Description of some interesting jumping spiders (Araneae: Salticidae) from South India

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Abstract
Five species of jumping spiders are being described from South India. Among these, Viciria diatreta Simon, 1902 has been reported after a span of 112 years from its first description, two species Phintella volupe (Karsch, 1879) and Thyene bivittata Xie & Peng, 1995 are new records in India, and two new species namely Chrysilla jesudasi sp. nov. and Stenaelurillus sarojinae sp. nov. are being described and illustrated.

Keywords: Description, New species, New record, Salticidae, South India.

1. Introduction
Salticids are the most diverse family of spiders with 600 genera and 5760 species in the world known till date [1]. They are known by 207 species and 73 genera in India [2]. Some important contributions were made by Simon [3, 4, 5], Reimoser [6], and Proszynski [7] who described many species from South India. Recently, few additions have been made to this family by Sunil [8], Karthikeyani and Kannan [9], Caleb [10] and Caleb et al., [11]. Yet, studies on this family are very little and our knowledge on this group is sparse.

In this paper, five species have been described out of which one species, Viciria diatreta Simon, 1902 is being reported after 112 years, two species Phintella volupe (Karsch, 1879) and Thyene bivittata Xie & Peng, 1995 are new reports in India and two new species namely Chrysilla jesudasi sp. nov. and Stenaelurillus sarojinae sp. nov. are described as new to science.

2. Materials and Methods
Spiders were collected by hand picking method from various places in and around Chennai city, Tamil Nadu and Kadapa (Cuddapah), Andhra Pradesh. Collections were made as a part of spider diversity study over a period of four years from 2010-2014. Live spiders were photographed using DSLR Nikon D60, 18-55mm. They were preserved in 70% alcohol and later examined using a stereo zoom microscope (NIKON SMZ). Male palps were detached, examined and kept in a separate vial along with the original specimen. Female genitalia were excised using fine surgical scalpel. The epigyne was then transferred to petri dish containing KOH 10% aqueous solution for clearing. USB digital microscope with micro-measure software was used for making measurements. Descriptions are based on fresh specimen unless or otherwise stated. The type specimens will eventually be deposited in the Zoological Survey of India (ZSI), regional station, Chennai. All measurements are in mm (millimeters). Leg measurements are given as, total length (femur, patella, tibia, metatarsus, tarsus).

Abbreviations: ALE = anterior lateral eyes, AME = anterior median eyes, PLE = posterior lateral eyes, PME = posterior median eyes, AME-AME = mutual distance between eyes, E = embolus, RTA = retrolateral tibial apophysis, S = spermathecae, SD = sperm duct, CO = copulatory opening, CD =copulatory duct, FD = fertilization ducts.

3. Results
Taxonomy
Description
3.1 Chrysilla jesudasi sp. nov. Caleb and Mathai (Figs. 1-14)
Type material, Holotype: Male, India, Vanianchatiram, Bethel vision gardens (13°21′61.27″

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N, 80°09′89.03″ E, 26.85m), 18.v.2014, Coll. John Caleb T. D and John Thomas C. H.

**Allotype:** female (data same as holotype)

**Paratype:** female, scrub jungle regions, Madras Christian College, Tamil Nadu, India (12°92′02.28″ N, 80°12′35.65″ E, 32m), 18.viii.2013, coll. John Caleb T. D.

**Diagnosis:** Male resembles *Chryssa acerosa* Wang & Zhang, 2012 and *Chryssa assimensis* Ahmed et al., 2014 but can be distinguished by different abdominal pattern (Fig. 1), palps have longer, slender embolus (Figs. 7, 11), longer than wide RTA with a bend at the tip (Figs. 8, 12). Females can be identified by abdominal pattern (Fig. 4) and can be separated clearly by widely separated copulatory openings placed laterally and typical path of copulatory ducts reaching spermathecae (Figs. 9, 10)

**Etymology:** Species name is a patronym after the first author’s grandfather, Jesudas Nuthakki.

**Male:** Total length 5.95; carapace 2.67 long, 1.92 wide; abdomen 3.28 long, 1.35 wide. Cephalothorax blackish covered with pale yellow scales behind the anterior eye region (Fig. 1), white hairs seen behind PME’s, central white patch placed further behind. Eye measurements: AME 0.57, ALE 0.30, PME 0.10, PLE 0.31; AME–AME 0.03, ALE–AME 0.14, PME–PME 1.38, PME–PLE 0.29, ALE–PLE 0.74, clypeus height 0.16. Anterior eyes surrounded by white scales anteriorly and yellowish scales posteriorly, clypeus covered with short white ‘moustache’, cheeks blackish (Fig. 2). White patch extends backwards around the rim of cephalothorax. Chelicerae unidentate, reddish black, covered with white hairs at its base, sternum yellow covered with pale yellow hairs. Leg measurements: I 7.43 (2.06, 1.06, 1.86, 1.64, 0.81); II 5.55 (1.74, 0.76, 1.23, 1.01, 0.80); III 5.92 (1.85, 0.80, 1.24, 1.46, 0.57); IV 6.19 (1.86, 0.80, 1.31, 1.54, 0.68). Leg formula: 1432. Leg I robust, long and dark, legs II–IV slender, leg I longer than wide, retrolateral tibial apophysis long and bent at the tips (Figs. 7, 8).

**Female:** Total length 4.12; carapace 2.08 long, 1.42 wide; abdomen 2.04 long, 1.18 wide. Cephalothorax whitish, covered with pale yellow scales covering the eye field, black scales arranged in three pairs found surrounding PME’s, behind PLE’s and posterior slope of cephalothorax (Fig. 4). Eye measurements: AME 0.47, ALE 0.24, PLE 0.07, PLE 0.26; AME–AME 0.05, ALE–AME 0.03, PME–PME 1.11, PME–PLE 0.23, ALE–PLE 0.60, clypeus height 0.19. Anterior eyes surrounded by white scales anteriorly and yellowish scales posteriorly, clypeus covered with white scales. (Fig. 5). Chelicerae pale orange, unidentate, sternum yellow covered with pale yellow hairs. Leg measurements: I 3.77 (1.23, 0.56, 0.85, 0.65, 0.48); II 3.33 (1.07, 0.48, 0.72, 0.61, 0.45); III 3.45 (0.96, 0.50, 0.85, 0.72, 0.42); IV 4.25 (1.28, 0.56, 0.96, 1.00, 0.45). Leg formula: 4132. Legs greenish yellow. Abdomen oval, yellow in color, a pair of lateral dark stripes running longitudinally throughout the length of the abdomen with brighter yellow bands (Figs. 4, 6). Spinnerets yellow. Epigyne with wide grooves, copulatory openings placed laterally outwards. Spermathecae spherical, placed closely and ducts running slightly diverging upwards making a ‘V’ shaped pattern in between, ducts then bend inwards and make a duck neck shaped diverging bend leading to the openings (Figs. 9, 10).

**Distribution:** Chennai, Tamil Nadu, South India

3.2 *Pinhteilla volupe* (Karsch, 1879) (Figs. 15 - 23)

**Specimen examined:** 1 male, 05.iii.2012, scrub regions neighborhood near Araabath lake, Thirumullaivoyal, Chennai, Tamil Nadu, India (13°12′51.06″ N, 80°13′55.64″ E, 21.73 m), coll. John Caleb T.D., and 1 male 15.xii.2013 (GPS same data) coll. Brainard T.D; 1 male, 20.vii.2010, scrub jungle patches beside Heber hall, Madras Christian College, Chennai, Tamil Nadu, India (12°92′02.87″ N, 80°13′35.23″ E, 32 m), coll. Sam Thomas

**Diagnosis:** Species can be distinguished by the length of embolus longer than most *Pinhteilla* species (Figs. 19, 22) and typical dorsal pattern with a horizontal patch and ‘M’ shaped orange scales on the abdomen (Fig. 15) (see Zabka [12]).

**Male:** Total length 4.57; carapace 1.83 long, 1.26 wide; abdomen 2.74 long, 0.89 wide Cephalothorax covered by reddish-orange scales, patch of blue iridescent hairs behind AME’s, between PLE’s and at the posterior part (Fig. 15). Posterior region of cephalothorax with spines near the pedicel and a notch. Clypeus covered with bluish hairs and patches extend along the base and below the lateral eyes (Fig. 17). Eye size and inter distance between AME 0.37, ALE 0.21, PLE 0.07, PLE 0.21; ALE–AME 0.04, ALE–AME 0.03, PME–PME 1.01, PME–PLE 0.12, ALE–PLE 0.47, clypeus height 0.19, chelicerae reddish brown, 2 promargin and 1 retromargin teeth, sternum oval shaped covered with iridescent scales, leg I robust, long and dark, legs II-IV lighter in color covered by iridescent scales dorsally. Leg measurements: I 4.28 (1.32, 0.51, 1.15, 0.77, 0.53); II 3.07 (1.02, 0.36, 0.69, 0.56, 0.44); III 3.23 (1.02, 0.35, 0.61, 0.76, 0.49); IV 4.11 (1.11, 0.31, 1.04, 1.08, 0.57). Leg formula: 1432. Abdomen long and narrow, shiny, covered by fine iridescent hairs, orange scales form a wide ‘M’ shaped pattern across, and a transverse patch posteriorly, spinnerets blackish in color (Figs. 15, 18).

**Distribution:** Sri Lanka; Burma; Chennai, India (New record)

**Remarks:** Species shows close resemblance to the type of Genus *Chryssa, Chryssa lauta* Thorell both morphologically and similarity in the palpal structure, but it has been placed in *Pinhteilla* (see Zabka [12]).

3.3 *Stenaeurlirrus sarojinai* sp. nov. Caleb and Mathai (Figs. 24-30)

**Type material, Holotype:** female, 14.i.2014 near sunflower fields, Kadapa, Andhra Pradesh, India (14°45′10.50″ N, 78°79′38.68″ E, 138 m), coll. John Caleb T.D.

**Etymology:** Species name is a patronym after the first author’s grandmother, Sarojini Devi.

**Diagnosis:** Species can be differentiated from *S. lesserti*
Reimoser, 1934 by difference in abdominal pattern (Figs. 24, 26), bean shaped spermathecae placed apart with copulatory ducts connecting from the median axis (Fig. 30) (closely placed in S. lesserti), copulatory openings elongated and are placed apart (Fig. 29) (round and closely placed in S. lesserti).

Female: Total length 5.89; carapace 2.52 long, 1.82 wide; abdomen 3.37 long, 3.48 wide.

Cephalothorax reddish brown, eye region covered with forward projecting hairs (Fig. 24), pair of white stripes on the dorsal surface extend till the posterior region. Eye measurements: AME 0.38, ALE 0.23, PME 0.07, PLE 0.21; AME-AME 0.06, AME-ALE 0.09, PME-PME 1.25, PME-PLE 0.20, ALE-PLE 0.62, clypeus height 0.24, two white transverse stripes traverse across the clypeus with hairs projecting forward midway. Broad white patch of hairs extend backwards along the rim of cephalothorax starting from the cheek region. Anterior eyes surrounded by white scales anteriorly and reddish-orange scales posteriorly, (Fig. 27). Chelicerae unidentate, reddish brown, sternum yellowish covered with pale yellow hairs. Leg measurements: I 3.54 (1.26, 0.58, 0.62, 0.44, 0.64); II 3.50 (1.25, 0.54, 0.64, 0.48, 0.59); III 6.21 (1.74, 0.87, 1.32, 1.49, 0.79); IV 6.03 (1.68, 0.93, 1.35, 1.09, 0.98) Leg formula 3412. Leg III and IV longer than anterior pair. Abdomen broad just below the anterior region, converging towards the posterior, almost pointed at the spinnerets, dorsal pattern with two white spots placed on a dark background separated by chevron shaped markings (Fig. 26), lateral sides covered by yellowish hairs with reddish brown spots, ventral region covered uniformly by yellow hairs. Spinnerets long, yellowish. Epigyne placed on a sclerotized plate, wider with two shallow copulatory openings leading to ducts in the median axis reaching the bean shaped spermathecae placed laterally as opposing to each other (Figs. 29 & 30).

Distribution: Kadapa, Andhra Pradesh, India.

3.4 Thyene bivittata Xie & Peng, 1995 (Figs. 31-37)

Specimen Examined: Male, India, Vanianchatiram, Bethel vision gardens, (13°21′61.27″ N, 80°09′89.03″ E, 26.85m) 18.v.2014, Coll. John Caleb T.D and Job Daniel J.R.

Diagnosis: Species can be differentiated from other congeners by the position of the extended outgrowth on the upper lateral region of the bulb (Figs. 34, 36), and pointed tibial apophysis (Figs. 35, 37) (for comparative diagnostic features see Xie & Peng [13]; Jastrzębski [14]). Similar species from India has been represented by Thyene sp. Proszynski, 1992.

Male: Total length 4.12; carapace 2.00 long, 1.47 wide; abdomen 2.12 long, 1.17 wide.

Cephalothorax dark brown with a posterior-median orangish-white patch (Fig.31). Eye measurements: AME 0.51, ALE 0.27, PME 0.06, PLE 0.26; AME–AME 0.03, AME–ALE 0.02, PME–PME 1.31, PME–PLE 0.22, ALE–PLE 0.56, clypeus height 0.15. Anterior eyes surrounded by white scales anteriorly and reddish orange scales posteriorly, clypeus reddish brown, covered with stripes of white scales (Fig. 33). White patch extends backwards on the lateral sides from below the ALE’s to the base of cephalothorax. Chelicerae with 2 promargin teeth and 1 retromargin tooth with bifurcated tip, reddish black. Leg measurements: I 3.71 (1.24, 0.57, 0.78, 0.57, 0.55); II 3.49 (1.18, 0.55, 0.71, 0.53, 0.52); III 3.91 (1.32, 0.50, 0.68, 0.78, 0.63); IV 4.08 (1.29, 0.62, 0.84, 0.66, 0.67). Leg formula: 4312. Legs dark covered with spines. Abdomen elongate, a median yellowish patch extends from anterior to posterior end, lateral regions dark brown throughout the length of abdomen, spinnerets dark brown (Fig. 31).

Distribution: China; Himalayas, Nepal; Chennai, India (New record)

Remarks: The species is known by the male alone. General body morphology does not resemble Thyene but was provisionally placed in this genus due to the resemblance of the palp structure [15]. Collection and examination of other specimens along with conspecific females could help placement in appropriate genera.

3.5 Viciria diatreta Simon, 1902 (Figs. 38-46)

Specimen Examined: male; 07.vii.2013, scrub region neighborhood near Araabath lake, Thirumullavaiyol, Chennai, Tamil Nadu, India (13°12′ 51.06″ N, 80°13′ 55.64″ E, 21.73m) coll. Brainard T.D.

Diagnosis: Specimen can be distinguished by dorsal pattern on the abdomen (Fig. 38). Male palp shows deviation from other Viciria species, with short embolus and shape of retrorotal apophysis (Figs. 45, 46).

Male: Total length 6.8; carapace 2.98 long, 2.13 wide; abdomen 3.82 long, 1.87 wide.

Cephalothorax blackish with greenish yellow patches dorsally, a patch between the AME’s, two lateral patches placed between PLE and PME’s, one white patch mid-dorsally on the slope (Fig. 38), cephalic region little higher than thoracic region, a white stripe of hairs running along the base of cephalothorax (Fig. 40). Eye size and inter distance between AME 0.52, ALE 0.29, PME 0.07, PLE 0.29; AME–AME 0.04, AME–ALE 0.08, PME–PME 1.36, PME–PLE 0.35, ALE–PLE 0.77, clypeus height 0.14. Frontal view (Fig. 41). Chelicerae blackish, 2 promargin and 1 retromargin teeth, Sternum yellow covered with pale yellow hairs uniformly along the edges, legs yellowish, Leg I robust with dark femur and white hairs dorsally. Femur II with a black venter. Leg measurements: I 6.38 (1.88, 0.95, 1.74, 1.06, 0.75); II 5.64 (1.73, 0.91, 1.25, 1.05, 0.70); III 5.40 (1.71, 0.76, 1.09, 1.11, 0.73); IV 6.12 (2.01, 0.74, 1.36, 1.17, 0.84). Leg formula: 1423. Abdomen long and narrowing posteriorly, three yellow patches running longitudinally (one mid-dorsally and two laterally) from the apical region to the spinnerets (Fig. 38). Venter covered by pale white scales, spinnerets greenish yellow (Fig. 39).

Distribution: Trichy, Chennai, South India.

Remarks: The species is known by the male only. The species has been misplaced in genus Viciria [15]. However, transfer must be delayed until comparison with the type specimen. Placement in appropriate genus would also be hindered in the absence of conspecific female.
**Fig 1-6:** *Chrysilla jesudasi* sp. nov. 1. Dorsal view of male, 2. Frontal view, 3. Lateral view, 4. Dorsal view of Female, 5. Frontal view, 6. Lateral View

**Fig 7-10:** *Chrysilla jesudasi* sp.nov. 7. Left male palp, ventral view, 8. retrolateral view, 9. Epigyne, 10. Vulva dorsal view. Scale bars 0.1mm.

**Fig 11-14:** *Chrysilla jesudasi* sp.nov. 11. Left male palp, ventral view; 12. retrolateral view, 13. Epigyne, 14. Vulva dorsal view.

**Fig 24-27:** *Stenaelurillus sarojinae* sp. nov. 24. Dorsal view of female, 25. Lateral view, 26. Abdomen, 27. Front view.

**Fig 28-30:** *Stenaelurillus sarojinae* sp. nov. 28. Epigyne, ventral view; 29 Epigyne ventral view, 30. Vulva dorsal view. Scale bars 0.1mm.
Fig 31-35: *Thyene bivittata* Xie & Peng. 31. Dorsal view of male, 32. Lateral view, 33. Front view, 34. Left male palp, ventral view, 35. retrolateral view.

Fig 36-37: *Thyene bivittata* Xie & Peng. 36. Left male palp, ventral view, 37. retrolateral view. Scale bars 0.1mm.

4. Conclusion
Salticids are the most diverse group of spiders, yet it is one of the least studied families in India [1, 8]. Two possible reasons could be attributed to such vast gap between sightings/reports. It either shows how poorly the fauna of spiders is studied in India or the spider must be very rare to be spotted (Proszynski, pers. comm). There is however, a challenging need to document species before they become extinct due to loss of habitat and other factors in the recent times. This presents a compelling necessity for urgent taxonomic revisions and more intensive diversity studies to bridge the gaps between existing knowledge on Indian Salticids.

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