

Diversity and distribution of Pisauridae (Araneae: Araneomorphae: Arachnida) in India

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Abstract

The present article deals with the faunal diversity and distribution of one of the spider family Pisauridae (Araneae: Arachnida), commonly known as nursery web spider, raft spider, fishing spider, in different Indian states and union territories and provides an update checklist based on the literature published up to January 31, 2021. It includes 29 species of spiders described under 11 genera in 18 states and 3 union territories (Andaman and Nicobar Islands, Jammu and Kashmir and Puducherry), out of which 12 species are endemic. The records demonstrated that only 3 species of these spiders are distributed widely: *Dendrolycosa gitae* (Tikader, 1970) (11 Indian states, 1 union territory), *Nilus albocinctus* (Dobson, 1859) (8 Indian states, 1 union territories), and *Perenethis venusta* L. Koch, 1878 (8 Indian states). Maximum 13 species of these spiders were recorded in Maharashtra followed by 10 species in Tamil Nadu.

Keywords: pisauridae, nursery web spider, raft spider, fishing spider, faunal diversity, and checklist

Introduction

The members of the order Araneae (Arachnida: Chelicerata: Arthropoda) are commonly known as spiders and ranks seventh in global diversity (49,136 species, 4207 genera, 128 families; World Spider Catalog ^[1] after the five largest insect orders (Coleoptera – ca. 4,00,000 species, Lepidoptera – ca. 1,80,000 species, Hymenoptera – ca. 1,50,000 species, Diptera – ca. 1,25,000 species, Hemiptera – ca. 50,000 species) and one arachnid order (Acari – over 50,000 species). The economic importance of spiders is immense. They are not only a good bioindicator of several ecosystems but being predators, chiefly entomophagous, regulate the insect population both in wild as well as in agroecosystem. Spiders are also known to kill about 50 times the number of prey they actually feed ^[2]. The number of records of spider species in India have increased gradually at the rate of 2.24% per year from 1067 species in 1987 ^[3] to 1855 species at the end of 2020 ^[4].

In spite of current researches on the diversity of spiders in India, their number is inadequate than other parts of the world. Recently, we updated the distribution pattern of 40 families of spiders in India ^[5]. In this continuation, the present article enlists the diversity and distribution of another family of spider, the Pisauridae in India.

Pisauridae are araneomorph spiders commonly called as nursery web spiders, but the semi-aquatic species are often called fishing spiders and raft spiders. They apparently look like wolf spiders (Lycosidae) but differ particularly in eye pattern and the fate of egg sacs. In wolf spiders, two eyes are very prominent in addition to other six, while all eight eyes in nursery web spiders are alike. Also, unlike attaching the eggs to their spinnerets like wolf spiders, the female of nursery web spiders carry their egg sacs with the chelicerae and palps beneath their body. The female constructs a nursery tent, inside which the eggsacs are placed until hatching. When hatching time approaches, the female ties the egg sac to leaves or branches and spins a protective nursery web around it. The spiderlings remain inside the

nursery web until their second moult while the female stands guard over it. These spiders are moderately large (above 10 mm) with long legs. The legs of the female are shorter in relation to body size than those of the male. They are wandering hunter in low vegetation or in ambush and never use webs for procuring prey. The semi-aquatic species, the fishing spiders and raft spiders, predate upon even larger preys such as small tadpoles and fishes in addition to a variety of aquatic insects. Unlike most of the other spider groups, pre-copulatory cannibalism of males by the females in Pisauridae is very common. In some species such as *Pisaura mirabilis* (Clerck, 1757), males present nuptial gift (silk-wrapped prey) to female prior to copulation ^[6].

The Pisauridae is comparatively a small spider family, currently with 51 genera and 353 species distributed worldwide, except extremely dry and cold environment ^[1]. Our knowledge on the diversity and distribution of Indian Pisauridae is scanty and highly patchy because extensive surveys for these spiders were performed only in a few places and most of the Indian states are still unexplored. There are several species of these spiders which are yet to be described and several species recorded from India have also been misidentified. Hence, these reports need re-examination. At present, the available knowledge of diversity and distribution of Pisauridae is scattered in literature and so far no consolidated account is available regarding their distribution pattern across the country. Therefore, this present work was taken up to provide up-to-date information of this family.

Materials and Methods

This checklist is based on the literature published in recent past books, journals and few authentic theses, websites, and World Species Catalog up to 31 January 2021 ^[1]. In most of the literature, published earlier, several errors crept in their scientific names even in the recent ones. It happened because such contents become outdated quickly and, due to

their perceived comprehensiveness, readers sometimes overlook newer sources of data. Additionally, the researches on spider taxonomy are continued with the description of new taxa, their modified status, and the publication of other nomenclatural decisions [7]. If a spider species is identified only up to generic level, it was considered as species if no other species of that genus is reported within the state. In the present checklist, attempts have been made to correct the errors in the scientific names of the spiders following World Spider Catalog. Only those synonymies were mentioned that were reported in India. All the endemic species are marked with (*). Seemingly, misidentified and erroneous records are marked with (†). If the spider species is not endemic, its Elsewhere distribution is also provided.

Results and Discussion

In India, Stoliczka [8] seems the first to describe a pisaurid spider, *Hygropoda longimana* collected from West Bengal. Later, O. Pickard-Cambridge [9, 10] described two species, *Euprosthonops ellioti* (O. Pickard-Cambridge, 1877) from eastern central India and *Perenethis dentifasciata* (O. Pickard-Cambridge, 1885) from Jammu & Kashmir. Consequently, three more species were described in 19th century, viz. *Hygropoda gracilis* (Thorell, 1891) [11] from Andaman & Nicobar Islands, *Nilus phipsoni* (F.O. Pickard-Cambridge, 1898) [12] from Maharashtra and *Eucamptopus coronatus* Pocock, 1900 [13] from Tamil Nadu. Among the Indian authors, Tikader [14] was first to described two species of Pisauridae, *Dendrolycosa gitae* (Tikader, 1970) from Sikkim and Tamil Nadu, and *Hygropoda sikkimus* (Tikader, 1970) from Sikkim. Later, Patel [15], Patel & Reddy [16] and Reddy & Patel [17] described five more species of spiders of this family: *Pisaura swamii* Patel, 1987 from Gujarat; *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 Puducherry. In the present century, only two species were described from India, *Tinus arindamai* Biswas & Roy, 2005 from Kerala [18] and *Nilus pseudoalbocinctus* (Sen *et al.*, 2010) from West Bengal [19]. Since then, no new species was described from India.

At present, 16 species were described and 13 more species (total 29 species) were recorded under 11 genera in only 18 Indian states and 3 union territories (Andaman and Nicobar Islands, Jammu and Kashmir, and Puducherry) and 41% (12 species) of them are endemic. Three species marked with (†) seem to be erroneous report. However, Caleb and Sankaran [4] enlisted only 18 species of Pisauridae described under 8 genera and the rest of the species recorded in India are either overlooked by them or are cases of misidentification. Indian record is only 8.2% of the world pisaurid fauna. None of the species of these spiders are described during the last 10 years.

Maximum 13 species of these spiders were recorded in Maharashtra followed by 10 species in Tamil Nadu, 9 species in West Bengal, 8 species in Kerala, 7 species in Gujarat, 6 species in Assam, 5 species each in Jammu & Kashmir, Karnataka and Odisha, and so on, and no species is recorded in Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Mizoram, Nagaland, Punjab and Tripura, Dadra and Nagar Haveli and Daman and Diu, Ladakh and Lakshadweep and need extensive research work.

Out of 29 species of Pisauridae recorded in India, only four species are widely distributed, viz. *Dendrolycosa gitae* (Tikader, 1970) (11 Indian states, 1 union territory), *Nilus albocinctus* (Doleschall, 1859) (8 Indian states, 1 union territories), and *Perenethis venusta* L. Koch, 1878 (8 Indian states). Following is the detailed list of these spiders distributed in Indian states and union territories and elsewhere.

Dendrolycosa bobbiliensis (Reddy & Patel, 1993)*

Syn. *Pisaura bobbiliensis* Reddy & Patel, 1993

- Andhra Pradesh [20]
- Gujarat [17]

Dendrolycosa gitae (Tikader, 1970)*

Syn. *Pisaura gitae* Tikader, 1970

- Andaman & Nicobar Islands [20]
- Assam [20]
- Goa [21]
- Gujarat [22]
- Karnataka [23]
- Kerala [24]
- Maharashtra [25]
- Meghalaya [26]
- Odisha [27]
- Sikkim [14, 20, 24]
- Tamil Nadu [28]
- West Bengal [14, 20, 24, 25]

Dendrolycosa putiana (Barrion & Litsinger, 1995)

Syn. *Pisaura putiana* Barrion & Litsinger, 1995

- Maharashtra [29]
- Assam [20]

Elsewhere: Philippines

4. *Dendrolycosa robusta* (Thorell, 1895)

- Maharashtra [30]
- Odisha [31]
- West Bengal [32]

Elsewhere: China, Laos, Myanmar, Vietnam

Dendrolycosa sp.

- Gujarat [33]

Dolomedes fimbriatus (Clerck, 1757)

- Tamil Nadu [34]

Elsewhere: Caucasus, Central Asia, Europe, Japan, Russia

Dolomedes tenebrosus (Hentz, 1844)†

- Tamil Nadu [35]
- West Bengal [36]

Elsewhere: Canada, USA

Dolomedes triton (Walckenaer, 1837)†

- Arunachal Pradesh [37]

Elsewhere: Cuba, North America

Dolomedes sp.

- Arunachal Pradesh [37]
- Karnataka [38]

- Madhya Pradesh ^[39]
- Maharashtra ^[40]
- Odisha ^[41]

Eucamptopus coronatus* Pocock, 1900

- Tamil Nadu ^[13, 20]

Euprosthonops ellioti* (O. Pickard-Cambridge, 1877)Syn. *Podophthalma ellioti* O. Pickard-Cambridge, 1877

- Eastern Central India ^[9]
- Tamil Nadu ^[13]

Hygropoda chandrakantii* (Reddy & Patel, 1993)Syn. *Tinus chandrakantii* Reddy & Patel, 1993

- Kerala ^[42]
- Puducherry ^[17, 20]

Hygropoda gracilis* (Thorell, 1891)Syn. *Dendrolycosa gracilis* Thorell, 1891

- Andaman & Nicobar Islands ^[11, 20]
- Maharashtra ^[29]

***Hygropoda longimana* (Stoliczka, 1869)**Syn. *Dolomedes longimanus* Stoliczka, 1869

- West Bengal ^[8]

Elsewhere: Bangladesh, Malaysia

Hygropoda sikkimus* (Tikader, 1970)Syn. *Tinus sikkimus* Tikader, 1970

- Andaman & Nicobar Islands ^[43]
- Arunachal Pradesh ^[20]
- Kerala ^[42]
- Sikkim ^[14, 20]
- West Bengal ^[43]

***Hygropoda* sp.**

- Maharashtra ^[30]
- Rajasthan ^[44]

***Nilus albocinctus* (Doleschall, 1859)**Syn. *Dolopoeus cinctus* (Thorell, 1891); *Thalassius albocinctus* (Doleschall, 1859); *Thalassius doleschalli* Pickard-Cambridge, 1897; *Thalassius marginellus* Simon, 1885; *Thalassius simoni* F.O. Pickard-Cambridge, 1897

- Andaman & Nicobar Islands ^[11]
- Assam ^[20]
- Karnataka ^[45]
- Kerala ^[20, 45]
- Maharashtra ^[29]
- Odisha ^[46]
- Rajasthan ^[44]
- Uttar Pradesh ^[47]
- Uttarakhand ^[48]

Elsewhere: Borneo, Celebes, Java, Myanmar, Philippines

Nilus decorata* (Patel & Reddy, 1990)Syn. *Pisaura decorata* Patel & Reddy, 1990

- Andhra Pradesh ^[16]
- Telangana ^[20]
- Uttar Pradesh ^[47]

***Nilus phipsoni* (F.O. Pickard-Cambridge, 1898)**Syn. *Thalassius phipsoni* F.O. Pickard-Cambridge, 1898

- Gujarat ^[49]
- Maharashtra ^[12, 13]
- Tamil Nadu ^[50]

Elsewhere: China, Indonesia

Nilus pseudoalbocinctus* (Sen et al., 2010)Syn. *Thalassius pseudoalbocinctus* Sen et al., 2010

- West Bengal ^[19, 20]

***Nilus* sp.**Syn. *Thalassius* sp.

- Goa ^[21]
- Gujarat ^[51]
- Kerala ^[52]

***Perenethis dentifasciata* (O. Pickard-Cambridge, 1885)**Syn. *Ocyale dentifasciata* O. Pickard-Cambridge, 1885; *Pisaura dentifasciata* (O. Pickard-Cambridge, 1885)

- Jammu & Kashmir ^[10]
- Tamil Nadu ^[53]
- Uttarakhand ^[28]

Elsewhere: Pakistan

***Perenethis sindica* (Simon, 1897)**Syn. *Perenethis indica* Pocock, 1900; *Tetragonophthalma sindica* Simon, 1897

- Maharashtra ^[13, 20]
- Tamil Nadu ^[54]
- West Bengal ^[20]

Elsewhere: China, Nepal, Pakistan, Philippines, Sri Lanka

***Perenethis venusta* L. Koch, 1878**Syn. *Perenethis unifasciata* (Chrysanthus, 1967)

- Assam ^[55]
- Gujarat ^[49]
- Karnataka ^[23]
- Kerala ^[20]
- Maharashtra ^[40]
- Odisha ^[56]
- Uttarakhand ^[28]
- West Bengal ^[36]

Elsewhere: Australia, Myanmar, Japan, Papua New Guinea, Philippines, Singapore, Thailand

***Perenethis* sp.**

- Assam ^[57]
- Karnataka ^[58]
- Uttarakhand ^[59]

***Pisaura mirabilis* (Clerck, 1757)**

- Jammu & Kashmir ^[60]
- Uttarakhand ^[59]

Elsewhere: Caucasus, Central Asia, China, Europe, Middle East, Russia, Turkey

Pisaura podilensis* Patel & Reddy, 1990

- Andhra Pradesh ^[16, 20]

- Gujarat ^[33, 49]
- Maharashtra ^[30]

Pisaura swamii* Patel, 1987

- Gujarat ^[15]
- Maharashtra ^[30]

***Pisaura* sp.**

- Andhra Pradesh ^[61]
- Assam ^[62]
- Gujarat ^[63]
- Jammu & Kashmir ^[64]
- Kerala ^[65]
- Madhya Pradesh ^[39]
- Manipur ^[66]
- Tamil Nadu ^[67]
- Uttar Pradesh ^[47]
- Uttarakhand ^[28]

***Pisaurina mira* (Walckenaer, 1837)†**

- Maharashtra ^[68]

Elsewhere: Canada, USA

***Pisaurina* sp.**

- Goa ^[21]
- Rajasthan ^[69]

***Polyboea vulpina* Thorell, 1895**

- Assam ^[55]
- Kerala ^[65]
- Tamil Nadu ^[70]

Elsewhere: Malaysia, Myanmar, Singapore, Thailand

***Polyboea zonaformis* (Wang, 1993)**

- West Bengal ^[19, 20]

Elsewhere: China, Laos

***Stoliczka affinis* Caporiacco, 1935**

- Jammu & Kashmir ^[20, 71]

Elsewhere: Pakistan?

***Stoliczka insignis* O. Pickard-Cambridge, 1885**

- Jammu & Kashmir ^[71]

Elsewhere: Pakistan

Tinus arindamai* Biswas & Roy, 2005

- Kerala ^[18, 20]
- Maharashtra ^[30]

***Tinus* sp.**

- Gujarat ^[22]
- Karnataka ^[72]

Three species, earlier described in India, are considered *nomina dubia* (doubtful species), e.g. *Dendrolycosa stauntoni* Pocock, 1900 ^[73], *Nilus marginatus* (Simon, 1887) ^[73], and *Perenethis rectifasciata* (O. Pickard-Cambridge, 1885) ^[74]. Record of *Nilus marginatus* (Simon, 1887) in

Maharashtra is the case of misidentification. One species, *Hygropoda mahendriensis* Vankhede *et al.*, 2013 is designated as *nomen nudum* ^[1] as explicit designation of the type specimen and its diagnosis both are lacking. Following is the detailed list of these spiders described/distributed in Indian states and union territories.

A. Doubtful species (*nomina dubia*)**1. *Dendrolycosa stauntoni* Pocock, 1900**

- Karnataka ^[13]

2. *Nilus marginatus* (Simon, 1888)

Syn. *Sphedanus marginatus* Simon, 1888

- Andaman & Nicobar Islands ^[75]
- Maharashtra ^{[29]†}

3. *Perenethis rectifasciata* (O. Pickard-Cambridge, 1885)

Syn. *Ocyale rectifasciata* O. Pickard-Cambridge, 1885; *Pisaura rectifasciata* (O. Pickard-Cambridge, 1885)

- Jammu & Kashmir ^[10]

B. *Nomen nudum***1. *Hygropoda mahendriensis* Vankhede *et al.*, 2013**

- Gujarat ^[49]
- Maharashtra ^[76]

Conclusion

A total of only 29 species under 11 genera of spiders belonging to the family Pisauridae were recorded only in 18 Indian states and 3 union territories and out of them 12 are endemic. Maximum species of these spiders were recorded from Maharashtra (13 species) and Tamil Nadu (10 species) followed by West Bengal (9 species), Kerala (8 species), Gujarat (7 species), and less number of species in other areas. Surprisingly, no species is recorded in Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Mizoram, Nagaland, Punjab and Tripura, Dadra and Nagar Haveli and Daman and Diu, Ladakh and Lakshadweep and need extensive research work.

References

1. World Spider Catalog. World Spider Catalog. Version 22.0. Natural History Museum Bern, online at <http://wsc.nmbe.ch>, accessed on 31 January, 2021.
2. Kajak A. Analysis of consumption by spiders under laboratory and field conditions. *Ekologia Polska*. 1978; 26:409-327.
3. Tikader BK. Handbook Indian Spiders. Zoological Survey of India, Calcutta. 1987; 251.
4. Caleb JTD, Sankaran PM. Araneae of India, version 2021. <https://indianspiders.in/> retrieved on January 31, 2021
5. Tiwari AK, Singh G, Singh R. Faunal diversity of Oonopidae (Araneomorphae: Araneae: Arachnida) in India. *Journal of Global Biosciences*. 2021; 10(2): in press.
6. Johnson JC, Sih A. Fear, food, sex and parental care: a syndrome of boldness in the fishing spider, *Dolomedes triton*. *Journal Animal Behaviour*. 2007; 74(5):1131-1138.
7. Singh R, Singh G, Sharma A. Faunal diversity of jumping spiders (Salticidae: Araneae: Arachnida) in

- India. International Journal of Biological Innovations. 2021; 3(1):1-37.
8. Stoliczka F. Contribution towards the knowledge of Indian Arachnoidea. Journal of the Asiatic Society of Bengal. 1869; 38(2):201-251.
 9. Pickard-Cambridge O. On some new species of Araneidea, with characters of two new genera and some remarks on the families Podophthalmides and Dinopides. Proceedings of the Zoological Society of London. 1877; 45(3):557-578.
 10. Pickard-Cambridge OP. Scientific results of the second Yarkand mission. Araneidea. Government Printing, Calcutta: 1885, 115.
 11. Thorell T. Spindlar från Nikobarerna och andra delar af södra Asien. Kongliga Svenska Vetenskaps-Akademiens Handlingar. 1891; 24(2):1-149.
 12. Pickard-Cambridge FO. On the cteniform spiders of Africa, Arabia and Syria. Proceedings of the Zoological Society of London. 1898; 66(1):13-32
 13. Pocock RI. The Fauna of British India including Ceylon and Burma Arachnida. Taylor and Francis, London, 1900; 279.
 14. Tikader BK. Spider fauna of Sikkim. Records of the Zoological Survey of India. 1970; 64:1-83.
 15. Patel SK. A new spider species: *Pisaura swamii* sp. nov. (Pisauridae). Biological Bulletin of India. 1987; 9: 64-66.
 16. Patel BH, Reddy TS. Two new species of the genus *Pisaura* Simon (Araneae: Pisauridae) from coastal Andhra Pradesh, India. Entomon. 1990; 15:37-40.
 17. Reddy TS, Patel BH. Two new species of the genera *Pisaura* Simon and *Tinus* Cambridge (Araneae: Pisauridae) from India. Entomon. 1993; 18:181-184.
 18. Biswas B, Roy R. Description of three new species of the genera *Thomisus* Walckenaer, *Cheiracanthium* C. L. Koch, and *Tinus* Cambridge of the families Thomisidae, Clubionidae and Pisauridae from India. Records of the Zoological Survey of India. 2005; 105(3-4):37-42.
 19. Sen S, Dhali DC, Saha S, Raychaudhuri D. Spiders (Araneae: Arachnida) of Reserve Forests of Doors: Gorumara National Park, Chapramari Wildlife Sanctuary and Mahananda Wildlife Sanctuary. World Scientific News. 2025; 20:1-339.
 20. Dhali DC, Sureshan PM, Chandra K. Indian Lycosoidea Sundevall (Araneae: Opisthothelae: Araneomorphae) in different states and union territories including an annotated checklist. World Scientific News. 2016; 47(2):298-317.
 21. Pandit R, Dharwadkar M. Preliminary checklist of spider fauna (Araneae: Arachnida) of Chandranath Hill, Goa, India. Journal of Threatened Taxa. 2020; 12(11):16597-16606.
 22. Siliwal M, Suresh B, Pilo B. Fauna of protected areas-3. Spiders of Purna Wildlife Sanctury, Dangs, Gujarat. Zoo's Print Journal. 2003; 18(11):1259-1263.
 23. Bhat PS, Srikumar KK, Raviprasad TN. Seasonal diversity and status of spiders (Arachnida: Araneae) in cashew ecosystem. World Applied Sciences Journal. 2013; 22(6):763-770.
 24. Sen S, Saha S, Raychaudhuri D. New and hitherto unknown nursery web spider species (Araneae: Pisauridae) from the reserve forests of Doors, West Bengal, India. Munis Entomology and Zoology. 2010; 5: 225-231.
 25. Bastawade DB, Khandal D. Arachnida: Araneae (Spiders). In: Fauna of Sanjay Gandhi National Park (Invertebrates) Borivali, Mumbai (Maharashtra), Conservation Area Series. Zoological Survey of India, Kolkata. 2006; 26:139-184.
 26. Roy TK, Saha S, Raychaudhuri D. Spider Fauna of Meghalaya, India. In Biodiversity: Exploration, Exploitation, Conservation and Management - Vision and Mission. Proceedings of the UGC Sponsored National Seminar, Kolkata, India, 19-20th November, 2016 (Eds. S. Saha, M. Manna, J. Ghosh, S. Podder, E. Haque, S. Guria and S. Dey). World Scientific News. 2017; 71:104-127.
 27. Siliwal M, Molur S, Daniel BA. Status and conservation of tarantulas in selected hot specks of southern India. Report submitted to Fauna and Flora International, UK. 2008; 57.
 28. Gupta N, Siliwal MA. Checklist of spiders (Arachnida: Araneae) of Wildlife Institute of India campus, Dehradun, Uttarakhand, India. Indian Journal of Arachnology. 2012; 1(2):73-91.
 29. More S, Sawant V. Spider Fauna of Radhanagari Wildlife Sanctuary, Chandoli National Park and Koyna Wildlife Sanctuary. Indian Journal of Arachnology. 2013; 2(1):81-92.
 30. Rithe K. Spider diversity from relocated area of Melghat Tiger Reserve. Indian Journal of Arachnology. 2012; 1(2):92-105.
 31. De K, Palita SK. A checklist of spiders from six sacred groves in Southern Odisha, India. Serket. 2018; 16(1):30-40.
 32. Raychaudhuri D, Saha S, Roy TK. Spiders: A proficient candidate in practising IPM for Darjeeling Tea. World Scientific News. 2016; 38:1-62.
 33. Yadav A, Solanki R, Siliwal M, Kumar D. Spiders of Gujarat: a preliminary checklist. Journal of Threatened Taxa. 2017; 9(9):10697-10716.
 34. Ganesh Kumar M, Sugumaran MP, Sivasubramanian K, Nagamani B. Studies on the ecology of the raft spider *Dolomedes fimbriatus* (Dol.) (Araneae: Pisauridae) in the rice fields of Coimbatore. Zoos' Print Journal. 1999; 14(6):45-46.
 35. Sugumaran MP, Duraimurugan B. Arthropod diversity in horticultural ecosystems in Keelaiyur block, Nagapattinam district, Tamil Nadu. Indian Journal of Ecology. 2019; 46(4):889- 891.
 36. Ghosh N, Biswas R, Mitra A. Species diversity, abundance and habitat association of spiders with relation to their guild composition in different habitats of North Bengal Wild Animals Park (Bengal Safari). International Journal of Life Sciences. 2018; 6(4):911-918.
 37. Chetry A, Moran J. Diversity of Namsai District, Arunachal Pradesh, India. International Journal of Basic and Applied Research. 2019; 9(7):343-351.
 38. Abhijith APC. <https://www.mysorenature.org/mysorenature/Spiders-of-Mysore-Area>, as on 15/10/2019 retrieved on January 31, 2021.
 39. Gajbe P. Fauna of protected areas-11. Spiders of Pench Tiger Reserve, Madhya Pradesh. Zoo's Print Journal. 2004; 19(9):16-24.
 40. Lanka LP, Kamble SS, Bodkhe AK. An Addition to

- spider fauna from the vicinity of Radhanagari wildlife sanctuary of Kolhapur district. *International Journal of Scientific Engineering and Research*. 2017; 5(7):280-283.
41. Palita SK. Faunal diversity assessment of invertebrates and lower vertebrates of Deomali hills of Eastern Ghats, Koraput, odisha, India. Final Technical Report. Odisha Biodiversity Board and Central University of Orissa. 2016; 44.
 42. Joseph MM, Paul J, Sankaran PM, Sebastian PA. Preliminary results on the spider fauna (Arachnida: Araneae) of the high altitude shola ecosystem in the Western Ghats. *Proceedings of the National Conference on Ecology Sustainable Development and Wildlife Conservation*. 2017, 41-49.
 43. Tikader BK. Studies on spider fauna of Andaman and Nicobar islands, Indian Ocean. *Records of the Zoological Survey of India*. 1977; 72:153-212.
 44. Lawania KK, Mathur P. Biodiversity and habit preference of spider fauna in eastern region of Rajasthan and its catchment area. *International Journal of Scientific Development and Research*. 2017; 2(6):475-484.
 45. Pickard-Cambridge FO. On the cteniform spiders of Ceylon, Burma and the Indian archipelago, west and north of Wallace's line; with bibliography and list of those from Australia, south and east of Wallace's line. *Annals and Magazine of Natural History* 1897; 6(20):329-356.
 46. Panda S, Mishra S, Priyadarshini D, Parida P. Spiders of Nandankanan. Forest Department, Government of Odisha. 2011; 64.
 47. Uniyal VP, Hore U. Effect of management practices on spider diversity in Terai Conservation Area (TCA). Final Project Report, Wild Life Institute of India, Dehradun; 2009; 222.
 48. Pooja A, Anilkumar, Quasin S, Lekshmi S, Uniyal VP. Spider fauna of Navdanya Biodiversity Farm, Uttarakhand, India. *Indian Forester*. 2019; 145(4):392-397.
 49. Solanki R, Siliwal M, Kumar D. A preliminary checklist of spiders (Araneae: Arachnida) in Jambughoda Wildlife Sanctuary, Panchmahal District, Gujarat, India. *Journal of Threatened Taxa*. 2020; 12(11):16576-16596.
 50. Sherriffs WR. A contribution to the study of south Indian arachnology. *Annals and Magazine of Natural History*. 1919; 9(4):220-253.
 51. Parmar BM, Patel KB, Joshi JD, Chaudhari NR. Faunastic study of spider's diversity from islands and coastal areas of Gulf of Kutch, India. *Life Sciences Leaflets*. 2015; 67:12-23.
 52. Adarsh CK, Nameer PO. Spiders of Kerala Agricultural University Campus, Thrissur, Kerala, India. *Journal of Threatened Taxa*. 2015; 7(15):8288-8295.
 53. Sugumar MP. Biodiversity of spiders in Western Ghats of Tamil Nadu. PhD thesis, Tamil Nadu Agricultural University, Coimbatore. 2001; 204.
 54. Simon E. Arachnides (2e partie). In: *Voyage de M. Maurice Maindron dans l'Inde méridionale*. 8e Mémoire Annales de la Société Entomologique de France. 1906; 75:279-314.
 55. Singh S, Borkotoki A, Sarmah CK. Species distribution of spiders in barpeta district of Assam: a diversity measure. *International Scientific Research Journal*. 2012; 4(1):47-57.
 56. Mohapatra AK, Biswas T, Parida SP. Spider diversity in RIE campus. *RIE Bhubaneswar*. 2014; 76.
 57. Das S, Bhattacharjee R, Saikia PK. Comprehensive checklist of diurnal spider diversity in Guwahati metropolitan area, Kamrup, Assam. *Tropical Zoology*. 2015; 5:121-131.
 58. Murali S, Jalali SK, Shylesha AN, Shivalinga Swamy TM, Gandhi Gracy R. Predatory spider fauna in brinjal crop their abundance and composition. *Journal of Entomology and Zoology Studies*. 2017; 5(5):675-681.
 59. Uniyal VP, Sivakumar K, Quasin S. Diversity of Spiders in Nanda Devi Biosphere Reserve. *Wildlife Institute of India, Dehradun. DST Project Completion Report*. 2011; 199.
 60. Punjoo S, Bhat GA. First report of spiders (Arachnida: Araneae) from Dachigam National Park, Kashmir, India. *International Journal of Research*. 2015; 2(2):707-719.
 61. Palem H, Kanike S, Purushottam VRS. Diversity of spider fauna (Arachnida: Araneae) in different ecosystems, Eastern Ghats, Southern Andhra Pradesh, India. *South Asian Journal of Life Sciences*. 2016; 4(2):51-60.
 62. Chetia P, Kalita DK. Diversity and distribution of spiders from Gibbon Wildlife Sanctuary, Assam, India. *Indian Journal of Arachnology*. 2012; 1(1):130-142.
 63. Patel BH, Vyas R. Spider of Hingolghadh Nature Education Sanctuary, Gujarat, India. *Zoos' Print Journal*. 2001; 16(9):589-590.
 64. Khan AA. Spider fauna on temperate rice in Kashmir. *Oryza*. 2011; 48(2):147-153.
 65. Sunil Jose K, Sudhikumar AV, Davis S, Sebastian PA. Preliminary studies on the spider fauna (Arachnida: Araneae) in Parambikulam Wildlife Sanctuary in Western Ghats, Kerala, India. *Journal of the Bombay Natural History Society*. 2008; 105(3):264-273.
 66. Kananbala A, Bhubaneshwari M, Siliwal M. A checklist of spiders (Arachnida: Araneae) of Manipur, India with some first records and a new species *Conothele khunthokhanbi* (Family: Ctenizidae). *Journal of Entomology and Zoology Studies*. 2018; 6(5):2209-2214
 67. Dharmaraj J, Gunasekaran C, Rajkumar V. Diversity and plethora of spider fauna at different habitats of the Nilgiris, Tamilnadu south India. *International Journal of Recent Scientific Research*. 2018; 9(3A): 24634-24637.
 68. Deshmukh US, Tekade AP. A report on the diversity of spider fauna from Charghad river basin of Morshi, Amravati India. *Bioscience Biotechnology Research Communications*. 2019; 12(3):809-813.
 69. Kaur M, Das SK, Anoop KR, Siliwal M. Preliminary checklist of spiders of Keoladeo National Park, Bharatpur, Rajasthan with first record of *Ptocasius strupifer* Simon, 1901 (Araneae: Salticidae) from India. *Munis Entomology and Zoology*. 2014; 9(1):501-509.
 70. Kapoor V. Effects of rainforest fragmentation and shade-coffee plantations on spider communities in the Western Ghats, India. *Journal of Insect Conservation*. 2008; 12:53-68.
 71. Caporiacco L-di. Aracnidi dell'Himalaia e Del Karakoram, raccolti dalla Missione italiana al Karakoram (1929-VII). *Memorie della Società*

- Entomologica Italiana, Genova. 1935; 13:161-263.
72. Nautiyal S, Khan YDI, Kaechele H, Bhaskar K. Diversity and distribution of spiders in Gogi, Yadgir district: a semi-arid landscape in southern India. International Journal of Ecology and Environmental Sciences. 2017; 43 (3):195-204.
 73. Jäger P. Revision of the spider genera *Nilus* O. Pickard-Cambridge 1876, *Sphedanus* Thorell, 1877 and *Dendrolycosa* Doleschall 1859 (Araneae: Pisauridae). Zootaxa. 2011; 3046:1-38.
 74. Sierwald P. Phylogenetic analysis of Pisaurine nursery web spiders, with revisions of *Tetragonophthalma* and *Perenethis* (Araneae, Lycosidae, Pisauridae). The Journal of Arachnology. 1997; 25:361-407.
 75. Simon E. Etude sur les Arachnides de 'Asie meridionale faisant partie des collection de ' Indian Museum (Calcutta). Journal of the Asiatic Society of Bengal. 1888; 56:101-117.
 76. Vankhede G, Keswani S, Rajoria A. A new species of the spider genus *Hygropoda* (Araneae: Pisauridae) from India. Indian Journal of Arachnology. 2013; 2(1):52-60.