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Review Article

DIVERSITY AND CHECKLIST OF COLLEMBOLA-FAUNA (INSECTA) OF JAMMU, KASHMIR AND LADAKH HIMALAYA, INDIA

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ABSTRACT
In this paper, the Collembola-fauna of 3 different geographical regions of North-west Himalaya, *viz.* Jammu, Kashmir and Ladakh, occurring in vast areas / localities and in diverse habitats like surface of stagnant water bodies, soils, grasslands, leaf-litter, vegetation, snowfields, glaciers, homes, etc., has been dealt with. The Collembolans of these regions include a total of 51 species, belonging to 10 main families under three orders. The total number of species and genera as 31 spp. (18 genn.), 16 spp. (9 genn.) and 4 spp. (3 genn.), is belonging to order Entomobryomorpha, Poduromorpha and Symphyleona respectively. The family Entomobryidae is the dominant family, with 16 species, under 8 genera. Genus *Lepidocyrtus* (sub-family Lepidocyrtinae), is having highest number of species i.e. 7. An up-to-date systematic checklist of Collembolans has been provided. Apart from this, diversity and species richness has been discussed.

Key Words: *Collembola, Checklist, Diversity, Jammu, Kashmir, Ladakh*

INTRODUCTION
Class Collembola includes insects commonly known as sprintails and snow fleas. These insects are abundantly occurring, primitive, wingless, soft-bodied, mostly elongate or globose, measuring generally 2-3 mm in length. Springtails have derived their name because of the presence of forked tail-like appendage or furcula or springing organ, on the underside of the 4th abdominal segment. With the help of furcula, most Springtails jump as far as 10-15cms. The collembolans inhabitant of snow, ice and glaciers, are called as "Snow fleas" like *Isotoma, Proisotoma, Hypogastrura, Aackia.*
The Collembolans have diverse range of habitats such as surface of stagnant water bodies, soils, grasslands, leaf-letter, vegetation, caves, snowfields, glaciers, and even homes. The majority of species feed on fungi, bacteria, decaying vegetation, mosses in damp places, saprophagous, organic detritus in soils and few are phytophagous. The most of species are inhabitant of soil and play an important role in decomposition of decaying plant material and releasing the nutrients in soil ecosystem also, serving as major food source for a wide variety of soil predators.
The collembolan –fauna of Jammu, Kashmir and Ladakh Himalyan region of paramount zoogeographical significance, include a total of 51 species, belonging to 30 genera. These species are distributed under 10 main families, belonging to 3 orders, *viz.* Poduromorpha, Entomobryomorpha and Symphyleona. These collembolan species are known to occur in diverse habitats, in vast areas and localities in temperate Kashmir, sub-tropical Jammu and cold desert Ladakh region, in north-west Himalaya.
In the present communication, the checklist of springtails and Snow fleas has been updated in the light of recent systematic and nomenclatural changes. In this direction, online databases, pertaining to checklist of collembolan of the world by Janssens, have been followed. The synonymies of taxa, given in parentheses, are listed under valid species in the checklist. Besides, diversity and species richness of collembolans of three geographically different regions of north-western Himalaya have briefly been discussed.

Systematic Checklist
Order 1: Poduromorpha
Superfamily 1: Neanuroidea
Family: Neanuridae
Subfamily 1: Frieseinae

1. *Friesea excels* Denis*
2. *Friesea* sp
Subfamily 2. Neanurinae
3. *Neanura* sp.*
Tribe: Lobellini
4. *Hilameria* (*Yetimeria*) sp.*
(= *Yetimeria*)
Subfamily 3. Uchidanurinae
5. *Uchidanura* sp.*
Superfamily 2: Hypogastruroidea
Family: Hypogastruridae
6. *Ceratophysella communis* (Denis)*
(= *Hypogastrura communis* Denis)
7. *Ceratophysella indovaria* Salmon
(= *Hypogastrura indovaria* Imms)
8. *Ceratophysella* sp.*
9. *Hypogastrura aniiala* (Nic.)*
10. *Hypogastrura harveyi* (Folsom)*
11. *Hypogastrura nivicola* (Fitch)*
12. *Hypogastrura* sp.
13. *Xenylla obscura* Imms
14. *Xenylla sincta* Baijal
Superfamily 3: Onychiuroidea
Family 1: Onychiuroidea
Subfamily: Onychiuridae
15. *Onychiurus* sp.
Family 2: Tulbergiidae
16. *Tullbergia* sp.
Order 2. Entomobryomorpha
Superfamily 1. Tomoceroidea
Family: Tomoceridae
Subfamily: Tomocerinae
Tribe: Tomoerini
17. *Tomocerus mitrai* Prabhoo & Muralideedharan
18. *Tomocerus petalospinus* Salmon
19. *Tomocerus* sp.
Superfamily 2. Isotomoidea
Family: Isotomidae
Subfamily 1: Anurophorinae
20. *Isotomodes* sp.
Subfamily 2: Isotominae
21. *Aackia karakoramensis* Yossi*
22. *Isotoma* (*Desoria*) *mazada* Yosii
23. *Isotoma spinicauda* Bonet *
24. *Isotoma violacea* (Tullberg)
(= *Isotoma* (*Desoria*) *trispinata* (Macgillivary)
25. *Isotoma* sp.*
Subfamily 3. Proisotominae
26. *Folsomia* sp.

27. *Proisotoma ladaki* Denis*
28. *Scutisotoma ladaki* (Denis)*
Superfamily 4. Entomobryoidea
Family: Entomobryidae
Subfamily1: Entomobryinae
29. *Entomobrya* sp.*
30. *Sinella curviseta* Brook
31. *Sinella montana* (Imms)
Subfamily 2. Orchesellinae
Tribe: Orchesellini
32. *Orchesella* sp.
33. *Orchesellides boraoi* Bonet*
Subfamily 3. Lepidocyrtinae
34. *Lepidiaphanus kashmirensis* Arora & Singh
35. *Lepidocyrtus caudatus* Carpenter
36. *Lepidocyrtus* (*Ascocyrtus*) *magnificus* Carpenter
37. *Lepidocyrtus* (*Acrocyrtus*) *malayanus* Yosii
38. *Lepidocyrtus* (*Cinctocyrtus*) *medius* Schaeffer
(= *Lepidocyrtus* (s.str.) *medius* Schaeffer)
39. *Lepidocyrtus* (*Lanocyrtus*) *cyaneus* Tullberg
(= *Lepidocyrtus cyaneus* (Tullberg)
40. *Lepidocyrtus unifasciatus* James*
41. *Lepidocyrtus* sp.
Subfamily 4. Willowsiinae
42. *Drepanosira subornata* (Denis)*
(= *Parasira subornata* Denis)
43. *Janetschekbrya brahamides* (Denis)*
(= *Seira brahamides* Denis)
44. *Janetschekbrya hutchinsoni* (Denis)*
(= *Entomobrya hutchinsoni* Denis)
Family 2. Paronellidae; Subfamily Paronellinae
45. *Dicranocentroides flavescens* Mitra
Tribe 1. Callyntrurini
46. *Callyntrura boerneri* Imms
Tribe 2. Cremastocephalini
47. *Salina* (*Salina*) *indica* (Imms)
(= *Salina indica* (Imms)
Order 3. Symphyleona
Superfamily 1. Sminthuridoidea
Family: Sminthurididae
48. *Sminthurides aquaticus* (Bourlet)*
49. *Sminthurides violaceus* Reuter*
Superfamily 2. Sminthuroidea
Family 1. Bourletiellidae
50. *Bourletiella arvalis* (Fitch)
Family 2. Sminthuridae; Subfamily Sminthurinae
51. *Sminthurus hamtaensis* Baijal
**(asterisk) marks shown above indicate distribution of collembolan species in Ladakh Himalayan regions of J & K State.*

Diversity and Species Richness

The earliest detailed systematic survey of collembola- fauna of Kashmir and Ladakh Himalayan regions was conducted by Denis (1936). He recorded as well as described new species from these regions, including 14 species, belonging to 12 genera under 6 families. The number of species investigated by him, now stand synonymized, see above given checklist. In this connection, the updated taxa, pertaining to different families are : 1 species of Bourletiellid, belonging to genus *Bourletiella*; 5 Entomobryids (*Drepanosira, Janetschekbrya*, *Lepidocrytus,Orchesellides)*; 2 Hypogastrurids (*Ceratophysella*, *Hypogastrura*); 3 Isotomids (*Isotoma*, *Proisotoma*, *Scutisotoma*); 1 Neanurid (*Friesea*); 2 Sminthuridids (*Sminthurides*).

In fifties, sixties and in recent years, 2004 and 2007, more collembolans were recorded and described, including a new genus *Aackia,* from diverse areas and localities of Jammu, Kashmir and Ladakh Himalayan regions by various authors : Baijal (1955, 1958); Arora and Singh (1962); Mani and Singh (1962), Yosii (1966a, 1966b), Hazara *et al.,* (2004) and, Masood and Pandit (2007). Besides these, Chandra & Sidhu (2009) provided checklist of genera, with only number of species of collembolans of Ladakh, covering a total of 17 species, belonging to 10 genera. Through the investigations by these authors, a total of 37 species, belonging to 23 genera, under 8 families became known from these regions.These are: 11 Entomobryids, belonging to genera, *Entomobrya, Lepidiaphanus*, *Lepidocyrtus*, *Orchesella* and *Sinella*; 7 Hypogastrurids (*Ceratophysella*, *Hypogastrura* , *Xenylla*); 6 Isotomids (*Aackia*, *Folsomia*, *Isotoma* and *Isotomodes*); 4 Neanurids (*Friesea*, *Neanura*, *Hilameria* (*Yetimera*) and *Uchidanura*); 2 Onychiurids (*Onychiurus* and *Tullbergia*); 3 Paronellids (*Callyntrura*, *Dicranocentroides, Salina*); 1 Sminthurid (*Sminthurus*); 3 Tomocerids (*Tomocerus*) .

Table 1: Total number of species / genera, belonging to families of Orders of Collembola of Jammu, Kashmir and Ladakh region

(1) Families of Poduromorpha	**Total number of Genera (Species)**
Hypogastruridae	3 (9)
Neanuridae	4 (5)
Onychuridae	2 (2)
(2) Families of Entomobryomorpha	
Entomobryoidae	8 (16)
Isotomidae	6 (9)
Paronellidae	3 (3)
Tomoceridae	1 (3)
(3) Families of Symphyleona	
Bourletiellidae	1 (1)
Sminthuridae	1 (1)
Sminthurididae	1(2)
Total	30 (51)

About 22 species, belonging to 16 genera, under 6 main families, *viz*. Entomobryidae, Hypogastruridae, Isotomidae, Neanuridae and Sminthurididae, are known to show prevalence in Ladakh region, see checklist (valid species marked with asterisk). A total of about 51 species of Collembola, distributed over 30 genera, under 10 main families, belonging to 3 orders, are known to occur in vast localities and areas of Jammu, Kashmir and Ladakh regions of North-western Himalaya. The Entomobryidae is the dominating family, with 16 species, belonging to 8 genera, followed by Hypogastruridae, with 9 species

(3 genera) and Isotomidae with 9 spp. (6 genn.). The lowest number of species *i.e.* 1 (1 genus) each, pertain to family Bourletiellidae and Sminthuridae, see above given Table 1.

In Kashmir region, the study on the collembolans in soil and litter (partly) decomposed in forests of Yousmarg, has been made by Raina *et al.*, (1979), showing high percentage of these insects after Acari in the forest ecosystem. However, these authors have not identified taxa to species or genera and not even to family level. Masood and Pandit (2007) have found 10 genera of collembolans, as most dominant group of soil insects of Dachigam National Park in Kashmir Valley. High population of collembolans has also been found in the almond and apple orchards of Kashmir. The collembolans of these cultivated avenues include *Sinella curviseta*, *Isotoma*, *Onychiurus*, *Hypogastrura*, *Folsomia and Tullbergia*, playing important role in soil fertility (Bhagat *et al.*, 1988; Rather and Shah, 2010).

REFERENCES

Arora GL and Singh M (1962). A new species of Lepidiaphanus from Kashmir (Entomobryidae: Collembola). *Journal of Bombay Natural History Society* **59**(1) 309-311.

Bhagat KC, Kaul VK and Masoodi MA (1988). First record of springtail, Sinella curviseta Brook (Entomobryidae: Collembola) in almond orchards of Kashmir. *Journal of Soil Biology and Ecology* **8**(2) 135-136.

Baijal HN (1955). Two new species of Collembola. *Agra University Journal Science Research* **4** 75-177.

Baijal HN (1958). Nival Collembola from North-west Himalaya. *Proceedings of National Academy of Science (India*), Allahabad **28** 349-360.

Chandra Kailash and Sidhu AK (2009). Insects of Ladkah. *ENVIS, Newsletter, Zoological Survey of India* **15**(1 & 2) 5-10.

Denis JR (1936). Yale-North India Expedition, Report on Collembola. Memoirs of *Connecticut Academy Arts and Sciences* **10** 261-282.

Hazara AK, Mandal GP and Suman KK (2004). On a collection of Collembola insects from Jammu and Kashmir. *Bionotes* **6**(1) 30.

Janssens F (1996). *Checklist of the Collembola of the World* [Online]. *http:// www.collembola.org* (Accessed 20 July, 2013).

Mani MS and Singh S (1962). Entomological Survey of Himalaya, Part XXVI. A contribution to our knowledge of the geography of high-altitude insects of Nival Zones from the North-west Himalaya, Part 4, *Journal of Bombay Natural History Society* **59**(2) 360-381.

Masood Amir-Bin and Pandit AK (2007). Soil Meso-fauna of Dachigam National Park in Kashmir Himalaya. *Journal of Himalayan Ecology and Sustainable Development (Kashmir University)* **2** 61-69.

Raina MK, Kachroo P and Dhar PK (1979). Soil and litter Meso-fauna from Kashmir Himalayas. *Geobios* **6**(Suppl.) 329-330.

Rather AQ and Shah AH (2010). Consequences of Pesticide pollution upon the population of Collembola (Springtails) in Kashmir apple orchard edaphic ecosystem. *Journal of Ecophysiology and Occupational Health* **10**(1 & 2) 9-12.

Yosii R (1966a). On some Collembola of Afganistan, India and Ceylon, collected by the Kuphe Expd. 1960. *Results of Kyoto University Science Expedition to Karakorum and Hindukush, 1955,* **8** 333-405.

Yosii R (1966b). Snow collembolan of the Siachen glacier in Karakorum. *Results of Kyoto University Science Expedition to Karakorum and Hindukush, 1955,* **8** 407-410.