26°50.893'N 88°50.882'E, coll. G.P. Mandal, (2287/H14).

*Distribution:* India (Duars: West Bengal Uttarakhand, Maharashtra, Himachal Pradesh, Jammu and Kashmir, Andhra Pradesh, Jharkhand and Chattisgarh).

### 31. *Callyntrura vestita* (Handschin, 1925)

1925. *Microphysa vestita* Handschin, *Treubia*, **6**: 258.

1957. *Handschinphysa vestita*: Salmon, *Acta. Zool. Cracov.*, **11** (14): 325-327.

1974. *Callyntrura (Handschinphysa) vestita*: Mitra, *Rev. Ecol. Biol. Sol.*, **11**(3): 410.

*Material examined:* 1 ex. on slide, 1 ex. in alcohol, India: West Bengal: Chapramari Beat, Gorumara NP, Jalpaiguri dist., 25.viii.2016, 26°54.898'N 88°51.439'E, coll. G.P. Mandal, (2284/H14); 3 ex. in alcohol, India: West Bengal: North Murty beat, Gorumara NP, Jalpaiguri dist., 24.viii.2016, 26°50.893'N 88°50.882'E, coll. G.P. Mandal, (2285/H14).

*Distribution:* India (Duars: West Bengal, Andhra Pradesh, Assam, Manipur, Meghalaya, Nagaland, Maharashtra, Chattisgarh, Jharkhand).

### 32. *Callyntrura semiviolacea* (Handschin, 1929)

1929. *Microphysa semiviolacea* Handschin, *Revue Suisse de Zoologie*, **36**(16): 254-255.

*Material examined:* 12 ex. in alcohol, India: Kerala: Brahamagiri Hills, Thirunelly, Wayanad dist., 16.ii.2016 11.92678°N 75.98600°E, coll. G.P. Mandal, (2423/H14).

*Distribution:* Shola Grasslands, Kerala, Odisha.

### 33. *Callyntrura ceylonica* (Ritter, 1911) Mitra, S.K. and Dallai, R, 1980

1911. *Campylothorax ceylonicus* Ritter, *Ann. Naturhist. Hofmus Wien*, **24**: 388.

1980. *Callyntrura ceylonica*: Mitra and Dallai, *Italian Journal of Zoology, N.S. Suppl.* **13**(9): 275.

*Material examined:* 17 ex. in alcohol, India: Kerala: Brahamagiri Hills, Thirunelly, Wayanad district, 16.ii.2016, 11.92678°N 75.98600°E, coll. G.P. Mandal, (2462/H14).

*Distribution:* Shola Grasslands, Western Ghats, Kerala. Elsewhere: Ceylon.

### 34. *Callyntrura delamarei* Mitra, 1974

1974. *Callyntrura delamarei* Mitra, *Rev. Ecol. Biol. Sol. Paris*, **11**(3): 408.

*Material examined:* 1 ex. in alcohol, India: Kerala: Manikunnu Hills, Kalpetta, Wayanad dist., 14.ii.2016, 11°59604'N 76°09985'E, coll. G.P. Mandal, (2088/H14).

*Distribution:* Shola Grasslands, Kerala, Odisha.

### 35. *Callyntrura escheri* (Handschin, 1929)

1929. *Microphysa escheri* Handschin, *Revue Suisse de Zoologie*, **36**(16): 253.

*Material examined:* 6 ex. in alcohol, India: Kerala: Hill slope, Chambera peak, Wayanad dist., 18.ii.2016, 11.54669°N 76.08337°E coll. G.P. Mandal, (2090/H14/ZSI).

*Distribution:* Shola Grasslands, Kerala.

*Remarks:* Endemic to South India.

### 36. *Callyntrura nigerrima* (Prabhoo, 1971) Mitra, 1974

1971. *Aphysa nigerrima* Prabhoo, *Oriental Insects*, **5**: 39, figs. 189-192.

1974. *Callyntrura nigerrima*: Mitra, *Rev. Ecol. Biol. Sol. Paris*, **11**(3): 433.

*Material examined:* From Literature (Prabhoo, 1971).

*Distribution:* Shola Grasslands, Wayanad, Western Ghats, Kerala

*Remarks:* Endemic to Kerala.

### 37. *Callyntrura prabhooi* Mitra, 1974

1974. *Callyntrura prabhooi* Mitra, *Rev. Ecol. Biol. Sol. Paris*, **11**(3): 415.

*Material examined:* From Literature (Mitra, 1974).

*Distribution:* Shola Grasslands, Kerala,

*Remarks:* Endemic to Kerala.

### 38. *Callyntrura sudindica* (Prabhoo, 1971) Mitra, 1974

1971. *Aphysa sudindica* Prabhoo, *Oriental Insects*, **5**: 41, figs. 193-196.

1974. *Callyntrura sudindica*: Mitra, *Rev. Ecol. Biol. Sol. Paris*, **11**(3): 399.

*Material examined:* Kerala: From Literature (Prabhoo, 1971).



*Distribution:* Shola Grasslands, Wayanad, Kerala.

*Remarks:* Endemic to Kerala.

### 39. *Callyntrura* sp.

*Material examined:* 1 ex. on slide, India: West Bengal: Baikunthapur forest, Jalpaiguri dist., 19.ix.2014, 26.753622°N 88.508176°E, coll. G.P. Mandal, (2385/H14).

*Distribution:* India (Duars: West Bengal).

Genus *Dicranocentroides* Imms, 1912

### 40. *Dicranocentroides flavescens* Yosii, 1966

1966. *Dicranocentroides fasciculatus* f.n. *flavescens* Yosii, *Res. Kyoto Univ. Sci. Exped. Karakoram and Hindukush*, 1955; 8:379.

*Material examined:* 13 ex. in alcohol, India: Kerala: Chembra Peak, Wayanad dist., 18.ii.2016, 11.54729°N 76.08537°E coll. G.P. Mandal, (2427/H14/ZSI). 13 ex. in alcohol, India: Kerala: Chembra Peak, Wayanad dist., 18.ii.2016, 11.54729°N 76.08537°E coll. G.P. Mandal, (2427/H14/ZSI); 7 ex. in alcohol, India: West Bengal: New Lands beat, near SSB, Kumargram range, BTR, Alipurduar dist., 28.ix.2015, 26.664750°N 89.840620°E, coll. G.P. Mandal, (2171/H14); 3 ex. in alcohol, India: West Bengal, Garden of inspection camp, BTR(W), Rajabhatkhawa, Alipurduar dist., 7.x.2015, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2172/H14); 1 ex. in alcohol, India: West Bengal, Dima beat, Rajabhatkhawa, BTR, Alipurduar dist., 26.ix.2015, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2173/H14); 1 ex. in alcohol, India: West Bengal, 50 Feet Beat, North range, Jaldapara NP, Alipurduar dist., 2.x.2015, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2174/H14); 4 ex. in alcohol, India: West Bengal, New Lands Tea Garden, New Lands beat, Kumargram range, BTR Alipurduar dist., 28.ix.2015, 26.664750°N, 89.840620°E, coll. G.P. Mandal, (2175/H14); 1 ex. in alcohol, India: West Bengal, Jainti, BTR(W), Alipurduar dist., 06.x.2015, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2176/H14).

*Distribution:* Duars, West Bengal and Shola Grasslands, Kerala, Andaman and Nicobar, Arunachal Pradesh, Himachal Pradesh, Jharkhand, Maharashtra, Manipur, Mizoram, Nagaland, Odisha, Sikkim, Tripura, Uttarakhand, Uttar Pradesh.

41. *Dicranocentroides indica* (Handschin, 1929) Mitra, 1975

1929. *Aphysa indica* Handschin, *Rev. Suisse, Zool., Geneva*, 36: 249-250.

1975. *Dicranocentroides indica*: Mitra, *Rec. zool. Surv. India*, 71: 85-88.

*Material examined:* 10 ex. in alcohol, India: Kerala: Konipara, Thirunelly, Wayanad dist., 15.ii.2016, 11.89865°N 76.00369°E coll. G.P. Mandal, (2485/H14/ZSI).

*Distribution:* Shola Grasslands, Wyanad, Ponmudi, Munnar, Western Ghats, Kerala, Arunachal Pradesh, Chhattishgarh, Manipur, Meghalaya, Mizoram, Uttar Pradesh, Jharkhand.

### 42. *Dicranocentroides gisini* Mitra, 1975

1975. *Dicranocentroides gisini* Mitra, *Rec. zool. Surv. India*, 71: 75-81.

*Material examined:* 1 ex. in alcohol, India: West Bengal, 3 km away from Jayanti, BTR, Alipurduar dist., 12.ix.2014, 26.645924°N 89.549003°E, coll. G.P. Mandal, (2383/H14); 1 ex. in alcohol, India: West Bengal, Rajabhatkhawa near FRH, BTR, Alipurduar dist., 26.ix.2015, 26.617454°N 89.528204°E, coll. G.P. Mandal, (2384/H14).

*Distribution:* India (Duars: West Bengal, Uttar Pradesh, Nagaland, Odisha).

Genus *Yosiia* Mitra, 1967

### 43. *Yosiia dehradunia* Mitra, 1967

1967. *Yosiia dehradunia* Mitra, *Proc. Zool. Soc., Calcutta*, 20: 43

*Material examined:* 2 ex. in alcohol, India: West Bengal: Chilapata forest, Jaldapara NP, Alipurduar dist., 1.x.2015, 26.690534°N 89.280461°E, coll. G.P. Mandal, (2161/H14); 11 ex. in alcohol, India: West Bengal: Kumargram nr. FRH BTR, Alipurduar dist., 27.ix.2015, 26.611012°N 89.829431°E, coll. G.P. Mandal, (2162/H14); 5 ex. in alcohol, India: West Bengal: Nilpara forest, Jaldapara NP, Alipurduar dist., 2.x.2015, 26.709850°N 89.348779°E, coll. G.P. Mandal, (2163/H14); 30 ex. in alcohol, India: West Bengal: Rajabhatkhawa nr range office, Alipurduar dist., 26.ix.2015, 26.615998°N 89.532393°E, coll. G.P. Mandal, 2164/H14; 10 ex. in alcohol, India: West Bengal: Sankos beat Hatinullah, Kumargram range BTR, Alipurduar dist., 28.ix.2015, 26.611012°N 89.829431°E, coll. G.P. Mandal, (2165/H14); 62 ex. in alcohol, India: West Bengal: Hasimara nr WBSEB office, Alipurduar dist.,

04.x.2015, 26.730871°N 89.350642°E, coll. G.P. Mandal, (2166/H14).

*Distribution:* India (Duars: West Bengal, Uttarakhand, Himachal Pradesh, Jharkhand, Tripura, Arunachal Pradesh, Sikkim).

Subfamily CYPHODERINAE Börner, 1913, *Sensu* Soto-Adams, 2008

Genus *Cyphoderus* Nicolet, 1842

#### 44. *Cyphoderus javanus* Börner, 1906

1906. *Cyphoderus javanus* Börner, *Mitt. Nat. Hist. Mus. Hamburg.*, 23: 180

*Material examined:* 4 ex. in alcohol, India: West Bengal: Murty river bed, Murty beat, Gorumara NP, Jalpaiguri dist., 18.ix.2014, 26°50.546' N 88°49.631'E, coll. G.P. Mandal, (2328/H14); 6 ex. in alcohol, India: West Bengal: Gorumara NP, South Range, Gorumara Beat, Jalpaiguri dist., 24.viii.2016, 26.756357°N 88.797479°E, coll. G.P. Mandal, (2329/H14); 1 ex. in alcohol, India: West Bengal: Chaklaghata, Chilapata, Jaldapara NP, Alipurduar dist., 01.x.2015, 26.549443°N 89.393614°E, coll. G.P. Mandal, (2330/H14); 2 ex. in alcohol, India: West Bengal: Rajabhatkhawa near FRH, BTR, Alipurduar dist., 26.ix.2015, 26.617454°N 89.528204°E, coll. G.P. Mandal, (2331/H14); 1 ex. in alcohol, India: West Bengal: Sankos beat, Kumargram range BTR, Alipurduar dist., 28.ix.2015, 26.611012°N 89.829431°E, coll. G.P. Mandal, (2332/H14); 3 ex. in alcohol, India: West Bengal: Kumargram nr. FRH BTR, Alipurduar dist., 27.ix.2015, 26.615423°N 89.827601°E, coll. G.P. Mandal, (2333/H14).

*Distribution:* India (Duars: West Bengal, Kerala, Rajasthan, Arunachal Pradesh, Manipur, Mizoram, Sikkim, Odisha, Maharashtra, Uttarakhand, Andaman and Nicobar Islands)

Family DICYRTOMIDAE Börner, 1906

Genus *Calvatomina* Yosii, 1966

#### 45. *Calvatomina* sp.

*Material examined:* 2 ex. in alcohol, India: West Bengal, Chaklaghata, Chilapata, Jaldapara NP, Alipurduar dist., 1.x.2015, 26.549443°N 89.393614°E, coll. G.P. Mandal, (2288/H14); 1 ex. in alcohol, India: West Bengal, Hasimara nr WBSEB office, Alipurduar dist., 4.x.2015, 26.730871°N, 89.350642°E, coll. G.P. Mandal, (2289/

H14); 4 ex. in alcohol, India: West Bengal, Chaklaghata, Chilapata, Jaldapara NP, Alipurduar dist., 23.ix.2014, 26.900914°N 88.513014°E, coll. G.P. Mandal, (2290/H14); 2 ex. in alcohol, India: West Bengal, Entry point, Lataguri, Gorumara NP, Jalpaiguri dist., 18.ix.2014, 26.714822°N, 88.763829°E, coll. G.P. Mandal, (2291/H14); 1 ex. in alcohol, India: West Bengal, Sevak Bridge, Hill slope, Duars, Jalpaiguri dist., 30.viii.2016, 26°52.504'N, 88°28.094'E, coll. G.P. Mandal, (2292/H14); 3 ex. in alcohol, India: West Bengal, Sevak Bridge, Hill slope, Duars, Jalpaiguri dist., 13.ix.2014, 26.645550°N, 89.481306°E, coll. G.P. Mandal, (2293/H14).

*Distribution:* India (Duars: West Bengal)

## Discussion

Duars region of north Bengal comprises the area of plains of Darjeeling district, Jalpaiguri and Alipurduar as a whole and upper parts of Cooch Behar district of North Bengal. The average rainfall of this area is about 3500 mm and altitude varies from 90 to 1750 meters. Soils are alluvial in nature and soil contains thick layers of leaf, due to this organic matter is high. Forest type is tropical evergreen in foothills, temperate evergreen in middle ranges. Collembola populations is very high in plains, the number is decreased in high elevations. Sixteen species under eleven genera of five families of collembola were found from Duars Region of Northern West Bengal.

Here, we have surveyed Shola grassland of Western Ghats, Kerala state only. The vegetation type of Shola grassland consists of more than 25 types of major trees, and forests are interspersed with montane grasslands, characterized by frost- and fire-resistant grass species. Shola soils are very rich in organic matter and contain high leafy materials. Even in dry season, shola soils have been shown to retain as much as twice the soil moisture in the surrounding grasslands. A total of 30 species of collembola have been recorded during the present study from Shola grassland of Western Ghats, of which, 19 species are endemic to Kerala (Table 1). One new species, *Lepidocyrtoides malabaricus* was published from Shola grassland of Western Ghats, Kerala (Mandal *et al.*, 2019). *Dicranocentroides flavescens* Yosii, 1966 is the only species found both in Duars region of north Bengal and Shola grassland of Western Ghats. As comparison to Duars region of North Bengal, collembolan species richness and endemecity is very high in the Shola grassland of

Plate 1



***Lobella (L.) maxillaris* Yossi, 1966**



***Xenylla reducta* Prabho, 1971**



***Isotomurus balteatus*  
(Reuter, 1876) Handschin, 1929**



***Isotomurus jharkhandensis*  
Mandal, Suman & Bhattacharya, 2017**



***Lepidocyrtoides malabaricus*  
Mandal, Suman & Bhattacharya, 2019**



***Acanthurella satkosiaensis*  
Mandal, Suman & Bhattacharya, 2019**

Plate 2



*Lepidocyrtus (Acrocyrtus) malayanus*  
Yosii, 1930



*Dicranocentrus cercifer*  
(Imms, 1912)



*Salina indica* (Imms, 1912),  
Yosii, 1960



*Salina striata* (Handschin, 1928)



*Callyntrura lineata* (Parona, 1892)



*Callyntrura vestita* (Handschin, 1929)

Plate 3



***Callyntrura semiviolacea***  
(Handschin, 1929)



***Callyntrura Ceylonica*** (Ritter, 1911)  
Mitra, S.K. & Dallai, R, 1980



***Callyntrura delamarei*** Mitra, 1974



***Dicranocentroides flavescens***  
Yosii, 1966



***Yosia dehradunia*** Mitra, 1967



***Cyphoderus javanus*** Börner, 1906

Western Ghats, this may be forest type, vegetation and soil structure and composition of organic and mineral matter.

From Western Ghats of Kerala part, a good numbers of Collembola fauna represents consisting 63 species under 45 genera of 15 families, out of which 26 species are endemic to Kerala (Prabhoo, 1970, 1971, 1976). In our project Shola grassland of Western Ghats, Kerala state, where 30 species of Collembola have been recorded, it is quite good number in comparison to Duars region of North Bengal. The photographs of some endemic and interesting species of Collembola are appended in three plates (Plate 1, 2, and 3).

Altogether forty five species was recorded from Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala respectively. From Duars Region of Northern West Bengal, sixteen species under eleven genera of five families were found and thirty species of Collembola belonging to eighteen genera under eight families have been recorded from Shola grassland of Kerala. From Shola grassland of Western Ghats, out of 30 species recorded 19 species are endemic to Kerala. One new species, *Lepidocyrtoides malabaricus* Mandal, Suman and Bhattacharya, 2019 was published from Shola grassland of Western Ghats, Kerala. This is the first

consolidated study of collembola fauna of Duars Region of Northern West Bengal and Shola Grassland of Western Ghats, Kerala.

Collembola play a significant role in the breakdown of leaf litter along with certain other micro-arthropods and consequently aiding in the process of humification. Thus they play a key role in enhancing soil fertility. They are also known to enrich the organic content of the soil in the form of faecal matter. Mitra (1993) has been reported that collembolan can be used as an index of crop production in the Agro-ecosystem some of them are minor pests in agriculture.

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