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## On collection of some collembola (Hexapoda: Entognatha: Collembola) from Rajasthan

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### Abstract

The present investigation is based on survey programmes conducted in Jalore and Bikaner districts of Rajasthan during the 2011-2013. Collembolans commonly known as Springtails are minute, soft bodied, wingless, primitive members of soil fauna inhabit both on the surface and the depth of the soil. Pitfall traps were used to collect collembolan specimens. Identification is done by Phase contrast microscope revealed 10 species of Collembola belonging to 8 genera and 3 families from Jalore and Bikaner districts of Rajasthan, India. Out of these, 8 species are recorded for the first time from Rajasthan.

**Keywords:** Soil, Collembola, Rajasthan, Pitfall, Springtails.

### 1. Introduction

Collembolans are commonly called as Springtails because of a spring like jumping organ found on the underside the fourth abdominal segment called furcula used for springing away from predators. They are small, soft bodied, wingless, primitive omnipresent members of soil fauna. Mouth parts are entognathous type and antennae moniliform mostly 4-6 segmented. They feed as scavengers on dead plant parts, fungal hyphae, decaying animal tissues and plant residues. They found in almost every soil with densities up to  $10^5$  individuals per  $m^2$  making them one of the most common animals on the planet alongside two other common soil taxa: nematodes and mites [1]. They inhabit both on the surface and the depth of the soil, under overturned rotting logs, under loose tree bark, in leaf litter or in compost and often occur in large aggregations. They exhibit a wide variety of feeding strategies and may consume plant litter, plant roots, bacteria, fungal hyphae, animal waste, decaying animal tissues, plant residues and even nematodes [2]. Collembola partly determine fungal succession [3]. They have a great influence in functioning of the decomposer as a result of their feeding activities and have a great potential as bio indicators of environmental conditions [4]. Extensive taxonomic studies of collembolan have been published throughout the world. There are approximately 8143 species described worldwide [5]. Indian Collembolan fauna represented 314 species belonging to 104 genera under 19 families [6]. First Indian collembolan species described from Malabar hill region [7]. Prabhoo [8-9] recorded 74 species from Western Ghats and Kerala. Seven species of springtails were reported from Jodhpur, Sriganganagar and Jalore districts of Rajasthan [10]. Faisal & Ahmad [11] studied the impact of agricultural practices on collembolan fauna of Sriganganagar district of Rajasthan. Present investigation revealed 10 species of Indian springtails belonging to 8 genera and 3 families from Jalore and Bikaner districts of Rajasthan, India.

### 2. Material and Methods

Survey and collection of soil Collembolans were made under institutional programmes of Central Arid Zone Research Institute, Jodhpur (Rajasthan). All surveys were undertaken during the 2011-2013 in Kolayat, Ahor, Jalore, Sayala, Raniwara and Sanchore talukas of Bikaner and Jalore districts of Rajasthan. The land covers of these regions characterized by Eucalyptus, Babool, oilseed and cereals crops along with some shrubs. Pitfall traps were placed in each field to collect collembolans specimens. Ethylene Glycol was used as a killing agent. All collected specimens were preserved in 70% ethyl alcohol. Hoyer's mounting medium was used for slide preparations and identification done by Carl Zeiss Phase contrast microscope

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following suitable keys. All identified specimens deposited at National Zoological Collection, Zoological Survey of India, Western Regional Centre, Pune, Maharashtra for further studies.

### 3. Results and Discussion

Systematic Account  
Phylum Arthropoda Latreille, 1829  
Subphylum Hexapoda  
Class Insecta Linnaeus, 1758  
Subclass Apterygota  
Order Collembola Lubbock, 1870  
Suborder: Arthropleona

#### 1. Family Brachystomellidae

##### 1. Genus *Brachystomella* Agren, 1903

##### 1. *Brachystomella terrafolia* Salmon, 1944

1944. *Brachystomella terrafolia* Salmon, *Rec. Dominion Mus.*, 1: 2, 135.

**Diagnostic characters:** Length up to 1mm. Cuticle coarsely granulated. Dorsally with dark purplish pigmentation scattered on a creamy white background. Ventral side with very little pigmentation. Ocular field dark black. Antennae, all legs and furcula purplish. Ratio of antennal segments 15:12:14:13; antennal IV segment with a deeply situated apical papilla and 3-4 stout sub apical sense rods. Post Antennal Organ consists of 6-7 vesicles arranged in a circle. Claws with a single median inner tooth. Unguiculus absent. Tenent hair nonclavate. Last abdominal segment without anal spines. Furcula short, mucro conical with a pointed distal end.

**Material examined:** 1 ex., Branch 64 RD Charanwala, Taluka Kolayat, District Bikaner, 30.x.2012, Latitude 27°83'33"N, Longitude 72°95"E, Reg. No. NZC/ZSI/WRC/Ent-13/95, Coll. N.R. Panwar & M. Kumar; 1 ex., Lalpura, Taluka Sanchore, District Jalore, 9.vii.2013, Latitude 24 55' 28.4"N, Longitude 71 35' 19.6"E, NZC/ZSI/WRC/Ent-13/107, Coll. N.R. Panwar & M. Kumar

**Distribution:** Bikaner (Rajasthan), Raigad, Ratnagiri, Sindhudurg (Maharashtra) and Kerala.

**Remarks:** Recorded for the first time from Rajasthan.

#### 2. Family Isotomidae Schaffer, 1896

##### Subfamily Anurophorinae Börner, 1901

##### 2. Genus *Isotomina* Axelson, 1900

##### 2. *Isotomina thermophila* Axelson, 1900

1900. *Isotomina thermophila* Axelson, *Medd. Soc. Fauna et Flora Fenn.*, 26: 113.

1947. *Isotomina thermophila* Stach, Family Isotomidae, *Acta Monogr.*, p 271.

**Diagnostic characters:** Body length up to 0.7 mm. Colour uniformly grey. Creamish background on ventral side. Antennae slightly dark with pale extremities. Antennal segments ratio I-IV as 24:32:34:50, segment III with a pair of small sensory organ in groove. Segment IV with a terminal bulbs and long curving sensory setae. Eyes 8+8. Post Antennal Organ subequal, broadly elliptical. Unguis carinate without tooth, unguiculus triangular with a small basal inner margin broad and swollen at the middle. Tenent hair absent. Furcula well developed not reaching to the ventral tube. Dens ventrally

with about 20 rather strong setae in 3 longitudinal rows. Mucro short, equally bidentate.

**Material examined:** 1 ex., Bhuwana, Taluka Sanchore, District Jalore, 9.vii.2013, Latitude 24° 42' 19.6"N, Longitude 71° 32' 14.3"E, NZC/ZSI/WRC/Ent-13/106, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan), Arunchal Pradesh, Assam, Kerala, Maharashtra, Sikkim and West Bengal.

**Remarks:** Recorded for the first time from Rajasthan.

#### Sub Family *Proisotominae* Stach, 1947

##### 3. Genus *Folsomides* Stach, 1922

##### 3. *Folsomides purvulus* Stach, 1922

1922. *Folsomides purvulus* Stach, *Annls Hist.-nut. Mus. natn. hung.* 19: 17.

1934. *Folsomides purvus* Mills, *A Monograph of the Collembola of Iowa*, P. 43.

1947. *Folsomides purvus* Stach, Family Isotomidae, *Acta Monogr.*, P 101.

**Diagnostic characters:** Small species, body length up to 0.65 mm long. White coloured. Clothed with plain setae arranged in transverse rows. Cuticle finely granulated. Antennal ratio as 15:22:25:40, ant IV sub apically six stout and two slender sense rods. Post Antennal Organ elliptical. Ocelli 2+2 in two separated pigmented spots. Claw without tooth. Unguiculus lanceolet-like and about ¼ as long as the inner margin of the claw. Tenent hair absent. Ventral tube with 3+3 setae on the flap and 1+1 seate on the anterior side. Mucro bidentate with hook like apical tooth; dens with 3 setae dorsally.

**Material examined:** 2 exs., Singawas, Taluka Raniwara, District Jalore, 25.vii.2012, Latitude 24° 43' 36.8"N, Longitude 72° 11' 12.8"E, NZC/ZSI/WRC/Ent-13/103, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan), Dhule, Nandurbar, Nashik, Raigad, Ratnagiri, Sindhudurg, (Maharashtra) and Kerala.

**Remarks:** Recorded for the first time from Rajasthan.

#### 4. *Folsomides Stachi* Folsom

1934. *Folsomides stachi*: Mills, *A Monograph on the Collembola of Iowa*, p.45;

1947. Stach: *Family Isotomidae Acta Monogr.*, p.99.

**Diagnostic characters:** Length up to 800µ long. Body white with black spot on the ocellar fields. Setae arranged in transverse rows with the difference that abdominal VI has only two rows. Antennae subequal to head; antennae IV with about a dozen sub apical sense rods. Post Antennal Organ narrow, more or less straight, about 10 times as long as wide and slightly longer the width of antennae I. Ocellus single. Unguiculus elongated and half as long as the inner margin of the claw. Apical tooth of mucro hooklike and slightly smaller than subapical tooth.

**Material examined:** 1 ex., Saryani, Taluka Sanchore, District Jalore, 9.vii.2013, Latitude 24° 59' 48.6"N, Longitude 71° 59' 57"E, NZC/ZSI/WRC/Ent-13/105, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan) and Kerala.

**Remarks:** Recorded for the first time from Rajasthan.

**4. Genus *Proisotoma* Börner, 1901**

**5. *Proisotoma minuta* (Tullberg, 1871) Börner, 1903**

**Diagnostic characters:** Body length up to 1.1 mm length. Mature individuals grayish brown, but juveniles lighter; ventral side lighter background. Clothed with plain setae arranged in transverse rows. Ocellar fields black. Eyes 8+8. Furcula focused on the dorsal side of the manubrium. Ventral manubrial setae 1+1 and six ventral setae on the dens. Dorsal side of the dens crenulated. Mucro tridentate.

**Material examined:** 1 ex., Bishangarh, Taluka Ahor, District Jalore, 12.ix.2011, Latitude 25° 26' 21.3"N, Longitude 72° 36' 42.5"E, NZC/ZSI/WRC/Ent-13/96, Coll. N.R. Panwar & M. Kumar; 1 ex., Sakariya, Taluka Sanchoe, District Jalore, 9.ix.2013, Latitude 24° 46' 18.5"N, Longitude 71° 21' 48.9"E, NZC/ZSI/WRC/Ent-13/108, Coll. N.R. Panwar & M. Kumar. 1 ex., Deldani, Taluka & District Jalore, 12.ix.2011, Latitude: 25° 81' 14.6"N, Longitude: 72° 33' 27.2"E, NZC/ZSI/WRC/Ent-13/97, Coll. N.R. Panwar & M. Kumar.

**Distribution:** Jalore (Rajasthan), Satara, Sindhudurg and Thane (Maharashtra).

**Remarks:** Recorded for the first time from Rajasthan.

**5. Genus *Folsomia* Willem, 1902**

**6. *Folsomia bajjali* Prabhuo, 1971**

1971. *Folsomia bajjali* Prabhuo, *Oriental Insects*, Soil and Litter Collembola of South India-I Arthropoda, 5 (1): 1-46.

**Diagnostic characters:** Length up to 0.5 mm long. Colour white. Clothed with short plain setae arranged in transverse rows. Abdomen V laterally with a blunt sense rod on each side. Post Antennal Organ elliptical, two and half times as long as broad, with four guard setae posteriorly and one seta each on the inner and outer side. Eyes absent. Claws without teeth, unguiculus lanceolate, half as long as the outer margin of the claw. Tenent hair absent. Furcula reaches to the middle of abdominal segment II. Dens dorsally with slight corrugations, mucro with two slender curve teeth, apical tooth longer than subapical tooth.

**Material examined:** 1 ex., Ratpura, Taluka & district Jalore, 12.ix.2011, Latitude 25° 05'17.9"N, Longitude 72° 34' 49.3"E, NZC/ZSI/WRC/Ent-13/98, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan) and Kerala.

**Remarks:** Recorded for the first time from Rajasthan.

**6. Genus *Cryptopygus* Willem, 1901**

**7. *Cryptopygus thermophilus* (Axelson, 1900)**

1900. *Cryptopygus thermophilus* Axelson *Medd. Soc. Fauna et Flora Fenn.*, 26: 113.

1947. *Cryptopygus thermophilus* *Polska Akademija Umiejetnosci, Krakaow*, 488 pp.

1963. *Cryptopygus thermophilus* Yosii, *Contr. Biol. Lab. Kyoto. Univ.*, 15: 4.

**Diagnostic characters:** Length up to 1.2 mm. Generally dark back ground with numerous pale spots. Fourth antennal segment without clearly distinguishable blunt setae. Eyes 8+8. Post Antennal Organ about 3 times longer than nearest eyes. Unguis without lateral tooth. Inner teeth present. Unguiculus without tooth. Dens with dorsal crenulations. Mucro bidentate.

**Material examined:** 1 ex., Malware, Taluka Raniwara, district Jalore, 25.vii.2012, Latitude 24° 47' 34.3"N, Longitude 72° 15' 34.1"E, NZC/ZSI/WRC/Ent-13/102, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore, Jodhpur, Sriganaganagar (Rajasthan), Assam, Manipur, Odisha, and West Bengal.

**7. Genus *Isotoma* Bourlet, 1839**

**8. *Isotoma* Sp.**

**Diagnostic characters:** This genus with Post antennal organ elongate or rounded, eyes 8+8. Abdominal setae unilaterally ciliated. Tenent hair absent. Ventral manubrial setae 14 or more. Dentes with less than 20 strong setae.

**Material examined:** 1 ex., Jiwana, Taluka Sayala, district Jalore, 12.ix.2011, Latitude 25° 22' 07.4"N, Longitude 72° 11' 19.6"E, NZC/ZSI/WRC/Ent-13/99, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan).

**8. Genus *Sinella* Brook, 1882**

**9. *Sinella curviseta* Brook 1882**

1882. *Sinella curviseta* Brook, *J. Linn. Soc. London. Zool.*, 16: 541-545.

1966. *Sinella curviseta* Yosii, *J. Coll. Arts & Sci., Chiba Univ.*, 4 (4): 461-531.

**Diagnostic characters:** Body with reddish pigment. Eyes with pigmented patches. Antennal segment III with many extremely minute blunt setae at its apical half. Tenent hair clavate. Unguis with minute apical tooth, unguiculus acuminate. Mucro very long with basal spine.

**Material examined:** 1 ex., Bakra Road, Taluka Sayala, district Jalore, 12.ix.2011, Latitude 25° 13' 11.6"N, Longitude 72° 29' 09.4"E, NZC/ZSI/WRC/Ent-13/100, Coll. N.R. Panwar & M. Kumar.

**Distribution:** Jalore (Rajasthan), Arunachal Pradesh, Assam, Punjab, Sikkim and West Bengal.

**Remarks:** Recorded for the first time from Rajasthan.

**Suborder: Symphypleona**

**3. Family Sminthurididae Börner, 1906**

**9. Genus *Sphaeridia* Linnaniemi, WM, 1912**

**10. *Sphaeridia biniserrata* (Salmon) 1951 Massoud, 1964**

1951. *Sphyrotheca biniserrata* Salmon, *Proc. R. Ent. Soc. London*, B 20: 138.

1956. *Indothea biniserrata* Stach, Family Sminthuridae. *Acta Monogr*, p. 206.

1964. *Sphaeridia biniserrata* Massoud et Delamare Deboutville, *Rev. Ecol. Biol. Sol.*, 1: 101.

**Diagnostic characters:** Female up to 0.43 and males up to 0.25 mm long. Uniformly colored with bluish pigment on all over the body and appendages. Terminal segment of the antennae with slightly denser pigment. Ocellar field dark with ocelli 6+6. Ventral side paler with little pigment. Abdomen with 3+3 bothriotricha, antennal ratio as 5:8:8:20; ant. IV with many slender blunt sense rods subapically. Hind claw with only external teeth. Unguiculus III with a strongly clavate

inner lamella without terminal filament. Tibiotarsus III on the inner side with two serrated sex setae each side with four to five denticles while in male it is Y shaped stout seta on the outer side. Mucro with a short dorsal an inner serrated and a smooth outer and ventral lamellae.

**Material examined:** 1 ex., Bhagli, Taluka Sayala, district Jalore, 25.vii.2012, Latitude 25° 07' 06.5"N, Longitude 71° 56' 00.2"E, NZC/ZSI/WRC/Ent-13/101, Coll. N.R. Panwar & M. Kumar

**Distribution:** Jalore (Rajasthan), Dhule, Pune, Raigad, Sindhudurg (Maharashtra) and Kerala.

**Remarks:** Recorded for the first time from Rajasthan.

#### 4. Conclusion

The Collembolan fauna of Jalore and Bikaner districts of Rajasthan has been studied comprehensively. A total of 10 species belonging to 9 genera and 3 families are recorded from the different localities of above two districts. Out of these 8 species are recorded for the first time from the Rajasthan State.

#### 5. Acknowledgements

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