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Cover: Watercolour illustrations—Striped Tiger *Danaus genutia*, Common Silverline *Cigaritis vulcanus*, Tamil Lacewing *Cethosia mahratta*. © Mayur Nandikar.

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COMMUNICATION

Diversity and distribution of springtails (Collembola) from Jharkhand, India

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Abstract: This paper included the diversity and distribution of collembolan fauna in Jharkhand. A checklist of collembolan fauna from Jharkhand has been formulated. Endemic species from Jharkhand have also been reported. Affinities between species and habitat as well as another species of Collembola is basic character for diversity as well as distribution. Different types of methodologies have been deployed for collection from distinctive habitats. Climatic conditions are the limiting factor for species distribution and endemism. *Lepidocyrtus* is the most diverse and distributed genus. *Isotomurus* is the highest endemic genus. Some collembolan fauna from Jharkhand are prevailing only in this state while some are distributed in different biogeographic zone in world.

Keywords: Affinities, checklist, collembolan fauna, endemic species, *Isotomurus*, *Lepidocyrtus*.

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Author contributions: the authors confirm their contribution to the paper as follows: Koushik Kumar Roy: idealization, conceptualization, and manuscript preparation. Guru Pada Mandal: survey & project supervisor, specimen collection, conceptualization, and reviewing. Kusumendra Kumar Suman: surveys, specimen collection, conceptualization, and reviewing. All authors approved the final version of the manuscript.

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INTRODUCTION

Collembola are among the most widespread and abundant terrestrial arthropods (Hopkins 1997). As of August 2023, over 9,400 species of Collembola have been indentified, distributed across 715 genera and 33 families within four orders: Poduromorpha, Entomobryomorpha, Symphypleona, and Neelipleona (Bellinger et al. 2023). Mandal conducted several surveys on Collembolan fauna in Jharkhand between 2012 and 2015. Collembola was reported from Jharkhand and distributed in five Symphypleona species under three genera with one endemic species. Additionally, one Poduromorpha species and 30 Entomobryomorpha species with five endemic species were also reported.

Taxonomic History

Mandal & Hazra (2004) documented eight species of six genera in two families from Jharkhand. Mandal & Suman (2013) newly recorded *Yosiia dehradunia* from Jharkhand state. Mandal et al. (2016) described four new species from Jharkhand and in 2017, they documented additional five new Isotomidae species from Jharkhand state.

The first record from the taxonomy study of Collembola especially from Jharkhand was *Lepidocyrtus exploratorius* Carpenter, 1924 from the district of Latehar. Many species have been described from many districts in the following years. In 2013, Mandal first recorded the family Paronellidae from Latehar and Hazaribagh districts. First *Salina* species was recorded in 2015. Dhanbad has been marked the first district to describe Orchesellidae species. Six species of Isotomidae have also been reported in the following years. *Calvatomina pagoda* Yosii, 1966 is the first species of Symphypleona from this state.

MATERIALS AND METHODS

Sampled sites

After the first survey conducted in 2012, a total of 40 sites from 16 districts have been surveyed for Collembola specimens. Collections have been made by soil and litter extraction, bush beating, and by using mouth operated aspirator in these following district with the number of sample sites in parentheses: Ranchi (four), Hazaribagh (one), Koderma (one), Sahibganj (four), Pakur (three), Jamtara (two), Dhandab (one), Deogarh (one), East Singbhum (four), West Singbhum (four), Seraikhela-Kharsawan (four), Khunti (one), Ramgarh (five), Bokaro (three), Giridih (one), and Latehar (one) (Figure 1).

Diversity from Jharkhand State

In total, 36 species of Collembola which are classified under 20 genera and eight families from this state are distributed among Symphypleona (13.9%), Poduromorpha (2.8%), and Entomobryomorpha (83.3%). Symphypleona has been reported from eastern districts of this state, especially the border of West Bengal (Tables 1,2).

In Entomobryomorpha, the family Isotomidae has been recorded with at least one species in eight districts, while Paronellidae and Entomobryidae have been recorded from almost all surveyed districts. In the case of Poduromorpha, Hypogastruiridae species have been documented from the Hazaribagh district where this family is found together with Isotomidae, Paronellidae, and Entomobryidae. Entomobryidae is also registered from 10 districts together with Isotomidae and Paronellidae (Tables 1,2).

Family Entomobryidae reported to have the highest species richness with 13 species followed by family Paronellidae with eight species, family Isotomidae with seven species, and family Sminthuridae with two species. Family Entomobryidae is also registered with the highest generic level of richness with six genera followed by family Paronellidae with five species (Tables 1,2).

East-Singhbhum district is documented with the highest species richness with 10 species from nine genera under the families Sminthuridae, Isotomidae, Paronellidae, and Entomobryidae. Dhanbad district also has the highest species richness with 10 species under nine genera which include all families except Hypogastruiridae and Entomobryidae. This district uniquely has all Symphypleona families. Ten species under six genera are reported from Hazaribagh district belonging to the families Hypogastruiridae, Isotomidae, Paronellidae, and Entomobryidae. Ramgarh district has reported 10 species under six genera, distributed among the families Isotomidae, Paronellidae, and Entomobryidae. Pakur district is recorded as the second highest species enriched region with eight species under eight genera where seven Entomobryomorpha genera and one Symphypleona genera. Saraikela-Kharsawan has species richness with nine species under seven genera distributed among the families Sminthuridae, Paronellidae, and Entomobryidae. Ranchi district has four species under three genera, all within Entomobryomorpha. Koderma district is rich with five species under five genera only under Paronellidae and Entomobryidae. Jamtara district is

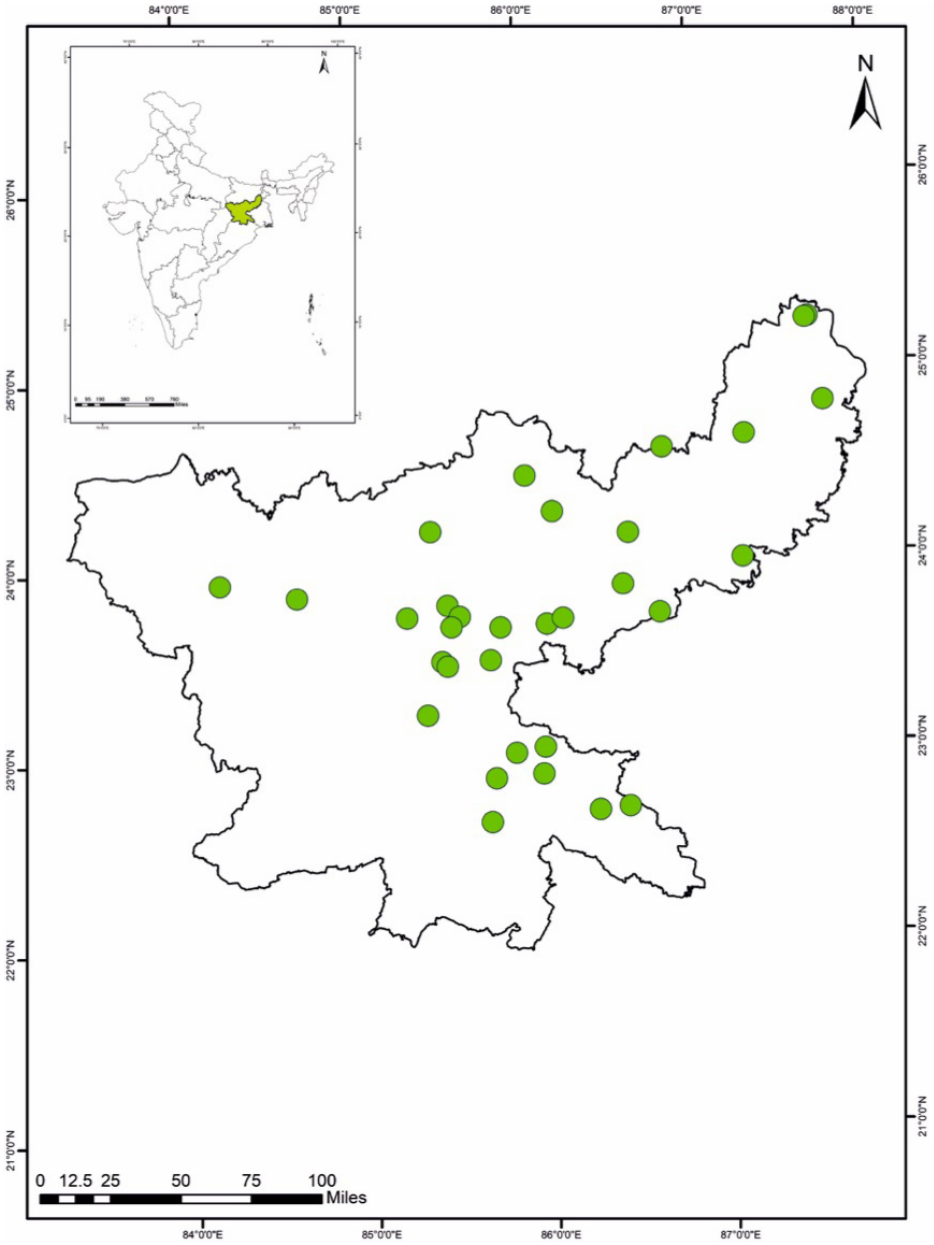

Figure 1. Map of Jharkhand (collection sites).

diversified with three species under three genera only under Entomobryomorpha. Bokaro district is rich with four species under four genera only under the families Paronellidae and Entomobryidae. Three species under three genera are reported from West Singbhum under the families Paronellidae and Entomobryidae. Sahebganj district enriched with six species under five genera from Entomobryomorpha. Deoghar district has three species under three genera from the families Dicyrtomidae and Paronellidae. Latehar district has five species under four genera from the families Paronellidae and Entomobryidae. Khunti district has the least diversity with two species under two genera from the family Paronellidae. Giridih district has the least diversity with single species from the family Dicyrtomidae (Tables 1,2).

From all surveyed sites, eight species under five genera belong to the family of Paronellidae. Thirteen species under six genera belong to the family of Entomobryidae, of which six species are *Lepidocyrtus*. Seven species in two genera belong to the family of Isotomidae. Genus *Isotomurus* and genus *Seira* are the other two diverse genera with six and three species, respectively. Genus *Lepidocyrtus*, the most distributed genus, has been reported from 11 districts. The second

Table 1. Checklist of the Collembola from Jharkhand, India.

	Scientific names	Record regions	Distribution	Reference
Symphypleona				
Sminthurididae				
1	*Sminthurides parvulus* (Krausbauer, 1898) Heymons, R & Heymons, H in Brauer, A, 1909	Db: Amaghata;	PAL, ORT	NZC
Dicyrtomidae				
Dicyrtominae				
2	*Calvatomina pagoda* Yosii, 1966	Dg: Khijuria; Db: Amaghata; Gd: Lachhudih	ORT	NZC
3	*Calvatomina trivandrana* Prabhoo, 1971	ES: Dimna Lake, Rakha Mines; SK: Kharswan;	Endemic#	NZC
Sminthuridae				
Sphyrothecinae				
4	*Sphyrotheca* (*Sphyrotheca*) *gangetica* Yosii, 1966	Db: Amaghata; Pk: Litti Para;	Endemic#	NZC
Sminthurinae				
5	*Temeritas dimna* Mandal, Suman & Bhattacharya, 2016	ES: Dimna Lake;	Endemic*	Mandal et al. 2015: 49–51
Poduromorpha				
Hypogastruridae				
6	*Ceratophysella indovaria* (Salmon, 1970)	Hb: Hazaribagh National Park;	Endemic#	Mandal 2014: 197
Entomobryomorpha				
Isotomidae				
Proisotominae				
7	*Proisotoma pakurensis* Mandal, Suman & Bhattacharya, 2017	Pk: Litti Para;	Endemic*	Mandal, Suman & Bhattacharya 2017: 98
Isotominae				
8	*Isotomurus balteatus* (Reuter, 1876) Handschin, 1929	Hb: Hazaribagh National Park;	PAL, NEO, AUS, ORT	Mandal 2014: 199
9	*Isotomurus dhanbadensis* Mandal, Suman & Bhattacharya, 2017	Db: Amaghata; Pk: Litti Para;	Endemic*	Mandal, Suman & Bhattacharya 2017: 100
10	*Isotomurus indicus* Mandal, Suman & Bhattacharya, 2017	Jt: Amlachatar; Rg: Rajrappa;	Endemic*	Mandal, Suman & Bhattacharya 2017: 102
11	*Isotomurus jharkhandensis* Mandal, Suman & Bhattacharya, 2017	Db: Amaghata; ES: Asanpani Pk: Litti Para Rg: Rajrappa, Kujju range; Rn: Sambar Fencing Park; Sg: Dhobijharna;	Endemic*	Mandal, Suman & Bhattacharya 2017: 103
12	*Isotomurus sahebganjensis* Mandal, Suman & Bhattacharya, 2017	Sg: Dhobijharna;	Endemic*	Mandal, Suman & Bhattacharya 2017: 105
13	*Isotomurus stuxbergi* (Tullberg, T, 1877) Babenko & Bulavintsev, 1993 {syn. *Isotomurus ciliatus* Stach, 1947}	Sg: Dhobijharna;	NEA, PAL, ORT, NEO	NZC
Orchesellidae				
Heteromurinae				
14	*Dicranocentrus cercifer* (Imms, 1912) Mari Mutt, 1979	Pk: Litti Para;	Endemic#	NZC
15	*Alloscopus tetracanthus* (Börner, 1906) Handschin, 1928	Db: Amaghata;	ORT, AUS	NZC
Paronellidae				
Paronellinae				
16	*Cyphoderus indicus* Mandal, Suman & Bhattacharya, 2016	Bo: Sector I;ES: Rakhamines;	Endemic#	Mandal et al. 2015: 45–47
17	*Cyphoderus jharkhandensis* Mandal, Suman & Bhattacharya, 2016	Dg: Khijuria; Jt: Amlachatar; Lt: Betla National Park; Pk: Litti Para, Hiranpur; Sg: Sahibganj, Rajmahal, Karam pahar; SK: Kuchia forest; WS: Kundruhati, Chaibasa;	Endemic*	Mandal et al. 2015: 47–48
Salininae				
18	*Salina* (*Salina*) *striata* (Handschin, 1928) Handschin, 1929	Kt: Birsa Mrig Bihar; Rg: Kujju range;	Endemic#	NZC

	Scientific names	Record regions	Distribution	Reference
19	*Salina* (*Salina*) *indica* (Imms, 1912) Salmon, 1957	Dg: Khijuria; Db: Amaghata; ES: Asanpani; Jt: Damka; Pk: LittiPara,Ramnathpur; Rg: Kujju range; Sg: Dhobijharna; SK: Kotwalbadi;	ORT	NZC
20	*Yosiia dehradunia* Mitra, 1967	Db: Amaghata; Hb: Hazaribagh National Park; Km: Koderma WLS; Pk: Litti Para; Rg: Rajrappa, Kujju range; Rn: Hundru;	Endemic#	Mandal 2014: 201
21	*Callyntrura* (*Handschinphysa*) *lineata* (Parona, 1892)	Bo: Balidihi, City Park lake; Hb: Hazaribagh National Park; Kt: Birsa Mrig Bihar; Km: Koderma WLS; Lt: Betla National Park; Pk: Litti Para; Rg: Kujju range;	PAL, ORT	Mandal 2014: 201
22	*Callyntrura* (*Handschinphysa*) *vestita* (Handschin, 1925) Uchida, 1954	ES: Asanpani; Hb: Hazaribagh National Park;	ORT	Mandal 2014: 201
23	*Dicranocentroides flavescens* Yosii, 1966	Db: Amaghata ES: Asanpani; Rg: Kujju range;	Endemic#	NZC
Entomobryidae				
Entomobryinae				
24	*Calx kailashi* Mandal, 2018	Km: Koderma WS;	Endemic#	Mandal 2018: 108
25	*Homidia cingula* (Borner, 1906) Yosii, 1959	SK: Giliganda Forest;	PAL, ORT	NZC
26	*Sinella curviseta* Brook, 1882	Hb: Hazaribagh National Park;	PAL, NEA, NEO, ORT, AUS	NZC
Seirinae				
27	*Seira* (*Seira*) *indica* (Ritter, 1911) Yosii, 1966	Hb: Hazaribagh National Park; Sg: Sahibganj;	Endemic#	Mandal 2014: 199
28	*Seira* (*Seira*) *indra* Imms, 1912	Bo: City Park lake; Hb: Hazaribagh National Park; Km: Koderma WS; Rg: Kujju range; WS: Chandil Dam	Endemic#	NZC
29	*Seira* (*Seira*) *lateralis* Yosii, 1966	ES: Jaduguda;	Endemic#	NZC
Lepidocyrtinae				
30	*Lepidocyrtus exploratorius* Carpenter, 1924	Lt: Betla National Park;	ORT	NZC
31	*Lepidocyrtus* (*Lepidocyrtus*) *curvicollis* Bourlet, 1839	Km: Koderma WS; Lt: Betla National Park;	PAL, ORT, NEA	NZC
32	*Lepidocyrtus* (*Lanocyrtus*) *cyaneus* Tullberg, 1871	ES: Asanpani; Hb: Hazaribagh National Park; SK: Kotwalbadi;	COS	Mandal 2014: 199
33	*Lepidocyrtus* (*Cinctocyrtus*) *medius* Schaeffer, 1898	Bo: Balidihi; ES: Asanpani, Burudihi; Rg: Rajrappa; Rn: Rukka dam; Sg: Dhobijharna; WS: Chaibasa;	ORT	NZC
34	*Lepidocyrtus* (*Setogaster*) *indicus* Handschin, 1929	Hb: Hazaribagh National Park; Rg: Kujju range;	ORT	NZC
35	*Lepidocyrtus* (*Acrocyrtus*) *heterolepis* Yosii, 1959	Db: Amaghata; Hb: Hazaribagh National Park; Rn: Ormanjhi	ORT	Mandal 2014: 199
36	*Acanthurella betlaensis* Mandal, Suman & Bhattacharya, 2016	Lt: Betla National Park;	Endemic#	Mandal et al. 2015: 41–44

Notes: Abbreviations of surveyed districts: Bo—Bokaro | Dg—Deoghar | Db—Dhanbad | ES—East Singbhum | Gd—Giridih | Hb—Hazaribagh | Jt—Jamtara | Kt—Khunti | Km: Koderma | Lt—Latehar | Pk—Pakur | Rg—Ramgarh | Rn—Ranchi | Sg—Sahebganj | SK—Seraikhela-Kharswan | WS—West Singbhum.
Abbreviations of Distributions: PAL—Palearctic | ORT—Oriental | NEO—Neotropical | AUS—Australian | NEA—Nearctic | COS—Cosmopolitan.
NZC—National Zoological Collection | Zoological Survey of India | Kolkata | India. #—refers to the endemic to India | *—refers only found in the surveyed state (Jharkhand).

most distributed genus is *Isotomurus*, which has been reported from eight districts (Tables 1,2).

Endemism

The state of Jharkhand recorded seven endemic species which are distributed into four genera of Symphypleona and Entomobryomorpha except Poduromorpha, which is almost 19.44% as compared with 36 species found in this state. Besides these species, 13 endemic species to India are also reported from this state. Almost all surveyed district of Jharkhand are reported with endemic species. Genus *Isotomurus*, with four species, is reported to have the highest endemism from this state as well as India. Three species of genus *Seira* are followed by endemic species which are also found in this state (Table 1).

Fifteen species under nine genera are also found in almost the same geographical region globally. Only

Table 2. Registration number of collembolan specimen in NZC with distribution in India (N.B. Serial Number are same as Table 1).

	Scientific names	Registration no.	Distributed in India
Symphypleona			
Sminthurididae			
1	*Sminthurides parvulus* (Krausbauer, 1898) Heymons, R & Heymons, H in Brauer, A, 1909	804/H14	Jharkhand, West Bengal, Uttar Pradesh
Dicyrtomidae			
Dicyrtominae			
2	*Calvatomina pagoda* Yosii, 1966	802/H14	Jharkhand, West Bengal
3	*Calvatomina trivandrana* Prabhoo, 1971	799/H14	Jharkhand, Kerala
Sminthuridae			
Sphyrothecinae			
4	*Sphyrotheca (Sphyrotheca) gangetica* Yosii, 1966	797/H14	Jharkhand, West Bengal, Maharashtra, Uttar Pradesh
Entomobryomorpha			
Isotomidae			
Isotominae			
13	*Isotomurus stuxbergi* (Tullberg, T, 1877) Babenko & Bulavintsev, 1993	2003/H14	Jharkhand, West Bengal
Orchesellidae			
Heteromurinae			
14	*Dicranocentrus cercifer* (Imms, 1912) Mari Mutt, 1979	790/H14	West Bengal, Kerala, Jharkhand
15	*Alloscopus tetracanthus* (Börner, 1906) Handschin, 1928	791/H14	Jharkhand, Kerala, West Bengal
Paronellidae			
Salininae			
18	*Salina (Salina) striata* (Handschin, 1928) Handschin, 1929	742/H14	Tamil Nadu (Nilgiri), West Bengal, Uttarakhand, Andaman and Nicobar Islands
19	*Salina (Salina) indica* (Imms, 1912) Salmon, 1957	743/H14	Jharkhand, Uttar Pradesh, West Bengal, Maharashtra, Uttarakhand, Himachal Pradesh, Andaman & Nicobar Islands
23	*Dicranocentroides flavescens* Yosii, 1966	727/H14	Jharkhand, Uttarakhand, West Bengal, Manipur, Maharashtra, Mizoram, Nagaland, Sikkim, Tripura, Arunachal Pradesh, Uttar Pradesh
Entomobryidae			
Entomobryinae			
25	*Homidia cingula* (Borner, C., 1906) Yosii, 1959	777/H14	Jharkhand, West Bengal, Maharashtra, Andhra Pradesh, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Arunachal Pradesh, Manipur, Sikkim, Mizoram, Nagaland, Odisha
26	*Sinella curviseta* Brook, 1882	778/H14	Jharkhand, Tamil Nadu, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Jammu & Kashmir, Arunachal Pradesh, Assam, Punjab, Sikkim, West Bengal, Andaman and Nicobar Islands
Seirinae			
28	*Seira* (*Seira*) *indra* Imms, 1912	793/H14	Jharkhand, West Bengal
29	*Seira* (*Seira*) *lateralis* Yosii, 1966	796/H14	Jharkhand, Maharashtra
Lepidocyrtinae			
30	*Lepidocyrtus exploratorius* Carpenter, 1924	699/H14	Jharkhand, Meghalaya, Maharashtra, West Bengal
31	*Lepidocyrtus* (*Lepidocyrtus*) *curvicollis* Bourlet, 1839	781/H14	Jharkhand, Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Lakshadweep, Odisha, Puducherry, West Bengal, Uttarakhand
33	*Lepidocyrtus* (*Cinctocyrtus*) *medius* Schaeffer, 1898	786/H14	Jharkhand, Bihar
34	*Lepidocyrtus* (*Setogaster*) *indicus* Handschin, 1929	784/H14	Jharkhand

one species of genus *Lepidocyrtus* is reported from all biogeographic zones of the world, making it a cosmopolitan species (Table 1).

Geographic and habitat distributions

The state of Jharkhand (21.950–25.233 °N; 83.333–87.967 °E) is a part of the Chota Nagpur Plateau as well as river sheds. Chota Nagpur Plateau was formed from the Deccan Plateau by continental uplift in the Gondwana period. Furthermore, the climate of the Chota Nagpur Plateau is analogous with to that of the Deccan Plateau. The climatic condition of Jharkhand State varies from subtropical humid to tropical wet and dry when temperature and precipitation also varies from very hot, dry summers (99°F) to cold winters (50°F) and 40 inches of rainfall, respectively. The soil of the Jharkhand State is composed mainly by of rocks, stones, and different types of minerals, especially mica. The geographical condition of Jharkhand creates such condition which promotes floral diversity, such as Sal, Jackfruit, Jamun, Kendu, Shisham, Mahua, Lac, Mango, Aasan, Baheda, and Bamboo as well as faunal diversity. Springtails are euedaphic species, usually saprophagous by nature. Collembola solely depend on the kind of foods which include fungi, lichens, and deteriorated animal or plant materials. Collembolan fauna is distributed in many strata of soil due to food availability. Euedaphic springtails feed on living plants, pollen, and algae which are available on plant bark. Instead of this, some collembola are specific for a definite food material. An abundance of collembola fauna in a definite part of the habitat forms microarthropod-fauna-associated soil. Most species live on the soil surface and are epiedaphic. Some species are also found on seedlings or plant surfaces. Edaphic, epiedaphic, hemiedaphic, and euedaphic Collembola, including the members of Sminthurididae, Isotomidae, and Poduromorpha, are distributed among many horizons of soil due to types of humus and vegetation. The distribution of Collembola in Jharkhand state is associated with the physical or geographical features of this state. A series of plateaus, hills, and valleys are characterized by the Chota Nagpur plateau. Dominated tropical moist and tropical dry deciduous forest create similar climatic conditions which generalize similar life to survive. The north-east side of the state has different vegetation due to many river basins. Endemism is bounded, at the species level, in the single specific locality with its vegetation and geographical parameters. Temperature and humidity are signifying an important role in endemism.

Affinities

Collembola species dispersal and distribution are signified by phylogenetic evolution. In the Symphypleona, species of *Sminthurides* disperse in the Palearctic and Oriental regions; while other species of *Calvatomina*, *Sphyrotheca*, and *Temeritas* are restricted to a definite locale (Table 1). In the Entomobryomorpha, some species of *Isotomurus* are distributed across many continents. The genus *Seira* is cosmopolitan but three species (*Seira* (*Seira*) *indica* (Ritter 1911) Yosii, 1966, *Seira* (*Seira*) *indra* Imms, 1912, and *Seira* (*Seira*) *lateralis* Yosii, 1966) are restricted to India (Table 1; Images 17–19). *Lepidocyrtus* is notably diverse in the Oriental region whereas *Lepidocyrtus* (*Lanocyrtus*) *cyaneus* Tullberg, 1871 is cosmopolitan (Table 1). In addition, the genus *Cyphoderus* is a cosmopolitan whereas *Cyphoderus indicus* Mandal, Suman, and Bhattacharya, 2016 have only been found in India (Table 1). Genus *Yosiia* is restricted only to the Indian region (Table 1).

DISCUSSION

Edaphic springtails or collembolan faunal diversity and distribution depend on their resources in their habitat. The morphology of collembolan is greatly parallelized with the vegetation. Taxa, such as Sminthurididae, Isotomidae, and Poduromorpha, bear vestigial appendages which are very much proportionate to movement. For some euedaphic species of Genus *Cyphoderus* in the aphotic environment, morphological characteristics are similar to cave dwellers such as the absence of pigmentation and eyes. Genus *Salina* is one type of this species which gives it with advantage of long appendages. *Isotomurus jharkhandensis* Mandal, Suman & Bhattacharya, 2017 and *Cyphoderus jharkhandensis* Mandal, Suman, & Bhattacharya, 2016 (Images 27,29) are two among the endemic species that are distributed all over the state at different elevations. Some species, such as *Temeritas dimna* Mandal, Suman & Bhattacharya, 2016, *Proisotoma pakurensis* Mandal, Suman & Bhattacharya, 2017, *Isotomurus sahebganjensis* Mandal, Suman & Bhattacharya, 2017 (Images 24,28) are show restricted distribution in a certain area. From this study, we found that one species, *Lepidocyrtus* (*Lanocyrtus*) *cyaneus* Tullberg, 1871, is a cosmopolitan species as well as seven species are endemic to Jharkhand. After the first collection and reported collembolan species from the state of Jharkhand, it was found that species endemism is very high, especially in Entomobryomorpha. Other states of India also show endemic species along

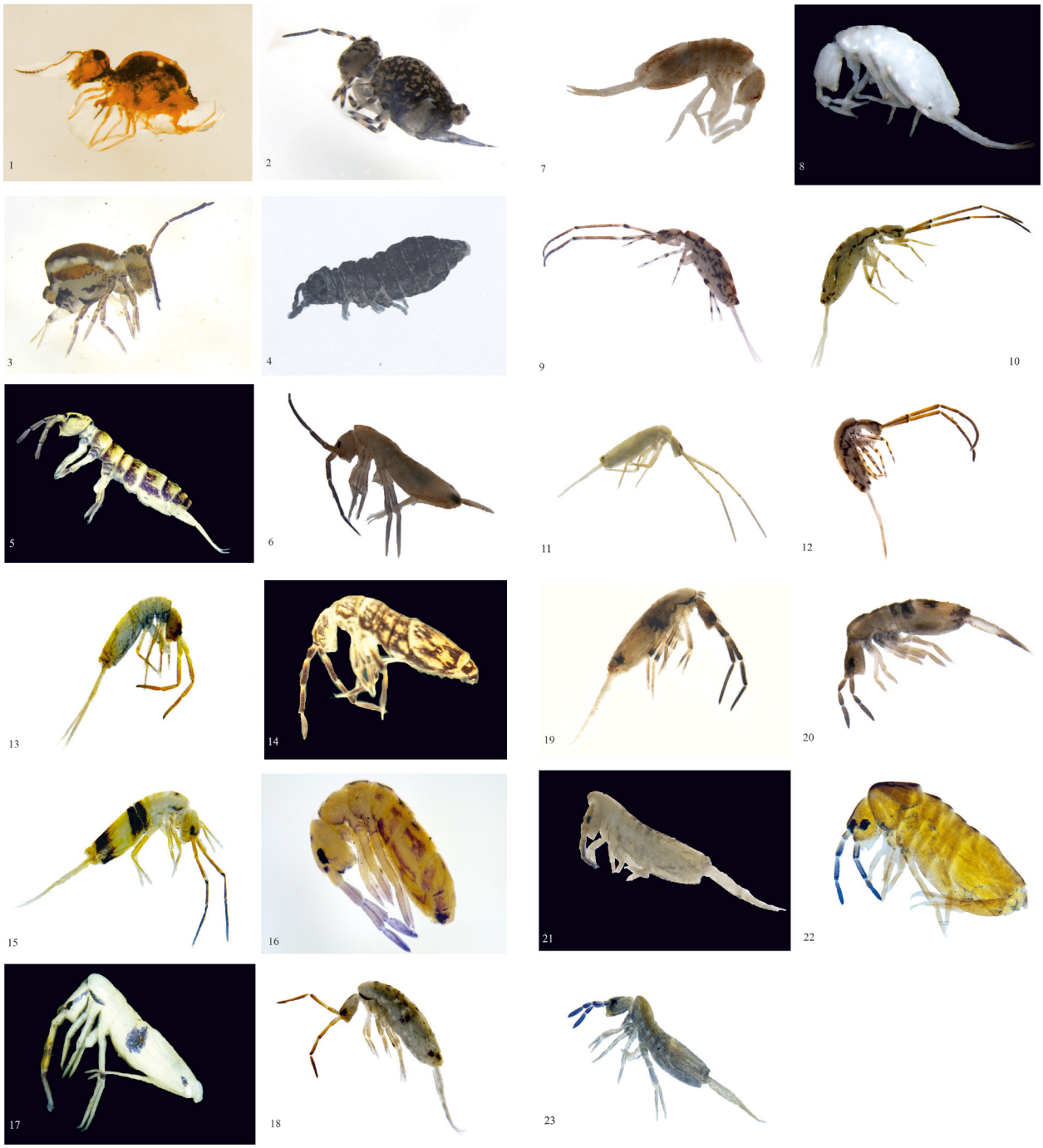

Image 1–23. Some collembolan species photographs from Jharkhand, India. 1—*Sminthurides parvulus* (Krausbauer, 1898) Heymons, R & Heymons, H in Brauer, A, 1909 | 2—*Calvatomina pagoda* Yosii, 1966 | 3—*Calvatomina trivandrana* Prabhoo, 1971 | 4—*Ceratophysella indovaria* (Salmon, 1970) | 5—*Isotomurus balteatus* (Reuter, 1876) Handschin, 1929 | 6—*Dicranocentrus cercifer* (Imms, 1912) Mari Mutt, 1979 | 7—*Alloscopus tetracanthus* (Börner, 1906) Handschin, 1928 | 8—*Cyphoderus indicus* Mandal, Suman & Bhattacharya, 2016 | 9—*Salina* (*Salina*) *striata* (Handschin, 1928) Handschin, 1929 | 10—*Salina* (*Salina*) *indica* (Imms, 1912) Salmon, 1957 | 11—*Yosiia dehradunia* Mitra, 1967 | 12—*Callyntrura* (*Handschinphysa*) *lineata* (Parona, 1892) | 13—*Dicranocentroides flavescens* Yosii, 1966 | 14—*Calx kailashi* Mandal, 2018 | 15—*Homidia cingula* (Borner, C., 1906) Yosii, 1959 | 16—*Sinella curviseta* Brook, 1882 | 17—*Seira* (*Seira*) *indica* (Ritter, 1911) Yosii, 1966 | 18—*Seira* (*Seira*) *indra* Imms, 1912 | 19—*Seira* (*Seira*) *lateralis* Yosii, 1966 | 20—*Lepidocyrtus* (*Lepidocyrtus*) *curvicollis* Bourlet, 1839 | 21—*Lepidocyrtus* (*Cinctocyrtus*) *medius* Schaeffer, 1898 | 22—*Lepidocyrtus* (*Setogaster*) *indicus* Handschin, 1929 | 23—*Lepidocyrtus* (*Acrocyrtus*) *heterolepis* Yosii, 1959. © Authors.

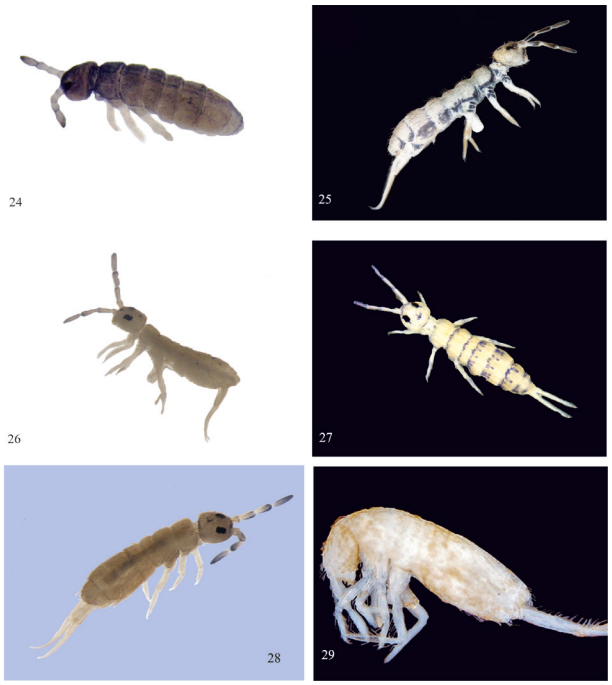

Image 24–29. Some endemic species of Collembola recorded from Jharkhand, India: 24—*Proisotoma pakurensis* Mandal, Suman & Bhattacharya, 2017 | 25—*Isotomurus dhanbadensis* Mandal, Suman & Bhattacharya, 2017 | 26—*Isotomurus indicus* Mandal, Suman & Bhattacharya, 2017 | 27—*Isotomurus jharkhandensis* Mandal, Suman & Bhattacharya, 2017 | 28—*Isotomurus sahebganjensis* Mandal, Suman & Bhattacharya, 2017 | 29—*Cyphoderus jharkhandensis* Mandal, Suman & Bhattacharya, 2016. © Authors.

with Jharkhand in some cases. Further study is needed to justify this finding. The collembola fauna from this state is little documented, ascribable to lack of survey. However, approvable work was done by G.P. Mandal et al. to survey and record these species. Besides, more surveys and exploration are required, from all types of habitats of this state, for detailing species diversity in this region.

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