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COLLEMBOLA (HEXAPODA) FAUNA FROM SIMBALWARA WILD LIFE SANCTUARY, HIMACHAL PRADESH, INDIA

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INTRODUCTION

Simbalwara Wildlife Sanctuary located in East-West part of Himachal Pradesh, is one of the best preserved sanctuaries in Shiwalik hills of the state. It lies between 30°24' to 30°28' N latitude and between 77°28' to 77°32' E longitude in Sirmour district of Himachal Pradesh. It is situated on right side of Nahan Ponta Sahib Road, about 6 km far from Puruwala. Ponta Sahib is about 18 km from Sanctuary. It is a small sanctuary spread over an area of 19.03 sq km with altitude ranging from 580 to 700 m above msl. The Sanctuary is triangular in shape and its southeast border is adjoined with Kaleswar National Park in the state of Haryana. The Sanctuary has subtropical climate with hot summer and severe winters. The summer temperatures touch as high as 46°C and plunges to 6°C during winters. Rain fall is heavy during monsoon of July- September. The present analysis of the composition of the species of Collembola is based on a collection made by Apterygota section of Zoological Survey of India during 2010-2011 fromSimbalwara Wild life Sanctuary, Sirmour district of Himachal Pradesh. The first Indian species of collembolan from Malabar hill regions was described by Ritter (1911). Thereafter, Imms(1912), Carpenter(1917), Handschin(1929), Bonet(1930), Mukherjee(1932),Brown(1932), Denis(1936), Baijal(1958), Salmon(1956), Choudhuri and Roy(1965), Yosii(1966), Prabhoo(1971), Mitra(1966), Hazra(1995) and Mandal(2008) contributed to the knowledge of Indian Collembola. There are about 8000 species described worldwide (FransJanessens, 2012). Indian fauna of Collembola represented by 299 species in 103 genera under 19 families (Mandal, 2010). The classification followed here after Christiansen and Bellinger (1998).

MATERIAL AND METHODS

A white enamel tray and aspirator were used. 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. Preserved specimens were cleared in Marc Andre 1 medium. Fresh specimens were 'explode' for displaying chaetotaxy. Dark specimens were kept in Potasium hydroxide (KOH) or Hydrogen peroxide (H^2O^2) for softening the chitin. Hoyer's mounting medium was used for slide-mounting of the specimens.Identification of specimens is done using a phase contrast compound microscope following Christiansen and Bellinger (1998).

SYSTEMATIC ACCOUNT

Order COLLEMBOLA
Suborder ARTHROPLEONA
Family HYPOGASTRURIDAE

This group of genera may be best recognized by the absence of true pseudocelli and simplicity of sense organ of third antennal segment.

I. Genus ***Xenylla*** *Tullberg*

1869.*XenyllaTullberg,W. Schultz Boktryckeri, Uppsala.* **21**pp.

1. ***Xenylla obscura*** Imms

1912.*Xenyllaobscura*Imms, *Proc. Zool. Soc. London:* 80-125.

1970. *Xenyllaobscura* Salmon, *R. Soc. N. Z. Biology Sci.,* **12**(13): 145-152.

Diagnosis: Body length 1.4 mm; elongate in shape; colour indigo-blue, segmental margins and ventral side pale. Antennal segment ratio as 10:12:12:14.P.A.O. absent; unguis carinate without lateral teeth but with 1, 1, 1 inner tooth near the apex; unguiculus absent.Ventral tube with 4+4 setae.Tenent hair, 2, 2, 2 very long and capitate at the end.Dentes and mucro separated, mucro short, thick about half as long as dens; dens with two long simple posterior setae.

Material examined: Kaludev river bed under stones & moss, Simbalwara Wild Life Sanctuary, 29.iii.2010, coll. G.P. Mandal, 15exs.

Distribution: INDIA: Himachal Pradesh, West Bengal, Uttar Pradesh Arunachal, Manipur, Mizoram and Nagaland.

II. Genus ***Ceratophysella*** Borner in Brohmer

1932. *Ceratophysella* Borner, *Fauna von Deutschland,* (4): 134-144.

2. ***Ceratophysella indovaria*** (Salmon)

1970. *Hypogastrura indovaria* Salmon, *Trans, Biol. Sci,* **12** (13): 149

Diagnosis: Dark brown in colour, ocelli on black fields. Body with sparse to heavy short and long curved simple setae. Antennae shorter than head, ratio 19:20, segment IV without sensory knob, but with 7-9 short, stout, bent sense rods, numerous long stout simple setae. P.A.O. very irregular, consisting of 4-12 indistinct disconnected lobes with or without central boss. Legs with claw and finely granulate unguiculus, long tenent hair never clavate. The dens with a double row setae down anterior face, each row with four setae; mucro finely granulate and spoon shaped with two distinct lamellae. Body length 0.8 mm.

Material examined: Kaludev river bed under stones & moss, Simbalwara Wild Life Sanctuary, 29.iii.2010, coll. G.P.Mandal, 20exs.

Distribution: INDIA: Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal, Assam, Manipur, Mizoram and West Bengal.

Family ENTOMOBRYIDAE

This family includes members of the Arthropleonacharcterised by reduced prothorax, without setae and postantennal segment and with scales or multilateral ciliate setae on all trunk segments, trochanteral organ, a series of short differentiated setae on the inner surface of the trochanter, fourth abdominal segment of some species much longer than the third. Without postantennal organ. Unguis and unguiculus always well-developed Furcula always well developed; Sexual dimorphism little or absent. It is distinguished by dorsal crenulatedentes and the short hook-like or bidentatemucro.

III. Genus ***Homidia*** Borner

1906. *Entomobrya* Borner, *Mitt. Naturhist. Mus. Hamburg* **23**: 147-188.

3. ***Homidia cingula*** Borner

1906. *Homidia cingula* Borner, *Mitt. Naturhist. Mus. Hamburg,* **23**: 147-188.

Diagnosis: Back ground yellowish. Body not compressed. Dentes with 33 spines. Abdominal segments III and IV with black blue pigmented transverse bands. Apical mucronal tooth smaller than anteapical.

Material examined: Kaludev river bed side under leaf litter, SimabalwaraWild Sanctuary, Sirmour dist., 29.iii.2010, coll. G.P.Mandal, 10 exs.

Distribution: INDIA: Himachal Pradesh, Uttar Pradesh, Arunachal Pradesh, Manipur, Sikkim, Mizoram, Nagaland, Orissa and West Bengal.

Family PARONELLIDAE

Members of this subfamily may be distinguished from other entomobryids by the straight unringeddentes, without spines but with a terminal bladder like projection. The mucro is short and blunt and quite different from that of other Entomobryids.

IV. Genus ***Salina*** Mac Gillivray

1894. *Salina* Mac Gillivray, *Can. Entomol.*, **26**: 105-110.

4. ***Salina indica*** (Imms)

1912.*Cremastocephalus indicus* Imms, Proc. Zool. Soc. *London*: 80-125.

1957. *Salina indica (Imms):* Salmon, Acta. Zool. Cracov. **11**(14): 313-362.

1973. *Salina indica* (Imms): Mitra, Oriental *Insects*, **7**(2): 159-202.

Diagnosis: Body length 1.4 mm.Colouration: General ground colour of body pale yellow, usually devoid of any dark pigment, occassionally the tergal margins and lateral extension of abdominal segment III with faint blue pigment. Antennal segments pale yellow, segments I, II, III with a faint of diffused blue pigments or absent in some cases. Legs and furcula pale yellow without any trace of rings or bands. Clothing: General surface of body densely clothed with acuminate, stiff microchaete; flexed macrochaetaesubobliquely truncated and broadly acuminate, present on head. Thoracic segments II-III and abdominal segments I.-VI with ciliated, acuminate macrochaetae; lasiotrichia present as on abdominal segments II (2+2), III (3+3), IV (2+2).Head: Frontal spines 1+1, conspicuous ; 2 dark pigmented ocellar fields one on each side of the head, each field containing 8 ocellii, arranged in two longitudinal parallel rows; ratio of antennal segments I-IV: 36:53:40:60.Thorax: Relative length index of Thoracic segments: II: III=25:17. Unguis elongate, slightly curved with paired basal, a median and a distal unpaired teeth on inner margin, paired external basolateral teeth normal. Unguculus of truncate type, nondentate; tenent hair well developed finely ciliated, clavate, tibiotarsal lobes well developed. Abdomen: Relative length index of Abdominal segments I: II: III: IV: V: VI =13:19:6:64:10:4; rami of retinaculum each with four teeth, corpus with a single median seta; ventral tube well developed. Manubrium: mucrodens = 45:54, mucro long, narrow, superficially lobed into three teeth; dental scale appendages relatively small faintly striated.

Material examined: Kaludev river bed side under leaf litter, SimabalwaraWild Sanctuary, Sirmour dist., 29.iii.2010, coll. G.P.Mandal, 22exs.

Distribution: INDIA: Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal, Manipur, Mizoram, Tripura and West Bengal.

5. ***Salina biformis*** Mitra

1966. *Salina biformis* Mitra, *J. Ent, New Delhi*, **28**(1): 67-73.

1973. *Salina biformis* Mitra, Oriental *Insects*, **7**(2): 159-202.

Diagnosis: Body length1.2 -1.4 mm. Coloration: Two types of colour dark and lighter. Head: Frontal spines 1+1Ocelli 8+8, each group in two parallel rows, ocelli G and H smaller. Clothing: Macrochaetae more or less obliquely truncated and broadly acuminate on head, thoracic segments II, III and abdominal segments I-IV; macrochaetae of Thoracic II, III/Abdominal segments I, II=23, 26/17, 4. Thorax: Unguis short, curved with outer two paired baso-lateral, a paired inner basal and two distal unpaired teeth. Trochanteral organ poor.Abdomen: Ventral tube anteriorly with 4+4 macrochaetae and 7+7 microchaetae with 9+9 micro chaetae posteriorly and a short unpaired median proximal spiny seta.

Material examined: Kaludev river bed side under leaf litter, SimabalwaraWild Sanctuary, Sirmour dist., 29.iii.2010, coll. G.P. Mandal, 8exs.;

Distribution: INDIA: Himachal Pradesh, Uttar Pradesh, West Bengal, Mizoram and Haryana.

V. Genus ***Callyntrura*** Borner

1906. *Callyntrura* Borner, *Mitt. Naturhist. Mus. Hamburg* **23**: 147-188.

6.***Callyntrura lineata*** (Parona)

1912. *Paronella borneri* Imms, *Proc. Zool. Soc. London*, pp. 80-125, new synonymy.

1912.*Paronellaphanolepis* Imms, ibid, pp. 80-125, new synonymy.

1957. *Handschinphysa lineata* Salmon, *Acta. Zool. Cracov.*, **11**(14): 313-362.

1974. *Callyntrura (Handschinphysa) lineata* Mitra, *Rev. Ecol. Biol. Sol.*, **11** (3):397-439.

Diagnosis: Coloration : Body pale yellow with variable purple to blue black pigment; head with

or without pigment thoracic I,II and abdimal segments I,II,III. Pigmented with purple to blue black pigment laterally or entirely.Clothing: Head, body and appendages clothed with setae and pseudoscales; macrochaetae flexed, obliquely truncated and ciliated (brush setae) setae on thoracic II, III and abdominal segments I, II, III. Antennae and legs clothed with darker, acuminate, cililated setae. Head: Pear shaped, frontal spines 4+4 present; ocelli, 8+8. .Head / Ant I =28/27; ratio of length of antennal segments I-IV 28:28:18:48; apex segment IV with a conspicuous sense knob encircled with setae. Thorax: Relative length index of thoracic segments II: III 52:22; unguis elongate, little curved, unguis with paired inner and 2 distal unpaired teeth; unguiculuslanceolate; tenent hair clavate. Abdomen: Relative length index of the segments 13:24:8:130:12:5; rami of retinaculum each with 4 teeth. Manubrium: mucrodens110:148; dentes stout; mucro plump with 6-9 teeth. Body length 2.5 - 4 mm.

Material examined: Kaludev river bed side under leaf litter, Simabalwara Wild Sanctuary, Sirmour dist., 29.iii.2010, coll. G.P.Mandal, 44exs.; 2 km away from Simbalwara F/R/H, SimbalwaraWild Sanctuary, Sirmour district,29.iii.2010, coll. G. P. Mandal, 72exs.

Distribution: INDIA: Himachal Pradesh, Manipur, Tripura and Uttarakhand.

VI. Genus ***Yosiia*** Mitra

1967.*Yosiia* Mitra, *Proc.Zool. Soc., Calcutta*, **20**: 43-47.

7. *Yosiia dehradunia* Mitra

1967.*Yosiia dehradunia* Mitra, *Proc. Zool. Soc. Calcutta.*, **20**: 43-47.

Diagnosis: Coloration: Pale yellow with dust of blue pigment over the body and a pair of dark blue-black patches one on each side on abdominal segments III and IV. Clothing: Scales absent; head and body clothed with setae, mostly ciliated; longer setae broad, cylindrical and blunt or slender acuminate; setae arising in clusters from the cervix and decumbent on posterior margin of head, similar setae also present anteriorly on mesotergum, head capsule and body. Head: Pear-shaped; ocelli 8+8 in pigmented ocellar fields each group of 8 ocelli arranged in two longitudinal parallel rows. Thorax: Segment I reduced; the relative length index of segments II: III= 23:11. Legs similar; each tibio-tarsus with two large tibio-tarsal lobes; unguiculus of the "truncate" type; trochanteral organ with 24 short spines. Abdomen: Relative length index of segments I: II: III: IV: V: VI=6: 15:4:67:9:6; Ventral tube short, anterior face with 4+4 long ciliated setae; rami of tenaculum each with 4+4 teeth; dens and manubrium subequal, dens crenulated; mucro vestigial; dental scale appendages greatly enlarged, dorsal in relation to dens and with longitudinal striations. Body length 1.14 mm.

Material examined: Kaludev river bed side under leaf litter, SimabalwaraWild Sanctuary, Sirmour dist., 29.iii.2010, coll. G.P.Mandal, 30 exs.

Distribution: Himachal Pradesh, Sikkim, Tripura and Uttarakhand.

VII. Genus ***Pseudosalina*** Mitra

1973.*Pseudosalina* Mitra, *Rev. Ecol. Biol. Sol., Paris*, **10**(3): 359-377.

8. ***Pseudosalina multiformis*** Mitra

1973.*Pseudosalina multiformis* Mitra, *Rev.Ecol. Biol. Sol., Paris*, **10**(3): 359-377.

Diagnosis: Coloration: General ground colour of head and body varies from white to pale yellow, darker patches present on Ths. II, III and anteriorly on Abd. I; a longitudinal streak on each side of Abd. III continuing anteriorly to Abd.II and posteriorly on Abd. IV. Clothing: Body clothed with micro &macrochaetae. Head: Frontal spines 1+1 reduced; ocelli 8+8 in pigmented ocellar fields, ocelli G and H smaller than the rest; relative length index of Ants. I: II: III: IV=13:8:7:18; Labrum setae 5,5,4. Thorax: Relative length index of Ths.II:III=26:17; legs all similar; unguis elongate, unguiculuslanceolate; tibio-tarsal lobe present; tenant hair finely ciliated, clavate; trochanteral organ with 26-32 spines. Abdomen: Relative length index of segments I:II :III: IV :V:VI = 14:21:8:75:7.5:7; ventral tube long, anterior face with 5+5 macrochaetae; relative length index of manubrium : mucrdens = 59:66;

mucrobidentate; dental scale appendage faintly striated. Body length 1.29-2 mm(excluding appendages).

Material examined: 2 km away from Simbalwara F/R/H, SimbalwaraWild Sanctuary, Sirmour district,29.iii.2010, coll. G. P. Mandal, 10exs.

Distribution: Himachal Pradesh and Uttarakhand.

SUMMARY

The present paper is first consolidated report of Collembola consisting of 8 species under 7 genera distributed over 3 families recorded from Simbalwara Wild Life Sanctuary, Sirmourdistrict of Himachal Pradesh. The family Hypogastruridae consists of 2 species and the family Entomobryidae consists of single species. The most dominant family represents by Paronellidae which comprises 5 species. All the species are recorded for the first time from this Sanctuary.

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