

Occurrence and biodiversity of Pisauridae in India

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Abstract

The family Pisauridae, commonly known as nursery web spiders, represents an ecologically significant group within the order Araneae, characterized by their semi-aquatic adaptations and unique reproductive behaviors. This study investigates the occurrence, diversity, and distribution of Pisauridae spiders across India, offering a comprehensive analysis based on records from 18 states and 3 union territories. A total of 29 species distributed across 11 genera were documented, with 12 species identified as endemic. States such as Maharashtra, Tamil Nadu, and West Bengal exhibit the highest species richness, while northeastern regions remain largely underexplored. Notable species, including *Perenethis venusta*, *Nilus albocinctus*, and *Dendrolycosa gitae*, demonstrate broad geographic ranges, reflecting their adaptability to varied habitats. This review underscores the critical need for systematic research and conservation efforts, particularly in biodiversity hotspots, to protect and understand the ecological roles of Pisauridae spiders in Indian ecosystems.

Keywords: Pisauridae, araneae, araneomorphae, arachnida, spiders, Indian species

Introduction

With over 49,000 described species, spiders (order Araneae) represent one of the most diverse and widespread orders of terrestrial animals. Found in nearly every ecosystem, from arid deserts to tropical rainforests, spiders play critical roles as predators, helping regulate insect populations. They belong to the class Arachnida, which includes other arthropod orders such as harvestmen or daddy longlegs (Opiliones), ticks and mites (Acari), and scorpions (Scorpiones). The evolutionary relationships within Arachnida remain a subject of ongoing research, with phylogenetic studies suggesting that the Pedipalpi—a group comprising whip-scorpions (Uropygi), tail-less whip-scorpions (Amblypygi), and short-tailed whip-scorpions (Schizomida)—are among the closest relatives of spiders.

Spiders are characterized by numerous shared-derived traits, including venom glands associated with their chelicerae, specialized male pedipalpi for sperm transfer, and abdominal spinnerets equipped with silk glands. These adaptations highlight their evolutionary success and ecological significance. Spiders are divided into two primary suborders:

- 1. Mesothelae:** Representing a basal lineage with segmented abdomens, consisting of one family and about 87 species.
- 2. Opisthothelae:** Encompassing the majority of spider diversity, with 107 families and nearly 49,000 species, and a loss of abdominal segmentation.

Fossil evidence suggests spiders originated in the Devonian period (~380 million years ago), with modern families diversifying during the early to mid-Cretaceous period

(~146–100 million years ago). Phylogenetic advancements over the last three decades have significantly clarified spider relationships, but gaps remain, particularly in understanding ancient lineages.

In India, spiders exhibit comparatively lower diversity than tropical regions like South America or Southeast Asia. Recent efforts to document their distribution have updated records for 40 families, shedding light on their ecological roles and highlighting endemic species. However, significant regions, particularly in northeast India, remain underexplored.

Among the diverse families, the Pisauridae, commonly referred to as nursery web spiders, stand out for their semi-aquatic habits and unique reproductive strategies. These spiders, sometimes called raft or fishing spiders, are often confused with wolf spiders (family Lycosidae). However, they differ significantly:

- Pisauridae spiders possess eight uniform-sized eyes, whereas Lycosidae feature two prominently enlarged eyes among their eight.
- Female Pisauridae carry their egg sacs using their chelicerae, unlike Lycosidae, which attach their sacs to spinnerets. As hatching approaches, nursery web spiders secure their egg sacs to vegetation and construct protective nursery webs for the emerging spiderlings, showcasing remarkable parental care.

Their ability to inhabit both terrestrial and aquatic environments underscores their ecological adaptability, making them key species for pest control and biodiversity maintenance. This article further explores the diversity, distribution, and ecological roles of Pisauridae in India, offering insights into their conservation needs.

Table 1: Different species of Pisauridae family Spiders in India

Sr.No.	Species	State
01.	<i>Dendrolycosa bobbiliensis</i>	Andhra Pradesh and Gujarat.
02.	<i>Euprosthenops ellioti</i>	Tamil Nadu and Eastern Central India.
03.	<i>Hygropoda chandrakantii</i>	Puducherry and Kerala
04.	<i>Hygropoda longimana</i>	West Bengal
05.	<i>Nilus decorata</i>	Telangana, Andhra Pradesh and Uttar Pradesh.
06.	<i>Nilus sp.</i>	Kerala, Goa and Gujarat.
07.	<i>Hygropoda gracilis</i>	Maharashtra and Andoman & Nicobar.
08.	<i>Hygropoda sikkimus</i>	Andoman & Nicobar, Sikkim, Kerala, West Bengal and Arunachal Pradesh.
09.	<i>Hygropoda sp.</i>	Rajasthan and Maharashtra.
10.	<i>Nilus albocinctus</i>	Assam, Karnataka, Odisha, Maharashtra,
11.	<i>Nilus phipsoni</i>	Tamil Nadu, Maharashtra and Gujarat.
12.	<i>Perenethis dentifasciata</i>	Uttrakhand, Tamil Nadu and Jammu and Kashmir.
13.	<i>Perenethis sindica</i>	Tamil Nadu, Maharashtra and West Bengal.
14.	<i>Nilus pseudoalbobocinctus</i>	West Bengal
15.	<i>Dolomedes sp.</i>	Maharashtra, Arunachal Pradesh, Madhya Pradesh, Karnataka and Odisha.
16.	<i>Dendrolycosa putiana</i>	Maharashtra, Assam.
17.	<i>Dendrolycosa robusta</i>	Odisha, Maharashtra, West Bengal.
18.	<i>Dendrolycosa sp.</i>	Gujarat
19.	<i>Perenethis sp.</i>	Karnataka, Assam and Uttrakhand.
20.	<i>Perenethis venusta</i>	Karnataka, Odisha, Maharashtra, Kerala West Bengal and Uttrakhand.
21.	<i>Pisaura podilensis</i>	Gujarat, Maharashtra and Andhra Pradesh.
22.	<i>Pisaura mirabilis</i>	Uttrakhand and Jammu & Kashmir.
23.	<i>Pisaura sp.</i>	Uttrakhand and Jammu & Kashmir.
24.	<i>Pisaura swami</i>	Gujarat, Maharashtra.
25.	<i>Pisaurina sp.</i>	Rajasthan and Goa
26.	<i>Polyboea vulpina</i>	Assam, Kerala and Tamil Nadu.
27.	<i>Stoliczka affinis</i>	Jammu & Kashmir
28.	<i>Pisaurina mira</i>	Maharashtra
29.	<i>Tinus arindamai</i>	Maharashtra and Kerala
30.	<i>Polyboea zonaformis</i>	West Bengal
31.	<i>Dolomedes tenebrosus</i>	Tamil Nadu, West Bengal
32.	<i>Dolomedes fimbriatus</i>	Tamil Nadu
33.	<i>Eucamptopus coronatus</i>	Tamil Nadu
34.	<i>Dolomedes triton</i>	Arunachal Pradesh
35.	<i>Dendrolycosa gitae</i>	Andaman & Nicobar Islands Assam, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Meghalaya Odisha, Sikkim, Tamil Nadu, West Bengal.



Fig 1: Pisauridae Species



Fig 2: Pisauridae Species

Literature review

The current study provides a detailed exploration of the distribution and faunal diversity of the Pisauridae spider family (Araneae: Arachnida) across various Indian states and union territories. This review also presents an updated checklist of Pisauridae species, based on research published up to January 31, 2021. Known by common names such as fishing spiders, raft spiders, and nursery web spiders, this

family is characterized by its ecological adaptability and unique reproductive behaviors (2).

Out of the 29 documented Pisauridae species in India, 12 are endemic. These species are distributed across 18 states and three union territories (Puducherry, Jammu and Kashmir, and the Andaman and Nicobar Islands), representing 11 genera. Interestingly, only three species demonstrate widespread geographic distribution: *Perenethis venusta* (L.

Koch, 1878) occurs in eight Indian states, *Nilus albocinctus* (Doleschall, 1859) spans eight states and one union territory, and *Dendrolycosa gitae* (Tikader, 1970) is found in 11 states and one union territory. Maharashtra hosts the highest number of these spiders (13 species), followed by Tamil Nadu (10 species).

Beyond Pisauridae, the faunal diversity of other spider families in India, particularly those less studied, has also been examined. Eleven additional families, including Theridiosomatidae, Symphytognathidae, Psechridae, Psilodercidae, Segestriidae, Palpimanidae, and Pimoidae, are underrepresented in existing research. Notably, no species from these families have been reported in several states, including Arunachal Pradesh, Chhattisgarh, Haryana, Mizoram, Telangana, and Tripura. Among union territories, records are limited to the Andaman and Nicobar Islands, Jammu & Kashmir, Lakshadweep, and Puducherry. Certain families, such as *Tetrablemmidae*, Selenopidae, and Psechridae, have a relatively higher representation, with 10, 8, and 7 species, respectively.

However, the representation of families like Segestriidae (5 species), Palpimanidae (4 species), Pimoidae (4 species), and Symphytognathidae (1 species) remains sparse. Tamil Nadu leads with 16 species documented, followed by Kerala and Uttarakhand (10 species each), Maharashtra (9 species), and Karnataka (8 species). Remarkably, 62.5% of species in these families are endemic, emphasizing their conservation importance. Indigenous families such as Pimoidae, Segestriidae, Symphytognathidae, and *Tetrablemmidae* contribute significantly to India's unique spider fauna.

Globally, spiders, including Pisauridae, play a critical role in natural pest control, particularly in agricultural ecosystems, by reducing insect populations and contributing to ecological balance. Studies on Egyptian spiders underline the challenges in systematic identification due to complex morphological variations. For instance, research in the Assiut Governorate of Egypt (27°14'N and 31°11'E), part of North Africa's arid belt, used manual collection methods over a year to compile a comprehensive faunal inventory. This survey documented 3,457 specimens from 42 genera and 47 species, including 40 species newly recorded in the region. Such efforts underscore the importance of systematic investigations and the development of morphological keys for accurate species identification and biodiversity assessments.

These insights emphasize the need for continued taxonomic research and ecological monitoring of spiders, particularly in biodiversity hotspots and underexplored regions. Enhanced understanding of spider diversity will not only inform conservation strategies but also highlight their ecological and agricultural significance.

Results and discussion

The pisaurid spider *Hygropoda longimana*, which was obtained from West Bengal, appears to have been described for the first time in India by Stoliczka^[8]. Two species were later described by O. Pickard-Cambridge^[9, 10]: *Perenethis dentifasciata* (O. Pickard-Cambridge, 1885) from Jammu & Kashmir and *Euprosthops ellioti* (O. Pickard-Cambridge, 1877) from eastern central India. Thus, three further species were described in the 19th century: *Eucamptopus coronatus* Pocock, 1900^[13] from Tamil Nadu, *Nilus phipsoni* (F.O. Pickard-Cambridge, 1898)^[12] from Maharashtra, and *Hygropoda gracilis* (Thorell, 1891)^[11] from the Andaman &

Nicobar Islands. Tikader^[14] was the first Indian author to describe two species of the Pisauridae: *Hygropoda sikkimus* (Tikader, 1970) and *Dendrolycosa gitae* (Tikader, 1970) from Sikkim and Tamil Nadu. Subsequently, five additional species of spiders belonging to this family were described by Patel^[15], Patel & Reddy^[16], and Reddy & Patel^[17]: *Nilus decorata* (Patel & Reddy, 1990) and *Pisaura podilensis* (Patel & Reddy, 1990) from Andhra Pradesh; *Dendrolycosa bobbiliensis* (Reddy & Patel, 1993) from Gujarat; and *Hygropoda chandrakantii* (Reddy & Patel, 1993) from Pune. Only two species from India have been described in the current century: *Nilus pseudoalbocinctus* (Sen *et al.*, 2010) from West Bengal^[19] and *Tinus arindamai* Biswas & Roy, 2005 from Kerala^[18]. No new species from India have been described since) appear to be inaccurate reports. However, only 18 species of Pisauridae were documented by Caleb and Sankaran^[4], who classified them under 8 genera. The remaining species found in India were either missed by them or were misidentified. Just 8.2% of the world's pisaurid fauna is found in India. Over the past ten years, no species of these spiders have been described. Only 18 Indian states and 3 union territories (Andaman and Nicobar Islands, Jammu and Kashmir, and Puducherry) currently have 29 species total—16 described and 13 additional species—under 11 genera, with 12 species, or 41%, being endemic. Three species that have been designated with (In Maharashtra, a maximum of 13 species of these spiders were observed, with 10 species coming next.

Conclusion

Spiders (~40,000 sp.) are members of the Class Arachnida and are categorised based on certain shared derived traits, including the ability to spin and synthesise silk. The links between spider families have grown more apparent in recent decades, mostly due to phylogenetic analysis of morphological traits. Few higher-level molecular systematic studies have been conducted, and those that have been conducted have had limited taxonomic sampling. Spider diversification is ancient, nevertheless, as molecular time estimations reveal that a number of spider families expanded rapidly in the early Cretaceous (146–100 million years ago, Ma) and earlier. Only 29 species, spread across 11 genera, have been found in 18 Indian states and 3 union territories under the family Pisauridae; 12 of these species are endemic. The highest number of these spider species were found in Tamil Nadu (10 species) and Maharashtra (13 species), while the lowest number were found in West Bengal (9 species), Kerala (8 species), Gujarat (7 species), and West Bengal (9 species). Surprisingly few species have been documented in the states of Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Mizoram, Nagaland, Punjab, Tripura, Dadra and Nagar Haveli, Daman and Diu, Ladakh, and Lakshadweep, which calls for extensive research.

Conflict of Interest Declared None

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