



## Entomobryoidea (Collembola) from Himachal Pradesh (India) in the Himalayas

ENRIQUE BAQUERO<sup>1,3</sup>, GURUPADA MANDAL<sup>2</sup> & RAFAEL JORDANA<sup>1</sup>

<sup>1</sup>Department of Environmental Biology, University of Navarra, 31008, Pamplona, Navarra, Spain

<sup>2</sup>Zoological Survey of India, Government of India, New Alipore, 700 053, Kolkata, India

<sup>3</sup>Corresponding author. E-mail: ebaquero@unav.es

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### Abstract

Collections made during March–April, 2010, October–November, 2010 and 2011 from different districts of Himachal Pradesh, India, by the Apterygota section of the Zoological Survey of India contained new species of Entomobryoidea. Localities sampled were Solan, Shimla, Kullu, Bilaspur, Kagra, Chamba and Sirmaur districts of Himachal Pradesh. Collections were mainly made using an aspirator from leaf litter, mosses, under stones, flowering garden plants and river embankments, wetlands and rotting logs. Sixteen species were found, belonging to genera: *Entomobrya*, *Himalanura*, *Homidia*, *Sinella*, *Willowsia*, *Lepidocyrtus (Acrocyrtus)*, *Lepidocyrtus (Cinctocyrtus)*, *Seira*, *Drepanosira* and *Salina*. Twelve of these have been described as new species.

**Key words:** macrochaetotaxy, new species, Entomobryidae, Paronellidae

## Resumen

Las capturas hechas durante los meses de marzo a abril de 2010, y octubre a noviembre de 2010 y 2011 en varios distritos de Himachal Pradesh, India, por la Sección de Apterygotas del Zoological Survey of India incluyen especies nuevas de Entomobryoidea. Las localidades muestreadas fueron los distritos de Solan, Shimla, Kullu, Bilaspur, Kangra, Chamba y Sirmaur, en Himachal Pradesh. La recolección se realizó utilizando aspirador sobre hojarasca, alfombras de musgo, bajo piedras, sobre flores en jardines, riberas de los ríos, humedales y troncos de madera podridos. Se han encontrado 16 especies pertenecientes a la superfamilia Entomobryoidea, incluidas en los géneros *Entomobrya*, *Himalanura*, *Homidia*, *Sinella*, *Willowsia*, *Lepidocyrtus* (*Acrocyrtus*), *Lepidocyrtus* (*Cinctocyrtus*), *Seira*, *Drepanosira* and *Salina*. Doce de ellas han sido descritas como nuevas especies.

**Palabras clave:** macroquetotaxia, especies nuevas, Entomobryidae, Paronellidae

## Introduction

Baijal (1955a, 1955b, 1958) and Singh *et al.* (1956) described nineteen species of Indian Collembola, based on Prof. M.S. Mani's Entomological expedition to the North West Himalaya during 1954–56; twelve of these species were from the 'Nival zone of NW Himalaya' under Lahaul Spiti. Denis (1936) described six species of Collembola in families Isotomidae and Entomobryidae from North West Himalaya, based on collections made by the Yale North India-Expedition. The present study is based on collections made during 2010–2011 from Solan, Shimla, Kullu, Bilaspur, Kangra, Chamba and Sirmaur districts of Himachal Pradesh, India, by the Zoological Survey of India.

The combined use of colour and macrochaetotaxy allows the identification of species and provides a useful description for species identification. The array (or group) of characters proposed by Jordana & Baquero (2005) and the chaetotaxy nomenclature of Szeptycki (1979), based on a constant and generally visible set of morphological characters (Christiansen 1958; Christiansen & Bellinger 1980) has proved useful. This allows the delimitation of multiple species within the genus *Entomobrya* and other related genera (Baquero *et al.* 2010; Jordana & Baquero 2010a; Jordana & Baquero 2010b, Jordana 2012).

## Material and methods

**Sites.** The state of Himachal Pradesh has boundaries with the Jammu and Kashmir in the North, Uttar Pradesh in the Southeast, China on East, Haryana in the South and Punjab in the West. It is located between 30°22' and 30°12' north and between 75°47' and 79°4' east. The mountainous state has altitudes ranging from 350 to 7000 m (1050 ft. to 21 000 ft.) above the sea level. The physiographic of Himachal Pradesh can be divided into three zones: the outer Himalayas or the Shivaliks, the inner or the middle Himalayas and the greater Himalayas or the Alpines. The Shivaliks include the districts of Hamirpur, Kangra, Una, Bilaspur and the lower parts of Solan, Sirmaur and Mandi. The altitude of lower Himalaya's ranges between 350 m to 1500 m and the rainfall in this zone ranges between 1500 mm to 1750 mm per annum. The middle region includes the parts of Sirmaur, Mandi and parts of Kangra, Shimla and Chamba and a rainfall between 750 mm to 1000 mm per annum. This zone remains under snow for almost six months. The Alpine zone is at an altitude of 4500 m and beyond and comprises of the Kinnaur and Pangi tehsils of Chamba and some parts of Lahaul and Spiti. The climate of Himachal Pradesh varies from semitropical to subarctic with an average annual rainfall about 1600 mm per annum. A map with the localities is available from [http://bit.ly/Himachal\\_Pradesh\\_Entomobryoidea](http://bit.ly/Himachal_Pradesh_Entomobryoidea).

**Sampling.** "Himachal Pradesh" survey was led by Dr. G.P. Mandal, as a part of action plan of Apterygota section of Zoological Survey of India. Collembola were collected using an aspirator from different districts of Himachal Pradesh, mainly from leaf litter, thick carpet of mosses, under stones, flowering garden plants and embankment of River, wetland and dead wood logs. The information given as "under hill stream" indicates a habitat where soil was moist because of running water from up stream, and the Collembola were collected from the surface layer of the moist soil.