

## VERTICAL DISTRIBUTION PATTERN OF COLLEMBOLA IN A SUB TROPICAL FOREST FLOOR OF MANIPUR

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The Collembola or Springtails are primitive, wingless insects. They are cosmopolitan in distribution and are amongst the most abundant of all the soil inhabiting arthropods. They live in a variety of habitats where they feed as scavengers on decaying vegetation and soil fungi. Despite their small size of only 0.2-9mm (Wallwork, 1970), their abundance makes them important soil organism, playing a significant role in decomposition process (Christiansen & Belinger, 1980). Vertical distributions of Collembola in a deciduous forest under Mediterranean climatic conditions were also studied by Detsis (2000). Recently many advance studies on different aspects of Collembola and Acarina using precise methods have been reported from various parts of the world. (Badejo *et al.*, 1999; Peterson, 2002; Addison *et al.*, 2003).

In India, studies on different aspects of soil microarthropods were reported by Hazra and Choudhuri (1983), Hattar and Alfred (1986), and Alfred *et al.* (1991). The present study deals with the vertical distribution of collembola in a subtropical forest ecosystem at Phayeng, Manipur by counting their numerical abundance month-wise and depth-wise.

The study was carried out for one year, from May 1998 to April 1999 in a subtropical forest floor at Phayeng, Manipur. The study area was divided into three sites each differing by 100m in elevation. Soil samples were collected from each site at different soil depths i.e. 0-10cm, 10-20cm, and 20-30cm by using soil corer. Three replicates from each site were taken monthly and altogether 324 soil samples were collected. Soil microarthropods were extracted by modified Tullgren funnel method (Macfayden, 1969). From the extracted microarthropods all the collembola were sorted and counted.

The distribution pattern of collembola in all the three study sites being similar, a combined average collembolan fauna was

considered for the study of vertical distribution in the present investigation. The average total number of collembola collected from the three study sites were  $2600 \times 10^2 \text{m}^{-2}$  and identified up to the family level. At 0-10cm soil layer 69.2% out of the total collembola population was recorded, at 10-20cm soil layer 18.7% was recorded and at 20-30cm soil layer only 12% of the total collembolan fauna was recorded. At the family level collembola were represented by Onychiuridae, Hypogastruridae, Entomobryidae, Isotomidae, Sminthuridae and Brachystomellidae at 0-10cm soil layer. Isotomidae exhibited highest population density of  $389 \times 10^2 \text{m}^{-2}$  per year followed by Hypogastruridae  $222 \times 10^2 \text{m}^{-2}$ , Sminthuridae  $46 \times 10^2 \text{m}^{-2}$  and Brachystomellidae  $16 \times 10^2 \text{m}^{-2}$ , respectively at 0-10cm soil layer (Table 2). Only four families were recorded at 10-20cm soil layer and they are represented by Isotomidae  $107 \times 10^2 \text{m}^{-2}$ , Hypogastruridae  $87 \times 10^2 \text{m}^{-2}$ , Onychiuridae  $72 \times 10^2 \text{m}^{-2}$  and Sminthuridae  $21 \times 10^2 \text{m}^{-2}$ . However, at 20-30cm soil layer only three families were recorded. They are represented by Isotomidae, Onychiuridae and Hypogastruridae and the population densities recorded were  $81 \times 10^2 \text{m}^{-2}$ ,  $62 \times 10^2 \text{m}^{-2}$  and  $30 \times 10^2 \text{m}^{-2}$ , respectively. Entomobryidae and Brachystomellidae were absent at 10-20cm and 20-30cm soil layer.

Most workers on soil animals are of the opinion that most abundant soil inhabiting collembola are usually abundant near the surface up to the layer of 10cm deep and are characterised by favourable moisture condition, adequate living space, aeration ratio and accumulation of organic debris (Wallwork, 1970; Christiansen & Bellinger, 1980; Holt, 1985; Badejo *et al.*, 1998). The findings of the present investigation also agree with their findings. This clearly shows that thick cover of litter in the undisturbed forest ecosystem provides for accumulation and aggregation of a large number of individuals in the top layer. Reduction in the abundance and aggregation of individuals in deeper layers may be due to the reduction of pore space, less available food sources and corresponding unfavourable microclimatic conditions. However, as far as collembolan densities were concerned in the vertical distribution there was a clear decrease in abundance from the top soil to the deeper layer irrespective of the forest, jhum or agricultural soils (Peterson, 1980; Hagvar, 1983; Holt, 1985; Culic *et al.*, 2002). The finding of the present investigation is almost similar to many of the earlier results. The slight variations in the vertical distribution pattern of collembola might be due to microclimatic conditions prevailing in the study site.

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**Table 1. Average monthly population densities of Collembola of the three study sites at 0-10, 10-20 and 20-30cm soil layers (Numbers  $\times 10^2 \text{m}^{-2}$ )**

Soil layers (cm)	M	J	J	A	S	O	N	D	J	F	M	A	Total
0-10	152.6	148	231	218	193	208.6	162.2	81	82.3	71	137	116	1800
10-20	38.6	40.3	59.3	58.6	38	67.3	41.6	26.3	30.6	20.6	36	31.6	488.5
20-30	23.3	24.3	38.6	37	27	33.3	28	24	19	10.6	23.6	23.3	312
<b>Total</b>	<b>214.5</b>	<b>212.6</b>	<b>329</b>	<b>313.6</b>	<b>258</b>	<b>309.2</b>	<b>232.6</b>	<b>181.4</b>	<b>131.9</b>	<b>75.2</b>	<b>196.6</b>	<b>175.6</b>	<b>2000</b>

**Table 2. Average monthly fluctuations of the families of Collembola for the three sites at three soil layers (Numbers x 10<sup>2</sup>m<sup>-2</sup>)**

Soil Layers (cm)	Family	Sampling months											
		M	J	J	A	S	O	N	D	J	F	M	A
0-10	Onychiuridae	5	2	3	4	9	21	56	44	31	15	9	3
	Hypogastruridae	45	51	44	23	11	5	3	-	-	7	12	21
	Entomobryidae	10	16	22	20	18	10	-	-	5	4	7	10
	Isotomidae	39	48	73	61	25	83	20	7	5	6	8	14
	Sminthuridae	3	4	8	5	6	11	4	-	-	2	1	2
10-20	Brachystomellidae	2	2	3	3	-	2	1	1	-	-	1	1
	Onychiuridae	3	1	1	2	2	6	14	13	11	8	6	5
	Hypogastruridae	18	20	13	10	5	3	2	-	-	2	5	9
	Isotomidae	5	6	3	19	16	35	7	2	2	3	4	5
	Sminthuridae	1	2	3	3	2	4	2	1	-	-	1	2
20-30	Onychiuridae	3	1	1	2	2	5	16	11	8	5	4	4
	Hypogastruridae	5	6	4	2	1	2	-	-	1	2	3	4
	Isotomidae	4	4	2	10	12	18	11	8	3	2	2	5

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## AN ALBINO ANABAS TESTUDINEUS (BLOCH) IN A WETLAND OF ASSAM, INDIA

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*web supplement*

During a study of the wetlands of Hajo, Kamrup district, Assam for ichthyofaunal resources (component beels 33 in number) we collected a fish from the Sorusola beel on 16 August 2004 which was completely white in colour in live condition which turned creamy-white on preservation (Formaldehyde) (see Image 1<sup>w</sup>). On comparison it was found to resemble the Koi fish *Anabas testudineus* (Bloch). The normal colouration of this fish is black, sometimes with a greenish tinge.

This species was captured with the help of different types of gears like *Ghokajal* (a lift net, triangular in shape, tied in a bamboo frame), *Kawailangi jal* (a gill net), *Goroilangi* net (a gill net), *Dingora* (made of bamboo stripes, rectangular in shape) and *Chalani* (made of bamboo stripes, rounded in shape) in the beels of Hajo. *Anabas testudineus* (Bloch) also known as climbing perch is called as *Kawai* fish in Assamese. It inhabits all kinds of freshwater, including large streams but flourish mostly in canals, ditches, lakes, ponds and swamps. By means of its supplementary breathing apparatus, it can thrive in water deficient in oxygen. These fishes are indigenous to Africa. This is a valuable food fish and considered medicinal in treatment of the sick and convalescent.

#### DESCRIPTION

Comparative measurements of the albino fish (1) IASSTF68 and a normal fish (2) IASSTF67 are given as percentage of standard length in Table 1.

Fin formula was found to be within the range.

Normal range (Talwar & Jhingran, 1991): D XVI–XVIII 8-10; A VIII-XI 9-11; Pi 13-14; VI 5;

Albino fish: D XVII, 9; A X, 10; P i, 14; VI 5; C 16

Normal fish: D XVII 8; A XI 9; P I 14; VI 5; C 16.

Body elongate and moderately deep, its depth 3.2 times of standard length.

Normal range (3.0-3.5) (Jayaram, 1999).

Snout length 7.2 times of standard length. Normal range 5.7-7.7 (Jayaram, 1999).

Mouth relatively terminal and oblique. Head is moderate and compressed. Snout, slightly conical. Head and body covered with ctenoid scales. Eyes large, lateral, in anterior part of head. Lips thin. Jaws equal. Two lateral lines are present, one with 15 scales and other with 11 scales. In lateral series 28 scales are

<sup>w</sup> See Image in the web supplement at [www.zoosprint.org](http://www.zoosprint.org)