

Zoogeographic affinities of Silverfishes (Zygentoma: Lepismatidae) of India

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Abstract

The poorly known Indian fauna of *Zygentoma* of the family Lepismatidae is presently represented by seventeen species. All these species are known to occur from fourteen States and two Union Territories of India. Available data indicates that absence of records of the family Lepismatidae in almost half of the states. Data concerning the species like *Acrotelsa collaris*, *Ctenolepisma* (*Ctenolepisma*) *longicaudatum*, *Lepisma saccharina*, *Thermobia domestica* are referred only to cosmopolitan synanthrops, therefore without any zoogeographic interest. The Lepismatidae, excluding those species, which are distributed from one country to other due to anthropogenic activities have lost all their zoogeographical weight. The genus *Lepidospora* with two species and *Ctenolepisma alticola* these are only known to occur from north-western states. However, the genus *Ctenolepisma* presents along Africa, Palearctic and Oriental Asia, Mediterranean Europe Australia and Central northern South America. *Afrolepisma* and *Xenolepisma* show a clear Afro-Indian distribution. The genus *Xenolepisma* being exclusive from Cape Province of South Africa and from India are discussed.

Keywords: *Zygentoma*, *Ctenolepisma*, Lepismatidae, Zoogeographic affinities, Indian fauna

Introduction

The order *Zygentoma* (commonly known as Silverfish) comprises of one of the earliest insects, are considered to be the sister group of the winged insects (Blanke *et al.*, 2014). The poorly known Indian fauna of *Zygentoma* under the family Lepismatidae is presently represented by seventeen species from which nine belongs to genus *Ctenolepisma*, two of *Acrotelsella* and one each of *Acrotelsa*, *Afrolepisma*, *Lepisma*, *Tricholepisma*, *Xenolepisma* & *Thermobia* (Fabricius, 1793; Hazra, Jana & Smith, 2022; Hazra, 1980, Silvestri, 1913, 1935, 1938; Hazra, Jana & Mandal, 2022; Paclt, 1961; Escherich, 1905; Oudemans, 1890; Hazra, Biswas & Mitra, 2000; Hazra, Jana, Mandal & Molero-Baltanás, 2022; Linnaeus, 1758; Packard, 1873; Hazra, Jana, Mandal & Molero-Baltanás, 2023 in press).

Materials and Methods

Data from various materials was used including National Zoological specimens of Apterygota section, Zoological

Survey of India, Kolkata and individuals collected by the authors during collecting survey trips in various localities of Indian states. from 2019 to 2021. The data as a whole were used to map the presence/absence of Lepismatidae species in Indian states. The species recorded only from India, and that therefore appear to be endemic, were considered to have undetermined affinities.

Results

The known taxa present in India has been summarized in Table 1. All these species are known to occur from fourteen states and two union territories of India and the table clearly shows the absence of records in almost half of the states in India. In this table, *Acrotelsa collaris* (Fabricius) Escherich, 1905, *Ctenolepisma* (*Ctenolepisma*) *longicaudatum* Escherich, 1905, *Lepisma saccharina* Linnaeus, 1758 and *Thermobia domestica* (Packard) Bergroth, 1890 ascribed with a 'C'; belonging to cosmopolitan synanthropous species with no zoogeographic interest due to anthropogenic

activities. Moreover, rest of the species ascribed with an ‘E’, are endemic to Indian fauna. Map 1 comprises of the known geographical distribution of the Zygentoma species in India. The Zoogeographical relationship of Zygentoma species of India is shown in Table 2, which clearly indicates that most of the species are endemic to India, except *Acrotelsa collaris*, *Ctenolepisma (Ctenolepisma) longicaudatum*, *Lepisma saccharina* and *Thermobia domestica*.

Discussion

The Lepismatidae, excluding those species which anthropophily removes all their zoogeographical weight, *Ctenolepisma alticola* known to occur from the north-western state, the genus *Ctenolepisma* presents a wide geographical range along Africa, Palaearctic and oriental Asia. Mediterranean Europe, Australasia and central and northern South America, *Afrolepisma* & *Xenolepisma* show

a clear Afro-Indian distribution, the *Xenolepisma* being exclusive from the Cape Province of Southern Africa and from India. *Afrolepisma* with a number of described species in the Afrotropical region, suggest that the only Indian known species will be no more than an Oriental extension of the genus (Mendes, 1988).

In conclusion to this preliminary approach, we can suggest, with little number of data available that:

- i. *Afrolepisma* (Map 2) & *Xenolepisma* (Map 3) actually known distribution seem to point to their very ancient origin, almost certainly before the breakup of the Afro-Indian tectonic plate; this means that they would be already individualized before the late Jurassic (Smith & Briden, 1979).
- ii. As the collision of the Indian & Eurasian plates must have occurred some 45 -35 million years ago (Eocenic time) which resulted in the Himalayas lift up (Smith *et al.* 1981).

Table 1. (1) Packard, 1873; (2) Oudemans, 1890; (3) Silvestri, 1913; (4) Silvestri, 1935; (5) Silvestri, 1938; (6) Wygodzinsky, 1954; (7) Paclt, 1961; (8) Hazra, 1980; (9) Hazra, 1993; (10) Hazra, Mitra & Biswas, 2000; (11) Hazra, Biswas & Mitra, 2004; (12) Hazra, Biswas, Kumar & Mandal, 2004; (13) Hazra, Mandal & Kumar, 2007; (14) Hazra & Mandal, 2010; (15) Hazra, Mandal & Kumar, 2012; (16) Hazra, Jana & Mandal, 2020; (17) Hazra, Jana, Mandal & Molero-Baltanás, 2022; (18) Hazra, Jana & Mandal, 2022; (19) Hazra, Jana & Smith, 2022; (20) Hazra, Jana, Mandal & Molero-Baltanás, 2023. [C=Cosmopolitan, E=Endemic]

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	<i>Acrotelsa collaris</i>	<i>Acrotelsella jhargramensis</i>	<i>Acrotelsella wygodzinskyi</i>	<i>Afrolepisma nigrina</i>	<i>Ctenolepisma (C.) alticola</i>	<i>Ctenolepisma (C.) amrabadense</i>	<i>Ctenolepisma (C.) boettgerianum</i>	<i>Ctenolepisma (C.) kawalense</i>	<i>Ctenolepisma (C.) longicaudatum</i>	<i>Ctenolepisma (C.) nigrum</i>	<i>Ctenolepisma (C.) tripurense</i>	<i>Ctenolepisma (C.) udumalpetense</i>	<i>Ctenolepisma (C.) venkataramani</i>	<i>Lepisma saccharina</i>	<i>Tricholepisma graveleyi</i>	<i>Xenolepisma subnigrina</i>	<i>Thermobia domestica</i>
	C	E	E	E	E	E	E	E	C	E	E	E	E	C	E	E	C
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ladakh	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Himachal Pradesh	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-
Punjab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haryana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uttarakhand	14	-	-	-	-	-	-	-	14	-	-	-	-	14	-	-	-
Rajasthan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	<i>Acrotelsa collaris</i>	<i>Acrotelsella jhargramensis</i>	<i>Acrotelsella wygodzinskiyi</i>	<i>Afrolepisma nigrina</i>	<i>Ctenolepisma (C.) alticola</i>	<i>Ctenolepisma (C.) amrabadense</i>	<i>Ctenolepisma (C.) boettgerianum</i>	<i>Ctenolepisma (C.) kavalense</i>	<i>Ctenolepisma (C.) longicaudatum</i>	<i>Ctenolepisma (C.) nigrum</i>	<i>Ctenolepisma (C.) tripurensis</i>	<i>Ctenolepisma (C.) udumalpetense</i>	<i>Ctenolepisma (C.) venkatanamani</i>	<i>Lepisma saccharina</i>	<i>Tricholepisma graveleyi</i>	<i>Xenolepisma subnigrina</i>	<i>Thermobia domestica</i>
	C	E	E	E	E	E	E	E	C	E	E	E	E	C	E	E	C
Bihar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sikkim	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
West Bengal	18	19	8	-	-	-	-	-	9	2	-	-	-	-	3	-	-
Arunachal Pradesh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Assam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nagaland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manipur	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-
Meghalaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mizoram	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tripura	-	-	-	-	-	-	-	-	10	-	10	-	-	-	-	-	-
Gujarat	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-
Madhya Pradesh	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-
Jharkhand	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-
Chhattisgarh	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-
Odisha	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Maharashtra	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-
Telangana	-	-	-	-	-	18	-	20	-	-	-	-	-	-	-	-	-
Karnataka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Andhra Pradesh	13	-	-	-	-	-	-	-	13	-	-	-	17	13	-	-	-
Goa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	5	1
Kerala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Andaman & Nicobar Islands	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	-
Puducherry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Delhi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chandigarh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lakshadweep	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dadra Nagar Haveli & Daman Diu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

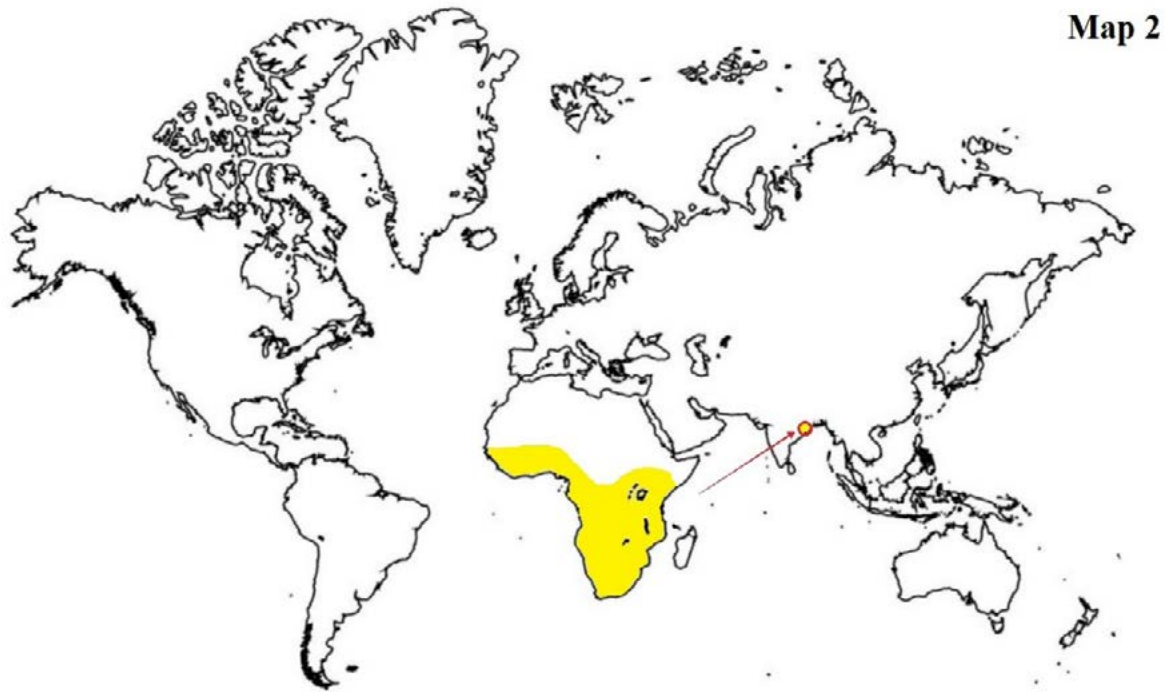
Table 2. Distribution of species occurring in different Zoogeographical realms.

	Name of the Species	Zoogeographical realms						
		India	Oriental	Palearctic	Ethiopian	Australian	Neotropical	Nearctic
1	<i>Acrotelsa collaris</i>	+	+	+	+	+	+	+
2	<i>Acrotelsella jhargramensis</i>	+	-	-	-	-	-	-
3	<i>Acrotelsella wygodzinskyi</i>	+	-	-	-	-	-	-
4	<i>Afrolepisma nigrina</i>	+	-	-	+	-	-	-
5	<i>Ctenolepisma (C.) alticola</i>	+	-	-	-	-	-	-
6	<i>Ctenolepisma (C.) amrabadense</i>	+	-	-	-	-	-	-
7	<i>Ctenolepisma (C.) boettgerianum</i>	+	-	-	-	-	-	-
8	<i>Ctenolepisma (C.) kawalense</i>	+	-	-	-	-	-	-
9	<i>Ctenolepisma (C.) longicaudatum</i>	+	+	-	+	+	+	+
10	<i>Ctenolepisma (C.) nigrum</i>	+	+	-	-	-	-	-
11	<i>Ctenolepisma (C.) tripurensis</i>	+	-	-	-	-	-	-
12	<i>Ctenolepisma (C.) udumalpetense</i>	+	-	-	-	-	-	-
13	<i>Ctenolepisma (C.) venkataramani</i>	+	-	-	-	-	-	-
14	<i>Lepisma saccharina</i>	+	+	+	+	+	+	+
15	<i>Tricholepisma graveleyi</i>	+	-	-	-	-	-	-
16	<i>Xenolepisma subnigrina</i>	+	-	-	+	-	-	-
17	<i>Thermobia domestica</i>	+	+	+	-	+	+	+

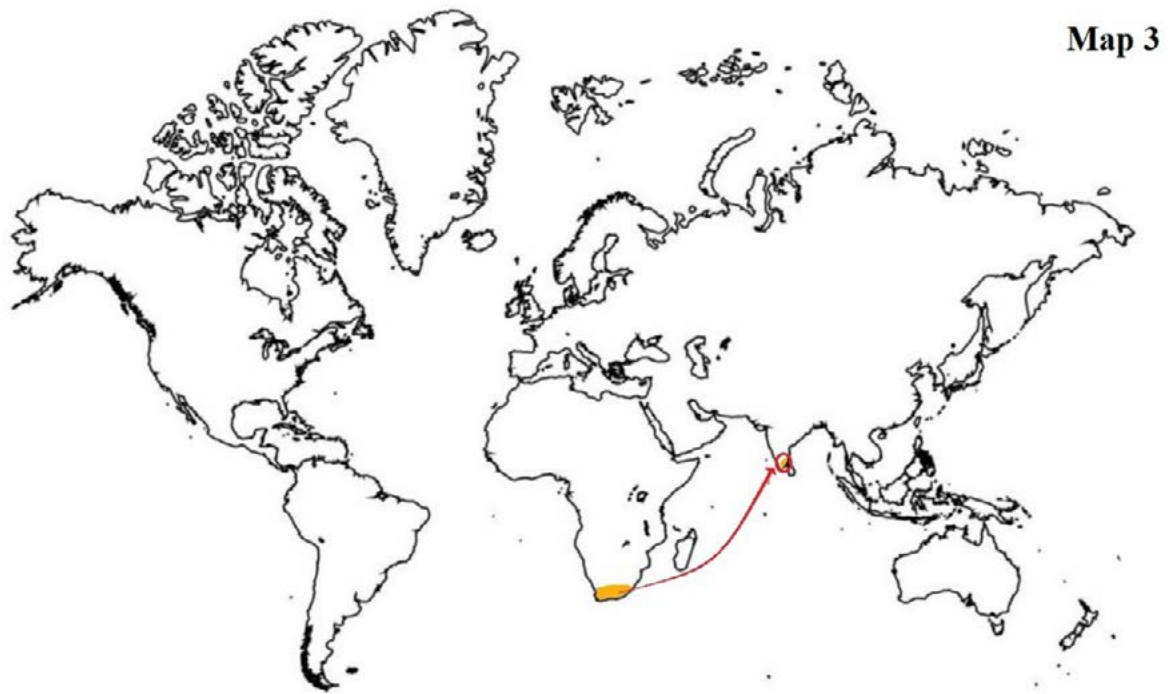


Map 1: Known geographical distribution of the *Zygentoma* species in India.

A. *Acrotelsa collaris*; B. *Acrotelsella jhargramensis*; C. *Acrotelsella wygodzinskyi*; D. *Afrolepisma nigrina*; E. *Ctenolepisma* (C.) *alticola*; F. *Ctenolepisma* (C.) *amrabadense*; G. *Ctenolepisma* (C.) *boettgerianum*; H. *Ctenolepisma* (C.) *kawalense*; I. *Ctenolepisma* (C.) *longicaudatum*; J. *Ctenolepisma* (C.) *nigrum*; K. *Ctenolepisma* (C.) *tripurensis*; L. *Ctenolepisma* (C.) *udumalpetense*; M. *Ctenolepisma* (C.) *venkataramani*; N. *Lepisma saccharina*; O. *Tricholepisma gravelyi*; P. *Xenolepisma subnigrina*; Q. *Thermobia domestica*.



Map 2: Distribution of genus *Afrolepisma* (Adapted from Mendes, 1989)



Map 3: Distribution of genus *Xenolepisma* (Adapted from Mendes, 1989)

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