 ISSN 2278 - 1587

A CHECKLIST OF SPIDERS (ARACHNIDA: ARANEAE) OF WILDLIFE INSTITUTE OF INDIA CAMPUS, DEHRADUN, UTTARAKHAND, INDIA

Neha Gupta[1] and **Manju Siliwal** [2]
[1]University School of Environment Management, Guru Gobind Indraprastha University, Sector 16-C, Dwarka, New Delhi, India
[2]Wildlife Information Liaison Development Society, 9-A, Lal Bahadur Colony, Gopalnagar, Peelamedu, Coimbatore 641004, Tamil Nadu, India.
Corresponding author: Email: neha_11taurian@rediff.com, Telephone # : 011-22417462

ABSTRACT

In this paper a preliminary checklist of spiders of the Wildlife Institute of India (WII) campus at Chandrabani, Dehradun is provided based on a short duration study which was carried out in June-July 2009 to assess the spider diversity of the study area. A total of 102 species belonging to 78 genera and 23 families are reported with Salticidae, Araneidae and Thomisidae being the dominant families among all the reported families. Four new records of spider species for India were recorded during the study, viz., *Dipoenura fimbriata* Simon, 1909 (Theridiidae), *Molione triacantha* Thorell, 1892 (Theridiidae) and *Thwaitesia margaritifera* O. P.-Cambridge, 1881 (Theridiidae) and *Marengo crassipes* Peckham and Peckham, 1892 (Salticidae). We also provide taxonomic description for new record species.
Keywords: new records, Theridiidae, Salticidae, *Dipoenura*, *Marengo*, *Molione*, *Thwaitesia*.
Abbreviations: ALE = anterior lateral eye, AME = anterior median eye, F = female, M = male, MOQ = median ocular quadrate, MS = Manju Siliwal, NG= Neha Gupta, PLE = posterior lateral eye, PME = posterior median eye, PLS = posterior lateral spinnerets, PMS = posterior median spinnerets, WII= Wildlife Institute of India, WILD = Wildlife Information Liaison Development Society. Abbreviations used for hair and spines count are d = dorsal, fe = femur, mt = metatarsus, p = prolateral, pa = patella, r = retrolateral, ta = tarsus, ti = tibia, v = ventral.

INTRODUCTION

The order Araneae is the seventh most diverse animal order in the World with report of 42,751 spider species belonging to 3,859 genera (Platnick, 2012). Out of these, a total of 1,685 species of spiders belonging to 438 genera and 60 families have been documented from India (Keswani *et al.* 2012; Platnick, 2012). Looking at the biogeography and area of the country, this number is much under-estimated; it is mainly because of lack of studies in most of the areas. One of the poorly studied states for spider research is Uttarakhand, till date only 38 species belonging to 20 genera and 4 families have been recorded from Uttarakhand (Tikader, 1980; Tikader and Malhotra, 1980; Tikader, 1982a; 1982b). Therefore, as a part of summer training program in June-July 2009 (by NG), the WII Campus, Dehradun was selected to initiate spider studies in the Uttarakhand. The WII campus

supports diverse habitat like wetland, scrubland, sal forest, flower beds, and human habitations, which provides habitat for different spiders. The only known report of spiders of WII is by Uniyal and Hore (2006), who reported 17 species of spiders belonging to 16 genera and 6 families. Therefore, a survey was carried out to prepare a preliminary checklist of spiders of the WII Campus, Dehardun. This study will enhance the existing biodiversity database of the region and will also provide reference data for study in future years.

METHODS

The study was executed in three main steps, survey and collection, preservation followed by identification of spider specimens. The collections were made during early morning hours (6 hours to 9 hours) and day time (16 hours to 18 hours), from different parts of the campus, including the 1.5 kilometers nature's trail along the lake, nursery area, and hostel and faculty quarter area, flower beds and the campus compound. The spider species were collected from their webs (constructed between vegetations/on ground), leaf litter, vegetation, walls, etc. Spiders from webs were collected by placing a plastic tube or collection vial below them, as they tend to drop on the ground when disturbed. Spiders hidden in the foliage were collected by gently shaking the branches; by doing so, they usually hang in air on a single strand of silk and it was easy to collect them in that state. Random and active searching involved thorough examination of all probable microhabitats, like, rolled or folded leaves, flowers, plant stems, adhered leaves and under surface of leaves, leaf litter, tree trunks, rock surface, grass blades, burrow on bunds, etc. Wandering spiders that were running on vegetation and grasses, in leaf litter and ground were chased in the collection vials. Some spiders occurring in human dwellings were collected from house walls and corners of rooms, by chasing the spider into a dry plastic tube or collection vial.

The collected specimens were sorted, preserved and identified in the laboratory. Each spider was identified mainly on the basis of morphological characteristics, like eye arrangement, cephalothorax and abdominal pattern and epigyne or palp structure. The details of body parts of specimens were examined in 95% ethanol under a Motic™ K-400 stereomicroscope. Different taxonomic keys (Tikader, 1980; Tikader and Malhotra, 1980; Tikader, 1982a; 1982b), literature (Tikader, 1987; Barrion and Litsinger, 1995; Sebastian and Peter, 2009), as well as on-line pictorial indexes (Proszynski, 2006) were used for identification. Spermathecae were dissected using a sharp entomological needle and transferred to concentrated lactic acid in 100°C water bath for 15 to 20 minutes in order to clear the non-chitinous tissues. A temporary mount of the cleared section was then prepared and observed. Illustrations were prepared with the help of a camera lucida attached to a MOTIC™ and Labomed™ CSM2 stereomicroscopes by MS. All measurements were made with a calibrated ocular micrometer and are in millimeters.

The temperature and humidity levels were noted for each day during the study. The recorded average maximum temperature for the month was 36.67°C

and average minimum temperature was 22.32°C. Total rainfall for the month was low, only 100.2 mm and average humidity was 66.35%.

RESULTS AND DISCUSSION

A total of 102 species (Table 5) belonging to 78 genera and 23 families were recorded from the study area. These are the results of a quick survey restricted to two months (June-July, 2009). Among all these 23 families, high diversity was observed in families Salticidae (48 species), Araneidae (17 species) and Thomisidae (11 species). Their dominance in the collection material may be due to biases in collection, as foliage dwelling spiders on or amongst vegetation were very easy to notice than those which were hiding in the crevices or amongst the leaf litter.

Four interesting spiders, *viz*., *Dipoenura fimbriata Simon, 1909, Marengo crassipes* Peckham and Peckham, 1892, *Molione triacantha Thorell 1892* and *Thwaitesia margaritifera* O. P.-Cambridge, 1881 were recorded during the present study from WII campus. Three of the species except for *Marengo crassipes* belong to the comb-footed spider family Theridiidae, whereas *M. crassipes* belong to the jumping spider family Salticidae. All the four species have not been previously reported from India. The species *D. fimbriata* was previously reported from Vietnam, Krakatau. Whereas, *M. triacantha* was reported from Laos, Malaysia, Singapore, Taiwan; *T. margaritifera* was reported from Sri Lanka, China and Vietnam; *M. crassipes* Peckham and Peckham, 1892 was only reported from Sri Lanka (Platnick 2012). Theridiids reported here are small spiders found in tangled web constructed amongst vegetations, and therefore, remain unnoticed until a systematic sampling is carried out in an area. Therefore, herewith we report their occurrence in India and also provide additional taxonomic characters for all these four species, which will help in future comparative taxonomic studies as well as confirmation of the species.

Other interesting species of spiders collected during the study were an *Oxyopes sp*. and two *Bomis spp*. It is likely that these are new to science but more taxonomic work needs to be carried out to confirm these species and it will be published in separate publication.

The present study was carried out for a short duration with restricted time frame but still found some interesting records of spiders. Further, if systematic surveys are carried out throughout different seasons of a year then many more new records and species new to science are expected. Also, long surveys are good to understand overall species diversity of the region as well as seasonal variations in spider abundance, which otherwise cannot be detected by short term results, such as shown here.

TAXONOMY

1. *Dipoenura fimbriata* Simon, 1909 (Figures 1A-F)

Material Examined: 2 females collected from WII campus, Dehradun, Uttarakhand, India, 12 June 2009, coll. N. Gupta, WILD-09-ARA-1094; WII campus, Dehradun, 6 September 2009, coll. M. Siliwal, WILD-09-ARA-1095.

Description: Total length 2.10. Carapace length 0.80, width 0.74. Abdomen length 1.30, width 1.04, 1.53 high (length and height inclusive of spines). Morphometry of legs and palp is given in Table 1.

Carapace (Figs. 1A-B): Reddish-brown, wider posteriorly; anteriorly moderately high and gradually sloping posteriorly, caput not raised; spines absent; fovea absent, slight depression in the foveal area.

Eyes (Fig. 1A): Eight in two rows, all transparent except PME, opaque, on low tubercles; anterior row recurved; posterior row straight. Ocular group 0.24 long and 0.46 wide; MOQ, slightly wider in front. Clypeus reddish-brown, glabrous, 0.17 high. Median eyes sub-equal and lateral eyes sub-equal; diameters ratio AME: ALE: PME: PLE = 4.5: 3: 4.5: 3; distance between AME-AME equals diameter of AME, PME-PME half diameter of PLE, PME-PLE equals diameter of PLE, AME-ALE 1/3rd diameter of PLE, ALE-PLE adjacent.

Sternum (Fig. 1D): Reddish-brown, rough, hair absent; 0.09 long, 0.09 wide. *Chelicerae*: Reddish-brown with light brown fangs, one promarginal tooth. *Labium* (Fig. 1D): Reddish brown; wider (0.23) than long (0.07). *Maxillae* (Fig. 1D): Reddish-brown with anterior edge lighter.

Leg: Coxae base seen from dorsal side, greenish-brown with 2-3 black annulates on fe, ti and mt, and faint annulates on ta; leg formula 1=423. *Claws:* Paired with single tooth, inferior claw present on all legs, almost the length of paired claws.

Palp: Greenish-brown, single curved claw without teeth.

Abdomen (Figs. 1A-C): Greenish-brown with blackish patch dorsal and mottled with white and black spots on dorsal and dorsolateral sides, tubercles black with two white patches at the base of posterior tubercles; ventral, greenish-brown with two parallel lines of white spots running between epigastral furrow and spinnerets; higher than long, four tubercles on the posterior end, uniformly covered with small black and pallid hairs.

Spinnerets: Three pairs, situated towards posterior end. Colulus absent.

Epigynum: Ventral, epigastral plate with round opening with an internal vertical septum dividing it into two round openings. Internal epigynum, two large oval spermathecae with copulatory ducts at its posterior end along with fertilization ducts and copulatory ducts broader and darker in the anterior half and later narrows down to tubes and opens into two round openings ventrally; fertilization duct, small on posterior prolateral side of spermatheca.

Distribution: India (present record), Krakatau, Vietnam

2. *Molione triacantha* Thorell, 1892 (Figures 2A-E)

Material Examined: Female collected from WII campus, Dehradun, Uttarakhand, India, 12 June 2009, coll. N. Gupta, WILD-09-ARA-1096.

Description: Total length 2.10. Carapace length 0.80, width 0.74. Abdomen length 1.30, width 1.04, 1.53 high (length and height inclusive of spines). Morphometry of legs and palp is given in Table 2.

Carapace (Figs. 2A): Round, reddish-brown; caput lighter than rest of the carapace, moderately raised, gradually sloping posteriorly; spines absent; fovea absent, slight depression in the foveal area.

Eyes (Fig. 2A): Eight in two rows, transparent eyes except PME and PLE, opaque, on low tubercles; anterior row recurved; posterior row straight. Ocular group 0.19 long and 0.39 wide; MOQ square. Clypeus reddish-brown, glabrous, 0.17 high. All eyes sub-equal; diameters ratio AME: ALE: PME: PLE = 7.5: 6.5: 7.5: 6.0; distance between AME-AME = PME-PME which is half the diameter of PLE, PME-PLE equals diameter of PLE, AME-ALE is 1/3rd diameter of PLE, ALE-PLE adjacent.

Sternum (Fig. 2C): Reddish-brown, glabrous; 0.53 long, 0.46 wide. *Chelicerae:* Reddish-brown with light brown fangs, two promarginal teeth. *Labium (Fig. 2C):* Brownish; wider (0.18) than long (0.08). *Maxillae (Fig. 2C):* Brownish with anterior edge lighter.

Leg: Coxal base seen from dorsal side, greenish-brown; leg formula 1423. *Claws:* Paired with single tooth, inferior claw present on all legs, almost the length of paired claws.

Palp: Greenish-brown, single curved claw without teeth.

Abdomen (Figs. 2A-C): Greenish-brown with dark brown patch before anterior spines and mottled with white and black spots on lateral and ventral sides; longer than wide, slightly overlapping carapace, three large sclerotized spines on posterior half of dorsum, two on the lateral side in center and one on posterior end; covered with black hairs; ventral epigastral area with a sclerotized plate covering round booklungs, and a small sclerotized patch on either side of epigastral plate.

Spinnerets: Three pairs, a sclerotized ring present around the spinnerets, situated towards posterior end (Fig. 2C). Colulus absent.

Epigynum: Ventral, sclerotized epigastral plate with two black spots (spermathecae impressions) with sickle shape extension on posterior retrolateral sides. Internal epigynum consists of large round spermathecae with long copulatory ducts running behind the spermathecae, ducts forms a loop above spermathecae and on reaching posteriorly bends again and goes up on either side of spermathecae to open ventrally in sickle shape openings; small fertilization duct on posterior prolaterial ends.

Distribution: India (present record), Malaysia, Singapore, Taiwan

3. *Thwaitesia margaritifera* O.P.-Cambridge, 1881 (Figures 3A-G)

Material Examined: One male collected from WII campus, Dehradun, Uttarakhand, India, 20 July 2009, coll. N. Gupta, WILD-09-ARA-1097; one female collected from WII campus, Dehradun, 20 July 2009, coll. N. Gupta, WILD-09-ARA-1098.

Table-1, Morphometry of legs and palp of female (WILD-10-ARA-1094) *Dipoenura fibriata* from Dehradun, Uttarakhand

	Leg I	Leg II	Leg III	Leg IV	Palp
Fe	0.98	0.80	0.48	0.98	0.26
Pa	0.33	0.30	0.26	0.33	0.11
Ti	0.63	0.39	0.33	0.63	0.13
Mt	0.63	0.43	0.39	0.63	-
Ta	0.35	0.30	0.28	0.35	0.22
Total	2.91	2.24	1.74	2.91	0.72

Table-2, Morphometry of legs and palp of female (WILD-10-ARA-1096) *Molione tricantha* from Dehradun, Uttarakhand

	Leg I	Leg II	Leg III	Leg IV	Palp
Fe	1.07	0.91	0.74	1.04	0.22
Pa	0.33	0.26	0.26	0.30	0.11
Ti	0.80	0.52	0.39	0.67	0.09
Mt	0.54	0.46	0.35	0.50	0.00
Ta	0.35	0.33	0.28	0.33	0.24
Total	3.09	2.48	2.02	2.85	0.65

Table-3, Morphometry of legs and palp of male (WILD-10-ARA-1097) and female (WILD-10-ARA-1098) *Thwaitesia margaritifera* from Dehradun, Uttarakhand

	Leg I		Leg II		Leg III		Leg IV		Palp	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Fe	3.41	3.95	2.05	2.27	1.55	1.50	3.09	3.41	2.50	0.50
Pa	0.55	0.82	0.55	0.73	0.45	0.59	0.55	0.73	1.18	0.18
Ti	3.23	2.82	1.77	1.59	1.09	1.05	2.73	2.50	0.59	0.36
Mt	4.68	4.27	2.27	2.14	1.50	1.59	3.86	3.86	0.00	0.00
Ta	1.14	1.09	0.77	0.82	0.55	0.73	1.00	0.91	1.73	0.55
Total	13.00	12.95	7.41	7.55	5.14	5.45	11.23	11.41	6.00	1.59

Table-4, Morphometry of legs and palp of male (WILD-11-ARA-1115) *Marengo crassipes* Peckham and Peckham, 1892 from Dehradun, Uttarakhand

	Leg I	Leg II	Leg III	Leg IV	Palp
Fe	0.96	0.51	0.38	0.56	0.59
Pa	0.50	0.34	0.29	0.38	0.23
Ti	0.72	0.32	0.27	0.47	0.14
Mt	0.55	0.35	0.31	0.42	0.00
Ta	0.29	0.21	0.19	0.22	0.45
Total	3.03	1.74	1.44	2.06	1.42

Table 5. List of spider species found from WII campus, Dehradun.

FAMILY	SCIENTIFIC NAME	SEX	COLLECTION SITE	MICROHABITAT	REMARKS
Araneidae	*Araneus mitificus* (Simon, 1886)	F	Area between office garde n and tennis court	vegetation	
Araneidae	*Argiope aemula* (Walckenaer, 1842)	M	Nature Trail	web	
Araneidae	*Argiope anasuja* Thorell, 1887	F	Nature Trail	web	
Araneidae	*Argiope pulchella* Thorell, 1881	F	Nature Trail	web	
Araneidae	*Cyclosa bifida* (Doleschall, 1859)	F	Nature Trail	vegetation	
Araneidae	*Cyrtarachne cf. raniceps Pocock,1900*	F	Nature Trail	on leaf	
Araneidae	*Eriovixia laglaizei* (Simon, 1877)	F	Nature Trail	vegetation	
Araneidae	*Eriovixia poonaensis* (Tikader & Bal, 1981)	F	Nature Trail	vegetation	
Araneidae	*Gea* sp.	F	House garden	vegetation	
Araneidae	*Larinia* sp.	J	Nature Trail	vegetation	
Araneidae	*Neoscona cf. chrysanthusi* Tikader & Bal, 1981	F	Nature Trail	web	
Araneidae	*Neoscona bengalensis* Tikader & Bal, 1981	F	Nature Trail	web	
Araneidae	*Neoscona cf. sinhagadensis* (Tikader, 1975)	F	House garden	vegetation	
Araneidae	*Neoscona nautica* (L. Koch, 1875)	F	Nature Trail	vegetation	
Araneidae	*Neoscona theisi* (Walckenaer, 1842)	M	Nursery, Trail	vegetation	
Araneidae	*Neoscona vigilans (Blackwall, 1865)*	M	Nature Trail	vegetation	
Araneidae	*Parawixia dehaanii* (Doleschall, 1859)	F	Nature Trail	web	

FAMILY	SCIENTIFIC NAME	SEX	COLLECTION SITE	MICROHABITAT	REMARKS
Clubionidae	*Castianera* sp.	F	Residential garden	ground	
Clubionidae	*Clubiona sp.*	SAM	Nature Trail	vegetation	
Dictyanidae	*Dictyna sp.*	F,SAM	Nursery, Nature Trail	vegetation	
Filistatidae	*Pritha* sp.	F	House	walls	
Hersilidae	*Hersilia cf. savignyi Lucas, 1836*	SAF	Nature Trail	vegetation	
Linyphiidae	*Linypha sp.*	SAF	Nature Trail	vegetation	
Linyphiidae	*Neriene sundaica* (Simon, 1905)	M, F	Nature Trail, Residential garden	vegetation	
Linyphiidae	*unidentified*	M	Nature Trail	vegetation	
Lycosidae	*Pardosa birmanica* Simon, 1884	M	Nature Trail	ground	
Lycosidae	*Pardosa songosa* Tikader & Malhotra, 1976	F	Nature Trail	ground	
Lycosidae	*Arctosa sp.*	F	Nature Trail	ground	
Miturgidae	*Cheracanthium* sp.	F	Residential garden	vegetation	
Nephilidae	*Nephila pilipes* (Fabricius, 1793)	F	Nature Trail	web	
Oecobiidae	*Oecobius sp.*	M, F, J	House	walls	
Oxyopidae	*Oxyopes javanus*	F	Residential garden	vegetation	new species
Oxyopidae	*Oxyopes shweta* Tikader, 1970	M	Nature Trail	on leaf	
Oxyopidae	*Oxyopes sp 1*	J	Nursery, Trail, Area between office garden and tennis court,	vegetation	new species
Oxyopidae	*Oxyopes sp. 2*	M, F, J	Nursery, Nature Trail	vegetation	new species
Oxyopidae	*Peucetia viridana* (Stoliczka, 1869)	F	Nature Trail	vegetation	
Philodromidae	*Monaeses* sp.	M	Residential garden	vegetation	
Philodromidae	*Tibellus elongatus* Tikader, 1960	F	Nature Trail	on leaf	
Pholcidae	*Artema atlanta* Walckenaer, 1837	F	New hostel	walls	

FAMILY	SCIENTIFIC NAME	SEX	COLLECTION SITE	MICROHABITAT	REMARKS
Pholcidae	*Crossopriza lyoni* (Blackwall, 1867)	F	Nature Trail	vegetation	
Pholcidae	*Phlocus sp.*	F	New hostel	walls	
Pisauridae	*Perenethis cf. vennsta*	F	Residential garden	vegetation	
Pisauridae	*Perenethis dentifasciata* (O. P.-Cambridge,1885)	F	Residential area	on leaf	
Pisauridae	*Pisaura gita*	F	Residential garden	vegetation	
Pisauridae	*Pisaura sp.*	J	Nature Trail	vegetation, walls, tree trunks	
Psecheridae	*Psechrus cf. torvus* (O.P.-Cambridge, 1869)	F	Nature Trail, New hostel	tree hole, wall	
Salticidae	*Asemonea tenuipes* (O.P.-Cambridge, 1869)	M, F	Nature Trail	vegetation	
Salticidae	*Bianor sp.*	J	Nature Trail	vegetation	
Salticidae	*Brettus anchorum* Wanless, 1979	M, F	Nature Trail, Residential garden	vegetation	
Salticidae	*Chrysilla versicolor* (C. L. Koch, 1846)	M	Nature Trail	foliage	
Salticidae	*Epeus indicus* Prószyn'ski, 1992	M, F	Nature Trail	vegetation	
Salticidae	*Epocilla aurantiaca* (Simon, 1885)	F	Nature Trail	on leaf	
Salticidae	*Evarcha pococki* Zabka, 1985	F	Nature Trail	under leaf	
Salticidae	*Hasarius adansoni* (Audouin, 1826)	M	Nature Trail	vegetation	
Salticidae	*Marengo crassipes* Peckham and Peckham, 1892	M	Residential garden	vegetation	New record for india
Salticidae	*Menemerus bivittatus* (Dufour, 1831)	F	Nature Trail	on leaf	
Salticidae	*Menemerus sp.*	SAF	Nature Trail	vegetation	
Salticidae	*Myrmarachne sp.*	J	Nature Trail	vegetation	

FAMILY	SCIENTIFIC NAME	SEX	COLLECTION SITE	MICROHABITAT	REMARKS
Salticidae	*Onomastus sp.*	M, F, J	Nature Trail	vegetation	
Salticidae	*Pancorius sp.*	J	Nature Trail	on leaf	
Salticidae	*Phintella vittata (C.L. Koch, 1846)*	F	Nature Trail	vegetation	
Salticidae	*Plexipppus sp.*	J	Nature Trail	vegetation	
Salticidae	*Plexippus paykulli* (Audouin, 1826)	M	Nature Trail	vegetation	
Salticidae	*Portia* sp.	M	House	walls	
Salticidae	*Rhene flavicomans* Simon, 1902	M	Nursery, Nature Trail	vegetation	
Salticidae	*Rhene rubigera*	M, F	Residential garden	vegetation	
Salticidae	*Telamonia dimidiata* (Simon, 1899)	F	Nature Trail	vegetation	
Salticidae	*Thiania bhamoensis* Thorell, 1887	M, F	Nature Trail	on leaf	
Salticidae	*Thyene sp.*	J	Nature Trail	on leaf	
Sparassidae	*Heteropoda sp.*	J	House	walls	
Sparassidae	*Olios milleti* (Pocock, 1901)	SAF	Nursery	vegetation	
Tetragnathidae	*Leucauge* cf. *parangsc ipinia Barrion & Litsinger, 1995*	M	Nature Trail	vegetation	
Tetragnathidae	*Leucauge decorata* (Blackwall, 1864)	M	Nature Trail	vegetation	
Tetragnathidae	*Opadometa fastigata (Simon, 1877)*	F	Nature Trail	web	
Tetragnathidae	*Tetragnatha mandibulata* Walckenaer, 1842	M	Nature Trail	vegetation	
Tetragnathidae	*Tetragnatha maxillosa* Thorell, 1895	M	Nature Trail	vegetation	
Tetragnathidae	*Tetragnatha sp 1.*	J	Nature Trail	vegetation	
Tetragnathidae	*Tetragnatha sp.2*	M	Nature Trail	vegetation	
Theraphosidae	*Haplocosmia himalayana* (Pocock, 1899)	J	Nature Trail	inside its burrow on bund	
Theridiidae	*Theridion* sp.	F	Nature Trail	vegetation	
Theridiidae	*Thwaitesia margaritifera* O.P.-Cambridge, 1881	M, F	Nature Trail	on leaf	New record for India

FAMILY	SCIENTIFIC NAME	SEX	COLLECTION SITE	MICROHABITAT	REMARKS
Theridiidae	*Achaearanea sp.*	J	Nursery	vegetation	
Theridiidae	*Chrysso nigriceps* Keyserling, 1884	F	Nature Trail	vegetation	
Theridiidae	*Chrysso sp.*	SAM	Nature Trail	vegetation	
Theridiidae	*Dipoenura fimbriata* Simon, 1909	F	Nature Trail	vegetation	First record of genus and species in India
Theridiidae	*Molione triacantha* Thorell, 1892	F	Nature Trail	vegetation	First record of genus and species for India
Theridiidae	*Theridion sp.*	J	Nature Trail	vegetation	
Thomisidae	*Amyciaea forticeps* (O.P.-Cambridge, 1873)		Nature Trail	on leaf	
Thomisidae	*Bomis sp.*	F, J	Nature Trail	vegetation	new species
Thomisidae	*Camaricus formosus* Thorell, 1887	M	Nursery, Trail,	Area between office garden and tennis court vegetation	
Thomisidae	*Massuria roonwali* (Basu, 1964)	F	Nature Trail	vegetation	
Thomisidae	*Misumena sp.*	SAM,SAF	Nature Trail,	vegetation	
Thomisidae	*Oxytate elongata* (Tikader, 1980)	M	Nature Trail	vegetation	
Thomisidae	*Pistius bhadurii* Basu, 1965	F	Nature Trail	vegetation	
Thomisidae	*Runcinia affinis* Simon, 1897	SAM, SAF	Nature Trail	vegetation	
Thomisidae	*Thomisus lobosus* Tikader, 1965	F	Nature Trail	vegetation	
Thomisidae	*Xysticus minutus* Tikader, 1960	M,F	Nature Trail	vegetation	
Thomisidae	*Xysticus sp.*	F	Nature Trail	vegetation	new species
Uloborbdiae	*Miagrammopes* sp.	M	Residential garden	vegetation	
Uloborbdiae	*Uloborus danolius Tikader, 1969*	F	Nature Trail	vegetation	
Uloborbdiae	*Uoborus sp.*	F	Nature Trail	vegetation	
Zoradiidae	*Hermippus* sp.	M	Nature Trail	ground	

Description: *Male*: Total length 3.13mm. Carapace length 1.36 mm, width 1.27 mm. Abdomen length 1.77mm, width 1.19mm, height 1.59. Morphometry of legs and palp is given in Table 1.

Carapace (Fig. 3A): Creamish except for caput (including ocular area) brown, narrow faint patch on lateral sides in thoracic area; longer than wide, thoracic area broader than cephalic area, fovea absent but 'U'-shape large depression present, caput high with ocular area raised sloping posteriorly, spines absent, few small pallid hair on posterior caput before foveal depression, rest of carapace glabrous.

Eyes (Fig. 3A): Eight, transparent except for posterior eyes, opaque; ALE, PME, PLE on low tubercles; ALE, PME and PLE forming a group. Ocular group 0.33 long and 0.52 wide; MOQ wider in front than behind. Clypeus creamish, glabrous, 0.39 high. AME largest; diameters ratio, AME: ALE: PME: PLE = 3: 1: 1.5: 2; distance between AME-AME equals diameter of ALE, PME-PME equals diameter of AME, AME-ALE, PME-PLE and PLE-ALE adjacent.

Sternum: Creamish except for distal ¼ brown, glabrous; as broad as long, 0.77. *Chelicerae*: Creamish with fangs brown. *Labium*: Brown; 0.41 wide, 0.32 long. *Maxillae*: Brown.

Leg: Coxae base seen from dorsal side; creamish with black annulations on the distal end of femorae, tibiae, metatarsi and tarsi; annulates with long black spines and hairs; glabrous except for few brown hairs and spines concentrated in the area of black annulates and long black spines on distal end of femorae, for length on patella and tibiae, rest covered with pallid hairs; paired claws with two unequal teeth, inferior claw long (almost length of paired claw) and present on all legs; leg formula 1423.

Palp (Fig. 3D): Embolus on ventral side pointing clockwise on left side of palp; conductor small; tegular apophysis bifurcated.

Abdomen (Figs. 3A-B): Oval with tubercle on posterior end; cream with black 'arrow-shape' marking surrounded with light golden-yellow patch, silver irregular shape spots on dorsal and lateral sides, black spot on tubercle; ventral creamish, 2-3 small silver spots in the center extending from lateral spots; longer than wide and high; covered with small brown and pallid hairs.

Spinnerets (Fig. 3C): Three pairs, creamish, covered with pallid hair and spigots. Colulus replaced by two setae.

Female: Total length 3.64. Cephalothorax 1.59 long, 1.41 wide. Abdomen 2.05 long, 3.45 wide and 3.91 high. Morphometry of legs and palp is given in Table 1.

Cephalothorax: Circular, creamish with a faint brown band between ocular area and foveal area mid-dorsal caput, glabrous, fovea absent but depression with black inverted longish triangular patch. Ocular area high, gradually sloping posteriorly. Spines absent.

Eyes: Eight, transparent except PME and PLE, opaque; PME, PLE and ALE on low tubercles in two rows; anterior row recurved; posterior row slightly recurved. ALE, PME and PLE form a group. Ocular group 0.29 long and 0.52 wide; MOQ wider in front than behind. Clypeus creamish, glabrous, 0.33 high. Diameters ratio, AME : ALE : PME : PLE = 5.5 : 5.5 : 5.0 : 5.0; all eyes sub-equal; distance between AME-AME half diameter of ALE, PME-PME equals diameter of PLE, AME-ALE, PME-PLE and PLE-ALE adjacent.

Sternum: Creamish, glabrous; 0.98 long, 0.80 wide. *Chelicerae*: Creamish with fangs brown. *Labium*: Brown; as long as wide, 0.26. *Maxillae*: Cream with anterior edge brown.

Legs: Like male with annulations more lighter than male.

Abdomen: Creamish, silver irregular shape spots on dorsal and lateral sides, small black spot on tubercle; ventral creamish except at the base of spinnerets light brown patch, a row of small silver spots below epigastral furrow extending from lateral sides; longer than in male, triangular with tubercle on posterior end; higher than long and wide; covered with small brown and pallid hairs. Rest like male.

Epigynum (Figs. 3E-G): Ventral, round protrusion with scape like (inverted v-shape) structure with black patch on either side of protrusion. Internal epigynum consists of two oval spermathecae with copulatory ducts coiled twice on spermathecae and ventrally opening in the scape like protrusion; small fertilization tube on the posterior prolateral sides of spermathecae.

Distribution: China, India (present record), Sri Lanka, Vietnam

4. *Marengo crassipes* Peckham and Peckham, 1892 (Figures 4A-E)

Material Examined: One male collected from WII campus, Dehradun, Uttarakhand, India, 9 June 2009, coll. M. Siliwal, WILD-09-ARA-1115.

Description: Total length 3.8. Carapace 1.91 long, 1.34 wide. Abdomen 1.89 long, 1.24 wide. Morphometry of legs and palp is given in Table 4.

Carapace (Fig. 4A): Brownish-black, except for caput (between ocular area) lighter brown patch extending till middle of carapace; longer than wide, fovea absent, covered uniformly with small short brown hair with pallid tips.

Eyes (Fig. 4A): Eight in three rows. AME and ALE situated in straight line in front of carapace. Ocular group 1.0 front width, 1.19 back width, 0.85 long; MOQ wider in behind than front. Clypeus brown, 0.16 high. AME largest; diameter AME 0.32, ALE 0.15, PME 0.05, PLE 0.13; distance between PME-PME 2.8 times diameter of AME, PLE-PLE 3 times diameter of AME, ALE-PME 2.19 times diameter of PME, AME-AME and AME-ALE adjacent.

Sternum: Yellowish-brown, covered with small brown hairs; 0.68 long, 0.49 wide. *Chelicerae*: Blackish with fangs black. *Labium*: Brown; 0.17 wide, 0.09 long. *Maxillae*: Brown; 0.25 long, 0.22 wide.

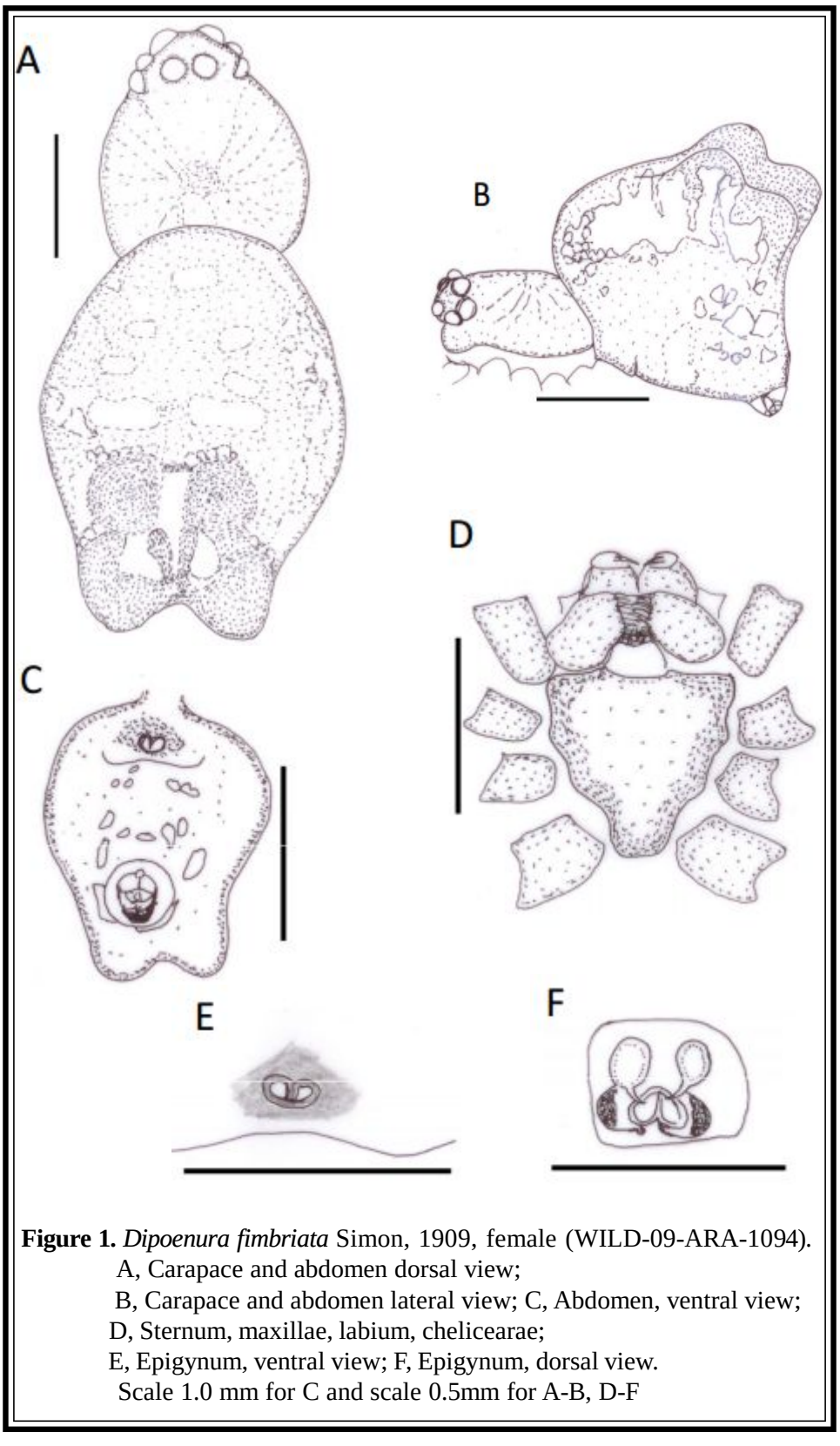

Figure 1. *Dipoenura fimbriata* Simon, 1909, female (WILD-09-ARA-1094).
A, Carapace and abdomen dorsal view;
B, Carapace and abdomen lateral view; C, Abdomen, ventral view;
D, Sternum, maxillae, labium, chelicerae;
E, Epigynum, ventral view; F, Epigynum, dorsal view.
Scale 1.0 mm for C and scale 0.5mm for A-B, D-F

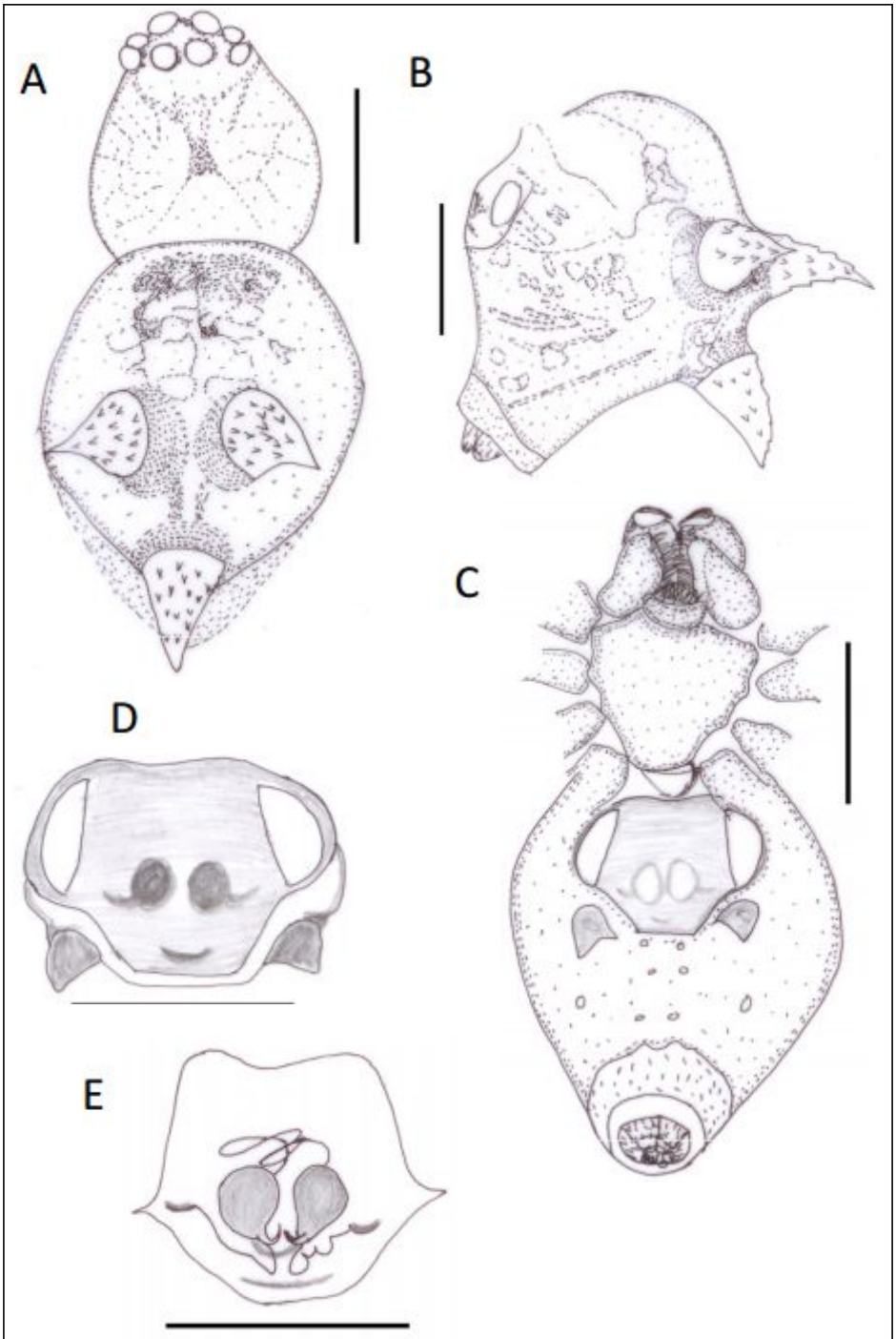

Figure 2. *Molione triacantha* Thorell, 1892, female (WILD-09-ARA-1096).
A, Cephalothorax and abdomen, dorsal view;
B.Abdomen, lateral view;
C, Sternum, maxillae, labium and chelicerae, abdomen, ventral view;
D, Epigynum, ventral view; E, Epigynum, dorsal view.
Scale 1.0mm for A, C and scale 0.5mm for B, D-E.

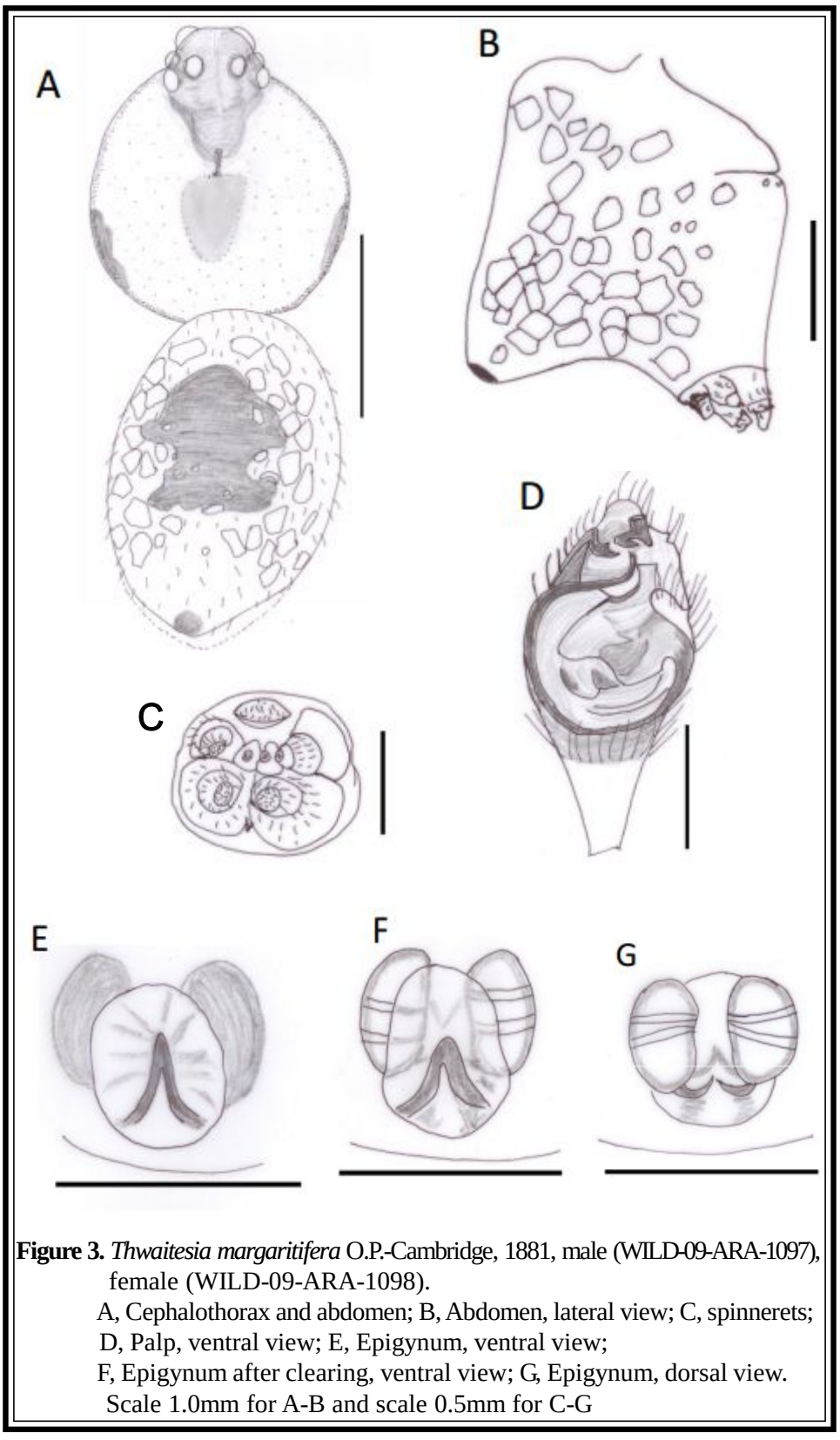

Figure 3. *Thwaitesia margaritifera* O.P.-Cambridge, 1881, male (WILD-09-ARA-1097), female (WILD-09-ARA-1098).
A, Cephalothorax and abdomen; B, Abdomen, lateral view; C, spinnerets; D, Palp, ventral view; E, Epigynum, ventral view; F, Epigynum after clearing, ventral view; G, Epigynum, dorsal view. Scale 1.0mm for A-B and scale 0.5mm for C-G

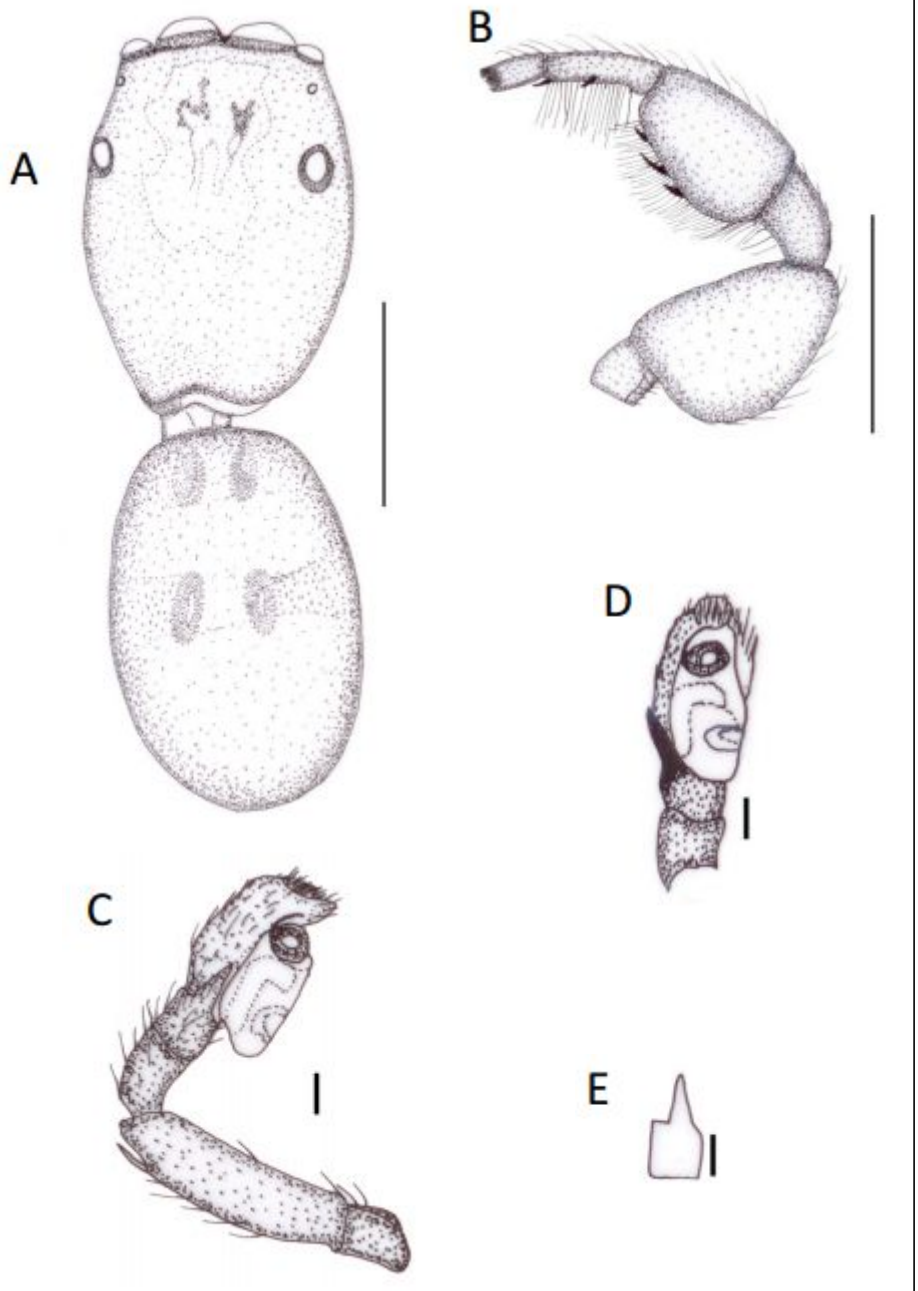

Figure 4. *Marengo crassipes* Peckham and Peckham, 1892, male (WILD-11-ARA-1115).
A, Cephalothorax and abdomen;
B, Leg I, prolateral view; C, male palp, retrolateral view;
D, palp, ventral view; E, Retrolateral tibial apophysis.
Scale 1.0mm for A-B and scale 0.1mm for C-E.

Leg: Leg I brownish-black except distal half mt and complete ta, pale yellow, leg II-IV pale yellow with long black patch on prolateral face of distal 3/4th femorae to tibiae, more prominent on legs III-IV; Leg I with fe, pa and ti inflated, fe, 0.66 wide and ti, 0.51 wide; ventral side of tibiae I with thick brush of long hairs, mt I ventrally with few long hairs, rest of the legs covered with short hairs and spines (Fig. 4B); leg formula 1423. *Spines*: Leg I, fe p=2; ti p=2, v=3; mt p=r=2; leg II, fe p=1, v=2. *Scopula*: Present on all tarsi for length, not very dense. *Claws*: Claw tufts well developed, covering the paired claw.

Palp (Figs. 4C-E): Embolus coiled twice at the tip; Retrolateral tibial apophysis (RTA) triangular, narrowing down at tips.

Abdomen (Fig. 4A): Oval, black except anterior mid-dorsal lighter; horizontal broad band mid-dorsal, narrowing in the center with long white hair, rest of the abdomen covered with small brown hairs; anteriorly two inverted sigma shape depression.

Spinnerets: Three pairs, brown, covered with pallid hair and spigots. Colulus absent.

Distribution: India (present record) and Sri Lanka

ACKNOWLEDGEMENTS

Authors are thankful to the faculties of Wildlife Institute of India for their help and support, Dr. K. Sankar and Dr. G. S. Rawat for granting permission to carry out survey in the institute campus and to use institute resources.

Author (NG) is also thankful to her home institution, Guru Gobind Singh University for coordinating the study program; Dr. Sanjay Keshari Das for his support and assistance; Mr. Suresh Kumar, WII, for his help in coordination of this study.

REFERENCES

Barrion, A. T. and J. A. Litsinger. 1995. Riceland Spiders of South and Southeast Asia. CAB International in association with the International Rice Research Institute, Wallingford, UK. 736 pp.

Keswani, S.; P. Hadole and A. Rajoria 2012. Checklist of spiders (Arachnida: Araneae) from India- 2012. *Indian Journal of Arachnology,*1(1): 2278-1587.

Platnick, N. I. 2012. The World Spider Catalog, Version 12.5. American Museum of Natural History. *http://research.amnh.org/iz/spiders/catalog/index.html*.

Proszynski, J. 2006. A pictorial index of genera of the Oriental Salticidae. http://salticida*e.org/salticid/diagnost/keys-sal/orien-alphabet.html.*

Sebastian, P. A. and K. V. Peter. 2009. *Spiders of India,* Orient Blackswan. 734 pp.

Tikader, B. K. 1980. Thomisidae (crab-spiders), *Fauna of India (Araneae).* I: 247.

Tikader, B. K. and M. S. Malhotra. 1980. Lycosidae (wolf-spiders), *Fauna of India (Araneae).* I: 248-447.

Tikader, B. K. 1982a. Araneidae(=Argiopidae), typical orb weavers, *Fauna of India (Araneae).* 2(1): 293.

Tikader, B. K. 1982b. Gnaphosidae, *Fauna of India (Araneae).* 2: 295-536.

Tikader, B. K. 1987. *Handbook of Indian spiders, Zool. Surv. India, Calcutta.* 251 pp.

Uniyal, V. P. and U. Hore. 2006. Studies on the spider fauna in Mixed Sal Forest area of Chandrabani, Dehra Dun, *Indian Forester.* 132(12): 83-88.