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RESEARCH ARTICLE

Morphometric studies on different species of spiders (Arachinda : Araneae)

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Abstract

The present study emphasizes on the morphometric variation for length and width of different species of spiders collected from different geographical regions of South India. Seven species of spiders belonging to six genera in six families were recorded. Spiders exhibit a greater degree of sexual size dimorphism. Females are larger with distinctly broad abdomen than males having small and narrow abdomen in seven species of spiders. The size of individual would vary in different species with respect to their habitat, adult lifestyle and their sexual size dimorphism

Introduction:

Spiders are found over the entire life supporting landscapes on earth. Spiders are important predators in most terrestrial habitats (Wise, 1993). Spiders are the potential biological indicators and helps in the natural control of harmful insects in various habitats (Kremen et al., 1993). Spiders are the most diverse and abundant invertebrate predators in the terrestrial ecosystems (Specht and Dondale, 1960). Arachnids constitute the second largest class representing 7% of total documented arthropods and it is estimated that 8.3% of arthropods are arachnids (Coddington and Levi, 1991).

Tikader (1982, 1987) published an inclusive list of Indian spiders comprising nearly 1067 species belonging to 249 genera and 43 families. Siliwal et al., (2005) has studied extensively the spider families of India covering number of species of various families distributed in different parts of the Indian sub-continent. In India, 1520 species of spiders belonging to 377 genera and 60 families has been reported (Sebastian and Peter, 2009). He has carried out extensive study on the ecology and behaviour of the South Indian spiders. Most of the species occur in tropic than in temperate regions of the globe, with a ubiquitous distribution encompassing varied habitats. About 44,906 species of spiders belonging to the 114 families and 3935 genera have been described so far (Platnick, 2014).

Morphometric studies of any animal species generally reveal to understand the interrelationship between the various features such as total length of the body, legs spinnerets, and other body parts. Morphometric study is a reliable technique for recognizing the degree of reproductive maturity without sacrificing the animals (Anandan, 1982). The morphometric studies on spiders are especially used for the differentiation of the sex (Suthaharan, 1986). In the present study, through morphometric measurements an attempt has been made to determine the growth of spiders and the possibility of using body proportions of the male and female sexes to differentiate them more clearly.

Materials and methods

Study area

The geography of South India is diverse, encompassing two mountain ranges, the Western and Eastern

Ghats, and a plateau heartland covering 635,780 km^2 of area with six states.

The study area comprises Bangalore Urban (Jnanabharathi campus) and Kolar (Antharagange) of Karnataka and Chittoor (Kaigal falls) of Andhra Pradesh (Fig 1). The forests of all these regions are dry deciduous forests, rich in eucalyptus, shrubs and small and large trees with water logging areas. The details of the collection are mentioned in Table 1.

The capital city of Karnataka is Bangalore, located in the heart of South Deccan of Peninsular India with an elevation range of 839-962m Average Mean Sea Level (AMSL). The city is blessed with pleasant climate with maximum temperature of 33ºC, minimum temperature of 14ºC and humidity ranging from 40 to 95% relative humidity (RH). The climate in Bangalore from March to May is dry and hot, and December to February is cold. It rains intermittently from June to December and the city receives both southwest and northeast monsoon rains. Jnanabharathi campus of Bangalore University located in South West of Bangalore is about 15km from city railway station (Table 1 and Fig 1). It is an isolated serene place with an area of 486 ha. and has diverse habitats consisting of mixed deciduous and non-deciduous vegetation.

Antaragange is a mountain located in the Shathashrunga mountain range. It is located three kilometers from Kolar city in the direction of Kolar hills, the series of mountains that form the temple backdrop. This is a sacred spot consecrated with a temple and tank which receives water from a spring.

Kaigal waterfall is situated in the Chittor District of Andhra Pradesh State and is surrounded by the Koundinya Wildlife Sanctuary. This falls is popularly known as Dumukurallu water falls in reference to the Kaigal village, situated about 2.5 kms from the falls and has an average elevation of 633 meters.

Sampling methods

Collection, identification and preservation: Species of spiders were collected by using ground hand collecting, aerial hand collecting and litter sampling methods followed by Coddington and Levi (1991); Coddington et al., (1996) from the selected geographical locations of South India. The collected specimens were brought to the laboratory, Centre for Applied genetics, Bangalore University, Bengaluru and photographed using Sony 12 megapixels digital camera. The specimens were stored in 90% alcohol. The adult males and females were identified under stereozoom microscope with the existing keys of Gajbe (2004) and Sebastian and Peter (2009). The morphometric measurements were carried out using the Mitutoyo digimatic caliper (mm scale) and the data were analyzed for mean ± standard deviation (Sampling number, N=10).

Results and Discussion

A total of seven species of spiders belonging to six genera in six families were recorded in the different parts of South India (Fig 1). The results of the morphometric measurements of different species of spiders from South Indian region are given below.

Crossopriza lyoni, Blackwall (1867)

Adult females are distinctly larger with broad abdomen than males (Fig 2a). The first pair of legs is considerably longer than the 3rd pair. The mean length and width of head is 1.95±0.03 and 2.33±0.03mm respectively. The mean length and width of abdomen is 4.53±0.13 and 3.46±0.11mm respectively. The total length (6.71±0.13) of the female specimen is bigger than the male specimens (5.24±0.03) (Table 1). First pair of legs is the largest with 53.45±0.24mm and the 3rd pair is the smallest with 27.89±2.20 mm (Table 2).

Adult males have small and narrow abdomen than females (Fig 2b). The first and second pairs are more or less equal in length. The mean length and width of head is 1.92±0.06 and 2.25±0.16mm respectively. The mean length and width of abdomen is 3.15±0.02 and 2.34±0.05mm respectively (Table 1). First pair of legs is the largest with 44.08±0.25mm and the 3rd pair is the smallest with 21.76±0.16mm (Table 2).

Artema atlanta Walckenaer (1837)

Adult females are conspicuously larger with broad abdomen than males (Fig 2c). The first pairs of legs are

considerably longer than the 3rd pair. The mean length and width of head is 3.62±0.07 and 3.84±0.04 mm respectively. The mean length and width of abdomen is 7.09±0.08 and 6.52±0.07mm respectively. The total length of the female specimen (11.13±0.25) is bigger than the male specimen (10.30±0.12) mm (Table 1). First pair of legs is the largest with 65.38±0.26 and the 3rd pair is the smallest with 41.83±0.30 mm (Table 2).

Adult males have small and narrow abdomen than females (Fig 2d). The first and second pairs are more or less equal in length. The mean length and width of head is 3.39±0.07 and 3.54±0.03 mm respectively. The mean length and width of abdomen is 6.57±0.09 and 6.40±0.09 mm respectively (Table 1). First pair of legs is the largest with 48.80±0.25 and the 3rd pair is the smallest with 36.48±0.30 mm (Table 2).

***Hersilia* sp.,** Audouin, (1826)

Adult females are distinctly larger with broad abdomen than males (Fig 2e). The first pairs of legs are considerably longer than the 3rd pair. The mean length and width of head is 2.55±0.05 and 2.26±0.05mm respectively. The mean length and width of abdomen is 4.89±0.07 and 3.65±0.08mm respectively. The total length of the female specimen (11.32±0.45) is bigger than the male specimen (10.41±0.38) (Table 1). First pair of legs is the largest with 23.17±0.32 and the 3rd pair is the smallest with 7.91±0.47 mm (Table 2).

Adult males have small and narrow abdomen compared to females (Fig 2f). The mean length and width of head is 2.38±0.05and 2.11±0.05 mm respectively. The mean length and width of abdomen is 3.94±0.07mm and 2.75±0.11mm respectively (Table 1). First pair of legs is the largest with 31.86±0.25 and the 3rd pair is the smallest with 9.12±0.25mm (Table 2).

***Heteropoda* sp.,** Latreille, (1804)

Adult females are noticeably larger with broad abdomen than males (Fig 2g). The first pairs of legs are considerably longer than female legs. The mean length and width of head is 5.11±0.04 and 5.20±0.08 mm respectively. The mean length and width of abdomen is 9.31±0.06 and 7.59±0.06 mm respectively. The total length of the female specimen (15.20±0.07) is bigger than the male specimen (11.55±0.06) (Table 1). First pair of legs is the largest with 21.14±0.31 and the 3rd pair is the smallest with 17.00±0.28 mm (Table 2).

Adult males have small and slender abdomen than females (Fig 2h). The first and second pairs are more or less equal in length. The mean length and width of head is 4.82±0.06 and 6.20±0.08 mm respectively. The mean length and width of abdomen is 6.07±0.04 and 5.48±0.07 mm respectively (Table 1). First pair of legs is the largest with 31.21±0.37 and the 3rd pair is the smallest with 26.82±0.17 mm (Table 2).

Nephila kuhli, Doleschall, (1859)

Adult females are noticeably larger than males (Fig 2i). The first pair of legs are considerably longer than the 3rd pair. The mean length and width of head is 12.09±0.05 and 8.23±0.05 mm respectively. The mean length and width of abdomen is 35.24±2.90 and 10.80±0.06 mm respectively. The total length of the female specimen 49.65±2.87) is bigger than the male specimen (6.33±0.18) (Table 1). First pair of legs is the largest with 83.71±0.30 and the 3rd pair is the smallest with 39.70±0.31 mm (Table 2).

Adult males are distinctly almost ten times smaller than females (Fig 2j). The first and second pairs are less equal in length. The mean length and width of head is 2.14±0.09 and 1.59±0.06mm respectively. The mean length and width of abdomen is 3.80±0.06 and 1.51±0.06mm respectively (Table 1). First pair of legs is the largest with 8.43±0.31 and the 3rd pair is the smallest with 5.20±0.29 mm (Table 2).

Nephila pilipes, Fabricius (1793)

Adult females are distinctly larger than males (Fig 2k). The first pairs of legs are considerably longer than the 3rd pair. The mean length and width of head is 12.78±0.06 and 8.42±0.07 mm respectively. The mean length and width of abdomen is 34.53±2.37 and 12.10±0.07 mm respectively. The total length of the female specimen (50.19±2.35) is bigger than the male specimen (5.96±0.06) (Table 1). First pair of legs is the largest with 84.56±1.40 mm and the 3rd pair is the smallest with 40.49±0.37 mm (Table 2).

Adult males are distinctly almost ten times smaller than females (Fig 2l). The first and second pairs are

less equal in length. The mean length and width of head is 1.89±0.04 and 1.50±0.07mm respectively. The mean length and width of abdomen is 3.78±0.05 and 1.49±0.05 mm respectively (Table 1). First pair of legs is the largest with 9.32±0.21 and the 3rd pair is the smallest with 5.95±0.60 mm (Table 2).

Selenops radiatus, Latreille (1819)

Adult females are conspicuously larger with broad abdomen than males (Fig 2m). The first pairs of legs are considerably longer than female legs. The mean length and width of head is 6.10±0.06 and 5.00±0.09 mm respectively. The mean length and width of abdomen is 4.68±0.03 and 4.87±0.04 mm respectively. The total length of the female specimen (11.44±0.06) is bigger than the male specimen (9.44±0.36) (Table 1). First pair of legs is the smaller with 15.89±0.30 in comparison with 3rd pair measuring 20.06±0.35 mm (Table 2).

Adult males have lesser and tapered abdomen than females (Fig 2n). The first and second pairs are more or less equal in length. The mean length and width of head is 5.82±0.30 and 4.69±0.15 mm respectively. The mean length and width of abdomen is 3.17±0.05 and 2.96±0.06 mm respectively (Table 1). First pair of legs is the largest with 16.74±0.25 mm and the 3rd pair is the smallest with 20.03±1.67 mm (Table 2).

Eventhough spiders are tremendously copious throughout the Indian subcontinent from coastline to the high Himalayan range; our understanding of Indian spiders is extremely fragmentary. The spiders (*Crossopriza lyoni*, *Artema atlanta*, *Hersilia* sp., *Heteropoda* sp., *Nephila kuhli*, *Nephila pilipes* and *Selenops radiatus*) in the current study are open in habitat and nocturnal in feeding, prey catching behaviour (Nentwig and Wissel, 1986). The females of all the species studied had a higher mean total length compared to their male counter parts, indicating their hefty size. It is a common phenomenon among spiders (Foelix, 1996). The present findings are first of its kind from the study region. The largest spider species recorded during the study was *Nephila pilipes* and the smallest species documented was *Crossopriza lyoni*. The selection mechanisms in which dwarfism in spiders have evolved due to vagaries in adult life styles (Vollrath and Parker, 1992). The body size plays a significant role in the life history of an organism and the potential fitness in many ways (Roff, 2002). Also, the body size effects virtually all physiological (e.g., metabolic rate) and fitness traits (Blanckenhorn, 2000). Several constraints, from physiological processes to environmental pressures, cumulatively regulate body size and related morphological characters (Angilletta and Dunham, 2003). Most of these features may vary from one habitat to another habitat and as such geographic discrepancies in body size (Boggs and Freeman, 2005; Eichenberger et al., 2009). Body size is a phylogenetically conserved trait, also the distribution of large and small bodied species among habitats and also across altitude results from family sorting according to environmental conditions (Entling et al., 2007). The difference in relative leg lengths and absolute lengths of coxa to patella is a strongest pattern in the morphometry of spiders. The larger distribution ranges allow seasonal migration to dodge austere climatic conditions by ballooning which requires smaller body sizes (Cushman et al., 1993).

The influence of spatial heterogeneity, prey density and predatory behaviour of the tropical spiders plays a vivacious role in the different habitats and their surveillance (Rosenzweig, 1995). The current inventory will add to the prevailing knowledge of spiders and serve to provide a base for future investigation on the poorly studied spider fauna in the study area. The findings described in this study, concerning important morphological characteristics, authenticate the prominence of applying taxonomical studies in other species of spiders, which can reveal differential characters to improve taxonomic identification of taxa. The present study is a preliminary record from the expanse to aid in population ecology and cytological studies in future. This preliminary study revealed need of more extensive sampling spanning large geographical area followed by supplementary studies.

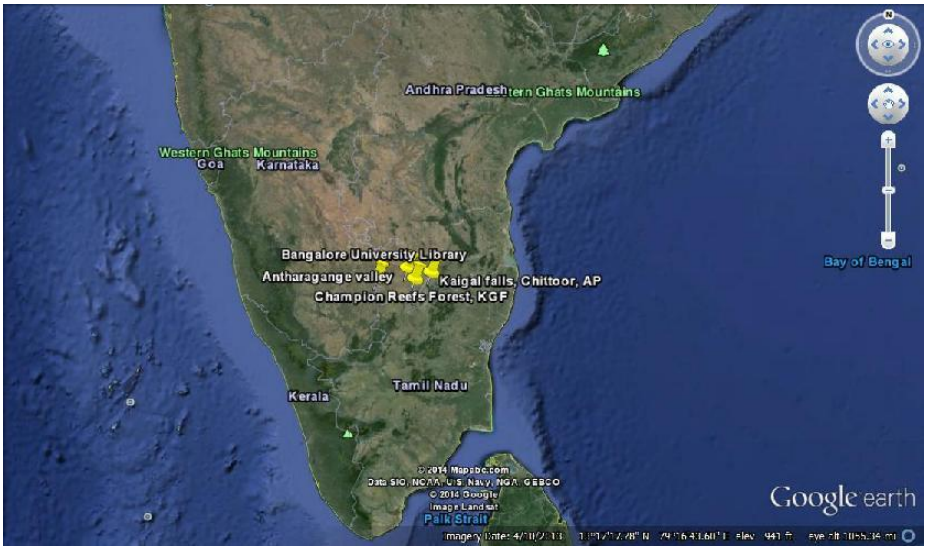

Figure 1. Map showing the geographical locations of specimen collection in South India.

Figure 2. Depictions of the spiders of the present study: a (♀) and b (♂)-*Crossopriza lyoni*; c (♀) and d (♂)-*Artema atlanta*; e (♀) and f(♂) - *Hersilia* sp.; g (♀) and h (♂) - *Heteropoda* sp; i (♀) and j (♂) - *Nephila pilipes* ; k (♀) and l(♂) - *Nephila kuhli*; m(♀) and n (♂) - *Selenops radiatus.*

Table 1. Details of the specimens collected from different geographical locations of South India.

Family	Species	Locations	Co-ordinates		Habitat	Distribution
Pholcidae	*Crossopriza lyoni*	JB Campus, Bangalore	12°56'48.47"N	77°30'29.87"E	Human habitations	Cosmopolitan
Pholcidae	*Artema atlanta*	JB Campus, Bangalore	12°56'48.47"N	77°30'29.87"E	Human habitations	Pantropical
Hersiliidae	*Hersilia* sp.	JB Campus, Bangalore	12°56'40.60"N	77°30'18.28"E	Tree trunks , walls	India, Myanmar, Philippines and Srilanka
Sparassidae	*Heteropoda* sp.	Kaigal Falls, Chittoor	13° 4'1.54"N	78°33'35.75"E	Houses and forest floor	India and Pantropical
Nephilidae	*Nephila pilipes*	Antharagange, Kolar	13° 8'33.75"N	78° 5'58.54"E	Deep forests	India to Sulawesi
Nephilidae	*Nephila kuhli*	Antharagange, Kolar	13° 8'33.75"N	78° 5'58.54"E	In and around forests	India, China, Phillippines to Australia
Selenopidae	*Selenops radiatus*	Antharagange, Kolar	13° 8'33.75"N	78° 5'58.54"E	Rock crevices, holes in old buildings	India

Table 2. Morphometric measurements (in mm) of head, abdomen and total length of the specimens.

Species	Sex	Head (Mean ± SD)		Chelicera	Palp	Abdomen (Mean ±SD)		Spinnerets	Total
		Length	Width			Length	Width		Length
Crossopriza lyoni	♂	1.92±0.06	2.25±0.16	0.33±0.03	1.17±0.02	3.15±0.02	2.34±0.05	0.17±0.02	5.24±0.03
	♀	1.95±0.03	2.33±0.03	0.35±0.03	0.55±0.03	4.53±0.13	3.46±0.11	0.23±0.02	6.71±0.13
Artema atlanta	♂	3.39±0.07	3.54±0.03	2.48±0.03	3.59±0.05	6.57±0.09	6.40±0.09	0.35±0.03	10.30±0.12
	♀	3.62±0.07	3.84±0.04	3.39±0.06	3.20±0.03	7.09±0.08	6.52±0.07	0.47±0.06	11.13±0.25
Hersilia sp.	♂	2.38±0.05	2.11±0.05	1.21±0.04	3.00±0.06	3.94±0.07	2.75±0.11	4.09±0.35	10.41±0.38
	♀	2.55±0.05	2.26±0.05	1.92±0.07	2.91±0.05	4.89±0.07	3.65±0.08	3.89±0.43	11.32±0.45
Heteropoda sp.	♂	4.82±0.06	6.20±0.08	2.41±0.06	8.28±0.03	6.07±0.04	5.48±0.07	0.65±0.03	11.55±0.06
	♀	5.11±0.04	5.20±0.08	2.88±0.05	7.30±0.07	9.31±0.06	7.59±0.06	0.78±0.06	15.20±0.07
Nephila pilipes	♂	1.89±0.04	1.50±0.07	0.69±0.06	2.19±0.04	3.78±0.05	1.49±0.05	0.30±0.05	5.96±0.06
	♀	12.78±0.06	8.42±0.07	9.89±0.05	14.08±0.04	34.53±2.37	12.10±0.07	2.88±0.05	50.19±2.35
Nephila kuhli	♂	2.14±0.09	1.59±0.06	0.81±0.06	2.38±0.07	3.80±0.06	1.51±0.06	0.40±0.07	6.33±0.18
	♀	12.09±0.05	8.23±0.05	9.80±0.06	13.80±0.06	35.24±2.90	10.80±0.06	2.32±0.05	49.65±2.87
Selenops radiatus	♂	5.82±0.30	4.69±0.15	1.80±0.05	4.36±0.14	3.17±0.05	2.96±0.06	0.56±0.05	9.44±0.36
	♀	6.10±0.06	5.00±0.09	1.75±0.06	3.58±0.06	4.68±0.03	4.87±0.04	0.67±0.01	11.44±0.06

Table 3. Morphometric measurements (in mm) of the legs of spiders.

Species	Sex		Legs							Total length of legs
		Leg length	Coxa	Trochanter	Fibia	Patella	Tibia	Metatarsus	Tarsus	
Crossopriza lyoni	♂	Leg 1	0.55±0.03	0.26±0.04	12.63±0.04	0.58±0.02	11.57±0.05	15.62±0.05	2.87±0.06	44.08±0.25
		Leg 2	0.33±0.03	0.16±0.03	8.98±0.04	0.43±0.04	7.63±0.22	10.66±0.03	2.05±0.03	30.23±0.32
		Leg 3	0.34±0.03	0.13±0.03	7.33±0.03	0.33±0.02	5.23±0.02	7.26±0.03	1.14±0.03	21.76±0.16
		Leg 4	0.29±0.02	0.16±0.02	8.79±0.02	0.57±0.03	6.57±0.03	9.81±0.06	1.82±0.02	28.0±20.19

	♀	Leg 1	0.45±0.04	0.24±0.03	14.84±0.05	0.85±0.04	14.27±0.06	19.36±0.03	3.45±0.05	53.45±0.24
		Leg 2	0.35±0.03	0.23±0.04	11.43±0.03	0.65±0.04	9.57±0.03	13.85±0.02	2.32±0.04	38.40±0.13
		Leg 3	0.35±0.02	0.19±0.02	8.86±0.02	0.51±0.01	7.05±0.01	9.87±0.03	1.07±0.01	27.89±2.20
		Leg 4	0.37±0.02	0.13±0.02	10.93±0.03	0.59±0.03	9.56±0.05	12.53±0.02	1.59±0.03	35.71±0.40
Artema atlanta	♂	Leg 1	0.98±0.08	0.43±0.03	11.48±0.04	1.63±0.03	10.95±0.03	19.67±0.04	3.67±0.03	48.80±0.25
		Leg 2	0.84±0.03	0.38±0.04	10.73±0.02	1.34±0.02	10.44±3.15	17.20±0.02	3.14±0.02	44.07±3.06
		Leg 3	0.76±0.04	0.22±0.06	9.74±0.04	0.98±0.04	9.23±0.03	13.31±0.04	2.24±0.07	36.48±.30
		Leg 4	0.83±0.02	0.41±0.03	11.06±0.06	1.42±0.04	9.95±0.03	18.03±0.07	3.18±0.07	44.88±0.31
	♀	Leg 1	1.54±0.03	0.49±0.04	15.73±0.04	1.65±0.03	16.75±0.04	24.78±0.04	4.45±0.04	65.38±0.26
		Leg 2	1.44±0.02	0.42±0.03	12.43±0.04	1.41±0.04	11.99±0.06	17.46±0.04	3.14±0.02	48.29±0.23
		Leg 3	1.38±0.04	0.32±0.03	11.43±0.05	1.10±0.03	10.28±0.08	14.85±0.06	2.46±0.05	41.83±0.30
		Leg 4	1.47±0.04	0.42±0.02	13.02±0.07	1.51±0.04	12.30±0.04	18.47±0.05	3.17±0.03	50.36±0.29
Hersilia sp	♂	Leg 1	0.65±0.03	0.33±0.03	9.34±0.03	0.67±0.02	8.86±0.04	7.96±0.04	4.06±0.05	31.86±0.25
		Leg 2	0.61±0.03	0.29±0.03	6.98±0.03	0.65±0.02	7.80±0.05	7.24±0.02	3.17±0.03	26.74±0.22
		Leg 3	0.45±0.03	0.16±0.04	2.32±0.13	0.23±0.03	2.34±0.04	2.36±0.46	1.26±0.04	9.12±0.25
		Leg 4	0.53±0.04	0.27±0.03	6.04±0.04	0.53±0.05	6.32±0.03	5.99±0.06	2.27±0.06	21.95±0.32
	♀	Leg 1	1.13±0.03	0.24±0.03	6.30±0.02	0.43±0.03	6.05±0.08	5.95±0.07	3.07±0.07	23.17±0.32
		Leg 2	0.76±0.04	0.19±0.04	5.98±0.05	0.32±0.05	5.54±0.07	5.17±0.05	2.88±0.06	20.85±0.34
		Leg 3	0.53±0.04	0.16±0.03	2.24±0.04	0.16±0.04	2.07±0.03	1.87±0.03	0.88±0.05	7.91±0.47
		Leg 4	0.94±0.06	0.43±0.03	4.94±0.06	0.38±0.05	5.55±0.06	4.88±0.06	1.87±0.05	18.97±0.35
Heteropoda sp.	♂	Leg 1	2.41±0.03	0.86±0.03	7.63±0.03	2.31±0.03	7.58±0.04	7.25±0.04	3.17±0.30	31.21±0.37
		Leg 2	2.20±0.05	0.66±0.04	7.85±0.04	0.98±0.04	8.45±0.04	7.76±0.04	2.74±0.04	30.63±0.29
		Leg 3	2.14±0.03	0.58±0.04	7.50±0.04	2.09±0.03	6.30±0.03	6.37±0.05	1.85±0.04	26.82±0.17
		Leg 4	2.20±0.02	0.62±0.02	6.35±0.20	2.10±0.02	6.29±1.25	8.22±0.02	2.57±0.03	29.66±1.24
	♀	Leg 1	1.52±0.03	0.62±0.03	6.51±0.14	1.87±0.03	4.93±0.03	3.83±0.03	1.86±0.03	21.14±0.31
		Leg 2	1.46±0.05	0.60±0.06	6.23±0.05	1.70±0.05	4.88±0.05	3.73±0.03	1.72±0.05	20.31±0.33
		Leg 3	1.29±0.04	0.39±0.04	5.09±0.04	1.53±0.04	4.13±0.06	3.17±0.04	1.40±0.04	17.00±0.28
		Leg 4	1.40±0.02	0.47±0.02	5.26±0.03	1.64±0.03	4.45±0.03	3.53±0.02	1.62±0.02	18.35±0.17

Table 3 continued……

Nephila pilipes	♂	Leg 1	0.57±0.03	0.17±0.03	2.42±0.03	0.70±0.03	2.27±0.03	2.60±0.03	0.60±0.03	9.32±0.21
		Leg 2	0.43±0.04	0.12±0.05	2.14±0.04	0.54±0.04	1.91±0.04	2.22±0.04	0.52±0.04	7.87±0.30
		Leg 3	0.24±0.04	0.06±0.04	1.89±0.03	0.34±0.04	1.43±0.42	1.76±0.04	0.23±0.03	5.95±0.60
		Leg 4	0.52±0.04	0.12±0.04	2.31±0.04	0.65±0.03	2.13±0.03	2.35±0.04	0.54±0.04	8.62±0.26
	♀	Leg 1	2.79±0.03	0.91±0.03	25.20±0.05	4.96±0.04	17.86±0.04	28.73±0.03	4.11±0.04	84.56±1.40
		Leg 2	3.20±0.04	0.85±0.04	19.35±0.04	4.18±0.05	12.68±0.04	21.20±0.05	3.57±.05	65.03±0.30
		Leg 3	3.02±0.04	0.63±0.05	11.57±0.04	2.59±0.12	7.46±0.05	12.15±0.05	3.08±0.04	40.49±0.37
		Leg 4	3.31±0.02	0.77±0.03	23.18±0.06	4.35±0.03	13.58±0.05	21.98±0.05	3.95±0.04	71.12±0.40
Nephila kuhli	♂	Leg 1	0.46±0.05	0.13±0.04	2.17±0.10	0.62±0.04	2.17±0.04	2.44±0.04	0.44±0.06	8.43±0.31
		Leg 2	0.32±0.05	0.08±0.04	2.12±0.04	0.43±0.04	1.78±0.04	2.08±0.04	0.32±0.05	7.13±0.30
		Leg 3	0.13±0.05	0.05±0.04	1.61±0.05	0.25±0.04	1.51±0.04	1.55±0.05	0.11±0.04	5.20±0.29
		Leg 4	3.25±0.04	0.81±0.04	24.33±0.05	4.91±0.04	17.78±0.05	28.60±0.06	4.04±0.05	8.56±0.17
	♀	Leg 1	3.25±0.04	0.80±0.04	24.33±0.05	4.91±0.04	17.78±0.04	28.61±0.07	4.04±0.04	83.71±0.30

		Leg 2	3.08±0.04	0.76±0.05	19.19±0.05	4.13±0.04	12.55±0.05	21.07±0.04	3.47±0.04	64.25±0.31
		Leg 3	2.88±0.05	0.52±0.05	11.42±0.04	2.49±0.05	7.38±0.05	12.04±0.04	2.98±0.05	39.70±0.31
		Leg 4	3.21±0.03	0.68±0.04	22.53±0.05	4.28±0.04	13.48±0.04	21.88±0.04	3.83±0.04	69.90±0.28
Selenops radiatus	♂	Leg 1	1.82±0.05	0.50±0.02	4.15±0.02	0.58±0.05	5.22±0.04	2.92±0.05	1.55±0.05	16.74±0.25
		Leg 2	1.84±0.05	0.62±0.05	4.27±0.04	0.62±0.04	5.55±0.04	3.31±0.03	1.75±0.04	17.96±0.57
		Leg 3	1.86±0.05	0.66±0.05	5.91±0.04	0.80±0.05	5.42±0.02	3.41±0.05	1.97±0.08	20.03±1.67
		Leg 4	1.81±0.05	0.68±0.08	5.23±0.04	0.72±0.04	5.88±0.02	3.37±0.03	1.88±0.04	19.56±0.46
	♀	Leg 1	1.62±0.05	0.43±0.07	4.04±0.05	0.53±0.04	5.00±0.04	2.80±0.05	1.47±0.04	15.89±0.30
		Leg 2	1.72±0.05	0.45±0.05	4.07±0.05	0.57±0.05	5.45±0.04	3.23±0.04	1.66±0.04	17.13±0.31
		Leg 3	1.77±0.06	0.63±0.05	5.81±0.04	0.77±0.04	5.92±0.05	3.31±0.04	1.85±0.08	20.06±0.35
		Leg 4	1.76±0.05	0.55±0.05	5.14±0.04	0.68±0.05	5.83±0.04	3.33±0.04	1.77±0.05	19.05±0.31

Conclusion

The present study envisages purely on the morphometry of spiders. Although, body size, altitude relationships of spiders are found to be variable, it cannot be ruled out that there are other environmental influences exclusively climatic variations also governing it. Morphometric analyses acts as an baseline data for analyzing the influence of mutation on shape, developmental changes in form, co-variance between ecological factors genetic constraints of shape and quantify an attribute of evolutionary implication. Keeping this in view an attempt was made to study the morphometrics for the spiders collected during the present study.

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