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Species increments to the Indian Araneofauna (Arachnida, Araneae) from Pathiramanal Island

Jobi J. Malamel

Division of Arachnology, Department of Zoology, Sacred HeartCollege (Autonomous), Kochi – 682013, Kerala, India
Corresponding author: jomaljoseph@yahoo.co.in

Abstract: Three species from three spider families are reported for the first time from India. *Cyrtophora unicolor* (Doleschall, 1857) (Araneidae), *Nasoona crucifera* (Thorell, 1895) (Linyphiidae), *Evarcha pococki* Zabka, 1985 (Salticidae) and *Phaeacius lancearius* Wijesinghe, 1991(Salticidae) were collected on Pathiramanal Island, Kerala, India. The first three species are new to India and the fourth is newly recorded from Kerala State, in southern India. Diagnostic characters, digital images and field photos for these species are provided.
Key words: Araneae, Araneidae, Linyphiidae, Salticidae, distribution, Ramsar site, India, Kerala.

Adiciones a la araneofauna de la India de la isla de Pathiramanal (Arachnida, Araneae)
Resumen: Se citan por primera vez de la India tres especies pertenecientes a tres familias de arañas. *Cyrtophora unicolor* (Doleschall, 1857) (Araneidae), *Nasoona crucifera* (Thorell, 1895) (Linyphiidae), *Evarcha pococki* Zabka, 1985 (Salticidae) and *Phaeacius lancearius* Wijesinghe, 1991(Salticidae) se recogieron en la isla de Pathiramanal, Kerala. Las tres primeras son nuevas para la fauna de arañas del país, y la cuarta se cita por primera vez del estado de Kerala, en el sur de la India. Se aportan caracteres diagnósticos, imágenes digitales y fotos de campo de estas especies.
Palabras clave: Araneae, Araneidae, Linyphiidae, Salticidae, distribución, sitio Ramsar, India, Kerala.

Introduction

Patiramanal Island represents one of the most diverse areas of the Kerala state of Southern India, situated in the Vembanad lake, a Ramsar site- wetland of international importance (The Secretariat of the ConventiononWetlands,Ramsar, Iran, 1971).It is a small island on the backwaters of Alappuzha, haven for hundreds of rare birds migrating from different parts of the World.Island posses a huge proportion of fauna like odonates, birds, mammals, reptiles and insects. Since it is not declared as a protected area and being a green patch of land with high levels of species diversity and endemism, it is also one of the least studied areas under enormous pressure from human activities such as tourism, waste disposal,grass cutting etc. Our pilot study in Pathiramanal Island disclosed the fact that Island harbours rich amount of arachnids, of which spiders have a huge share. The Araneae, comprising currently 47098 valid species of spiders in 4073 genera and 113 families (World Spider Catalog - 2017) is one of the most diverse groups within the Phylum Arthropoda.Although this particular group is described aswidespread and occurring in almost all habitats, its geographical distribution is poorly known from India. It is not due to the actual absence of this group, but to a lack of studies and adequate sampling in the region.The aim of this study is to report the occurrence of three species *Cyrtophora unicolor* (Doleschall, 1857) (Araneidae), *Nasoona crucifera* (Thorell, 1895) (Linyphiidae) and *Evarcha pococki* Zabka, 1985 (Salticidae) from India as well as a salticid species *Phaeacius lancearius* (Thorell,1895) from Kerala for the first time, providing digital images, distribution map and taxonomic notes based on the specimens collected from the Pathiramanal Island.

Materials and methods

Specimens are collected from the Pathiramanal Island (9º37' 07.11"N, 76º23'04.95"E; 4 m. alt) located in the Alappuzha District of Kerala state in South India (Fig. 1).The specimens were preserved in 70% ethanol and studied under a Zeiss Stemi 2000-C stereomicroscope. Epigynum was cleared using 10% KOH solution. All measurements are in millimetres. The digital images were taken by Leica DFC295 camera attached to Leica M205 C stereomicroscope with LAS montage facility. The specimens are deposited in thecollection of Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala, India (ADSH).

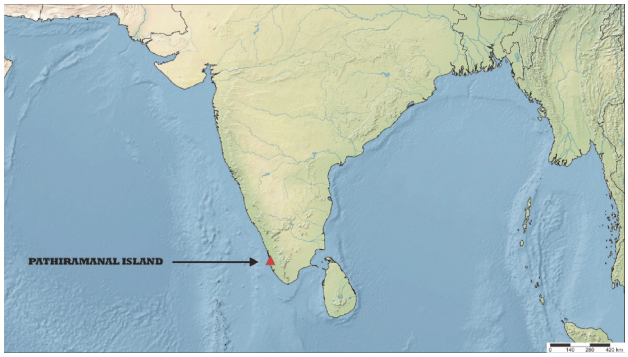


Fig. 1 Distribution map.

Taxonomic accounts

Family Araneidae Clerck, 1757

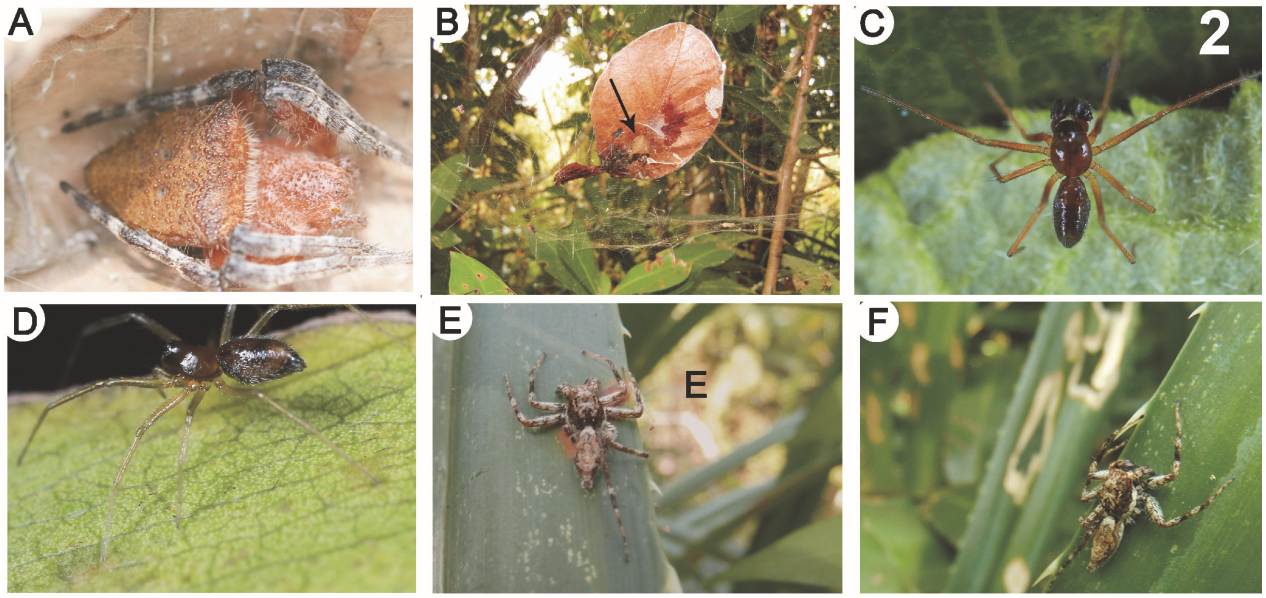
***Cyrtophora unicolor* (Doleschall, 1857)**

For detailed description and illustrations see Framenau, 2008 (But orientation of the female epigynum illustration is wrong in this paper, Figs 8 & 9).

DIAGNOSTIC CHARACTERS (Fig. 2 A, B; Fig. 3 A-I)

MALE: Cephalic region protruding, numerous tubercles present dorsally on the carapace, opisthosoma with several small sclerotized sigillae. Palpal organ complex, tegulum baso-laterally with a slight bulging. Conductor tongue-like located disto-medially above the tip of the embolus. Embolus looks like long horn with a broad base and a chisel shaped tip. Terminal apophysis broad with distinct ridges; radix short, lying below and away from the claw shaped median apophysis.

FEMALE: Cephalic area of the prosoma constricted, while thoracic area semicircular; both prosoma and opisthosoma with numerous tubercles; opisthosoma triangular in shape with distinct sigillae and one pair of less prominent disto-lateral hump. Epigynum: spermathecae oblong, sclerotized; fertilization duct short, roughly s-shaped originating from the centre of the spermathecae, directed upwardly and parallel to each other; copulatory duct very short, highly sclerotized;copulatory opening semicircular, medially placed and confronting each other.



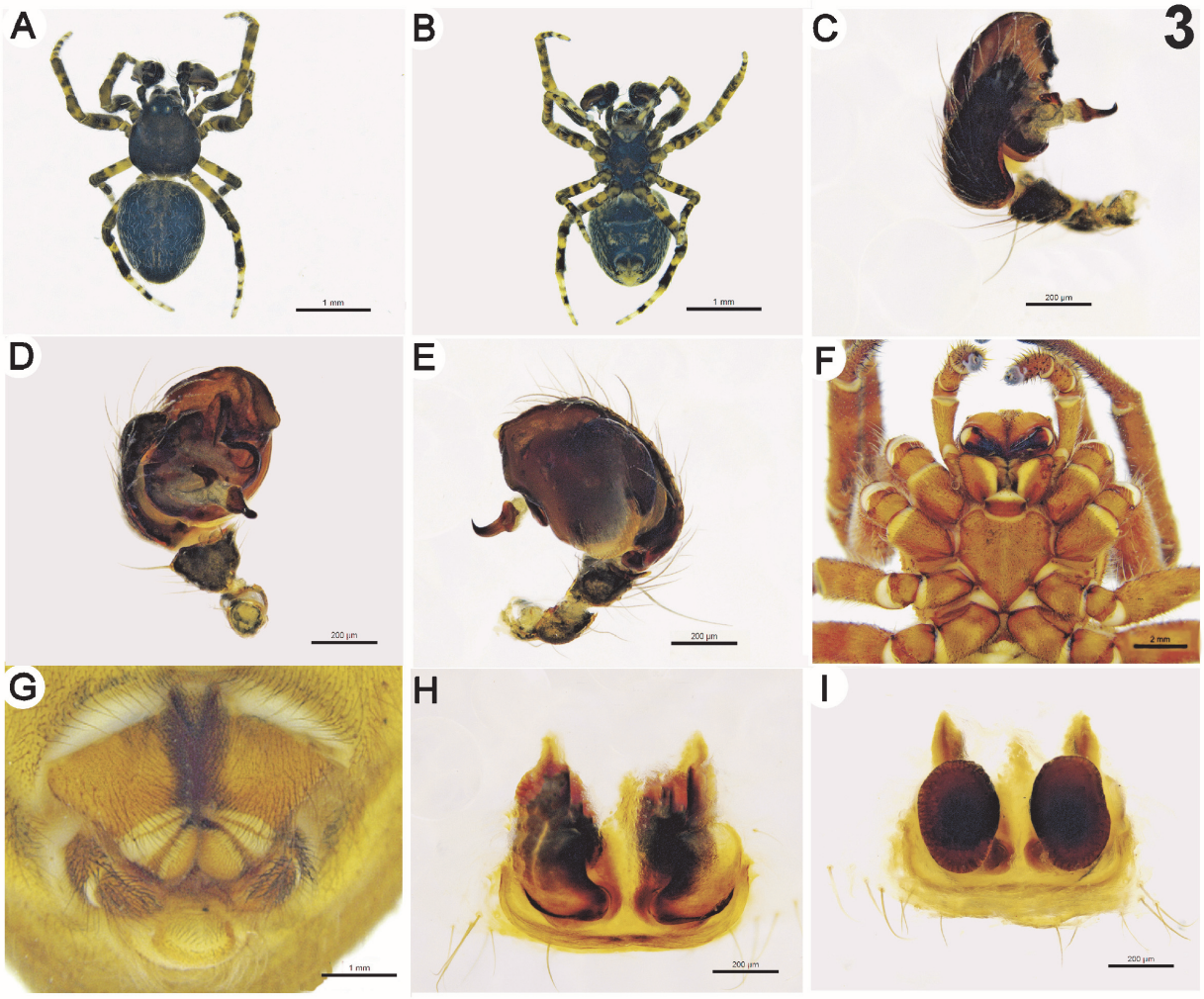


Fig. 2 Habitus. **A-B**. *Cyrtophora unicolor* female; **C-D** *Nasoona crucifera* male and female; **E-F**. Male of *Phaeacius wanlessi*. **Fig. 3.** *Cyrtophora unicolor* (Doleschall, 1857). Male (**A**) dorsal (**B**) ventral (**C**) palp prolateral (**D**) ventral (**E**) retrolateral (**F**) Female sternum (**G**) spinnerets (**H**) epigynum ventral (I) dorsal.

MATERIAL EXAMINED. 1♂, 2♀ (*Cyrtophora unicolor*) 7-1-2015 (ADSH94853A), 11-2-15(ADSH94853B), India, Pathiramanal Island (9º37'07.11"N, 76º23'04.95"E; 4 m. alt) from foliages by hands; Jobi M.J, Pradeep M.S & Jimmy Paul.

DISTRIBUTION. *Cyrtophora unicolor* (Doleschall, 1857) was first known from Indonesia and distributed in Thailand, Central Sumatra, Malaysia, Singapore, Myanmar, eastern border of Papua New Guinea, Japan, Sri Lanka, Philippines, China, Southern Taiwan, Christmas Island and India (New record).

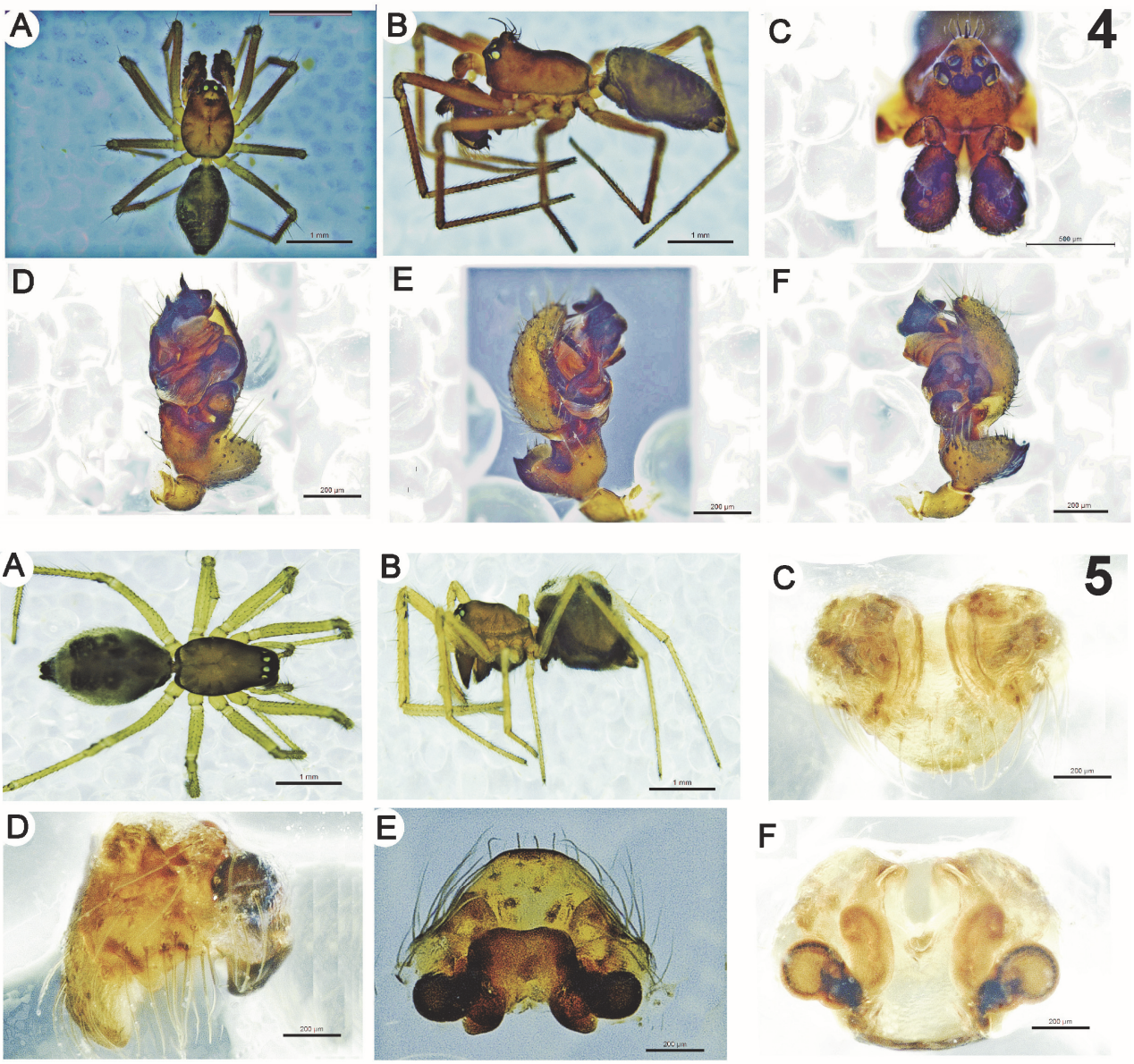


Fig. 4. *Nasoona crucifera* (Thorell, 1895). Male (**A**) dorsal (**B**) lateral (**C**) frontal (**D**) palp prolateral (**E**) ventral (**F**) retrolateral. **Fig. 5.** *Nasoona crucifera* (Thorell, 1895). Female (**A**) dorsal (**B**) lateral (**C**) epigynum frontal (**D**) lateral (**E**) ventral (**F**) dorsal.

Family Linyphiidae Blackwall, 1859

***Nasoona crucifera* (Thorell, 1895)**

For detailed description and illustrations see Tu & Li (2004).

DIAGNOSTIC CHARACTERS (Fig. 2 C, D; Fig. 4 A-F; Fig. 5 A-F).

MALE: Cephalic area prominent, elevated behind the eye region with a dome shaped lobe bearing a strong, long, forwardly curved spine with a hook like tip and some bent bristles behind. A cheliceral bulging on the median of the ventral side. Sternum rough, dull coloured with hairs. Palpal organ complex, tibia massive, a flower like structure with strongly sclerotized petals. Ventral tibial petal with a bulged structure overlaying on the subtegulum, the tibial area nearby the paracymbium with a transverse row of macrosetae; paracymbium inverted comma like structure in retrolateral view with a proximal arm with some short hairs. Radix strongly sclerotized with a posterior thumb like tail piece, anteriorly divided into well sclerotized processes, anteriorly with numerous serrations and a flat, short lateral radix process but clearly separated from anterior radix process. Embolus long, basally flat, progressively thin and epically conical in shape and originates from radix. Terminal apophysis bent, pointed, with a flat, transparent lamella characteristica with apical margin having a median depression present in the apical position of the tegulum.

FEMALE: Cephalic area without any clear modification. Epigynum with multifaceted views and a ventral and dorsal plate, ventrally hirsute, laterally like a bird-mouth. Spermathecae sclerotized, small, globular. Copulatory duct basally thick, relatively long and line in close association with dorsal plate, distal half with a single twist, apically narrowing, copulatory opening concealed under the posterior part of the ventral plate. Fertilization duct very small, very thin and confronting each other.

MATERIAL EXAMINED. 3♂, 4♀, 2 juveniles (*Nasoona crucifera*) 7-1-2015 (ADSH493376A), 16-3-2015 (ADSH493376B),14-2-2016 (ADSH493376C), 21-7-2016 (ADSH493376D), India, Pathiramanal Island (9º37'07.11"N, 76º23'04.95"E; 4 m. alt) from foliages by hands; Jobi M.J, Pradeep M.S & Jimmy Paul.

DISTRIBUTION. – *Nasoona crucifera* is reported from Myanmar, Vietnam, China, Laos and India (New record).

Family Salticidae Blackwall, 1841

***Evarcha pococki* Zabka, 1985**

DIAGNOSTIC CHARACTERS (Fig. 6 A-F)

MALE: For detailed description and illustrations see Żabka (1985). Opisthosoma with a yellow-orange median belt and laterally a black background with longitudinal rows of orange spots and transverse

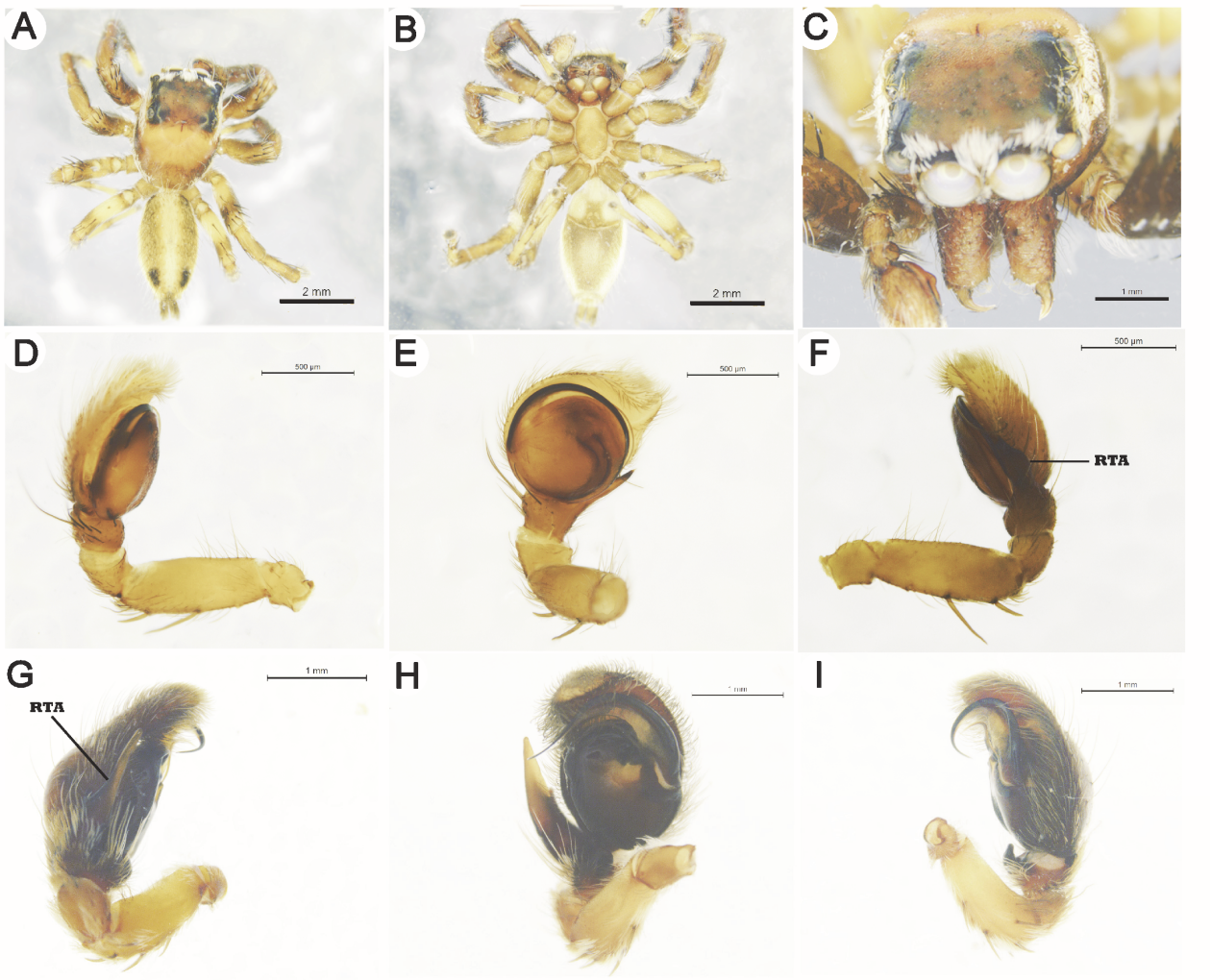


Fig. 6. *Evarcha pococki* Zabka, 1985 Male (**A**) dorsal (**B**) ventral (**C**) frontal (**D**) palp prolateral (**E**)) ventral I (**F**) retrolateral. *Phaeacius wanlessi* Wijesinghe, 1991 Male (**G**) palp prolateral (**E**) ventral I (**F**) retrolateral. RTA – retro-lateral tibial apophysis

lines. Palpal organ massive, cymbium apico retro-laterally narrowing, tegulum circular, retro-lateral tibial apophysis stout with a prolateral tiny thorn like branch and retro-lateral short pointed branch, sperm duct visible in ventral view, embolus very long, filiform, surrounding one time around the tegulam, embolic tip hook shaped.

MATERIAL EXAMINED. 1♂ 14-4-2015(ADSH8417569A), India, Pathiramanal Island (9º37'07.11"N, 76º23'04.95'E'; 4 m. alt) from foliages by hands; Jobi M.J, Pradeep M.S & Jimmy Paul.

DISTRIBUTION *E. pococki* is recorded from Bhutan to Vietnam, China and India (New record).

***Phaeacius lancearius* (Thorell, 1895)**

DIAGNOSTIC CHARACTERS (Fig. 2 E, F; Fig. 6 G-I)

MALE: For detailed description and illustrations see Wanless (1981b) and Prószyński (1984a).

Prosoma clothed with recumbent brown translucent hairs; broad band of white hairs with sinuate upper edge at lateral margins; palpal organ massive, dark brown, cymbium densely hairy. Dorsal, ventral and retro lateral sides of the tibia with dense hairs, retrolateral of the tibia with prominent long hairs. Tegulum ovoid, retrolateral tibial apophysis bifurcated, one smaller, thumb like and the other one elongate, tapering towards the end. Ventral tibial apophysis stout, strong and sclerotized. Embolus with distal haematodochal apophysis, long, 2/3rd of the proximal portion broad and with a transparent membraneous structure, embolic tip chisel shaped.

MATERIAL EXAMINED. 1♂ 11-2-15 (ADSH844177A), India, Pathiramanal Island (9º37'07.11"N, 76º23'04.95"E; 4 m. alt) from foliages by hands; Jobi M.J, Pradeep M.S & Jimmy Paul.

DISTRIBUTION: *P. lancearius* is described from Burma and India (New record from Kerala).

Discussion

Spider species *Cyrtophora unicolor* (Doleschall, 1857), *Nasoona crucifera* (Thorell, 1895) and *Evarcha pococki* Zabka, 1985 are recorded from Pathiramanal Island in this study represent new distributional records for India as well as *Phaeacius lancearius* Wijesinghe, 1991 for Kerala, southern state of India.Though all these four recorded species have already been registered from other localities, they have not yet been reported from these zones.

The spider genera *Cyrtophora* and *Nasoona* normally occur in the Indo-Australasian region. *C. unicolor* and *N. crucifera* are oriental species described from several places by several authors. The known distribution of *C. unicolor* is updated to include Southern parts of China, Taiwan and Japan in the North, the Philippines and Papua New Guinea to the south-east, Indonesia and Christmas Island to the South, and Thailand, Myanmar, and Sri Lanka to the East (Framenau, 2008). With our new records, the geographical distribution of these two species is extended to the North West of the oriental region.

Salticids are the most diverse spider family with a worldwide distribution having 5,950 recognised species in 625 genera (World Spider Catalog - 2017). *Evarcha* Simon, 1902 is one of the 'species rich' genus in the family, but only one species is reported from India to date (World Spider Catalog, 2017). The report of *E. pococki* Zabka, 1985 from India adds a second species for the country and

expand the geographical range of the species. Another genus *Phaeacius* Simon, 1900 is a 'species less' genus with a typical Oriental or Indo-Malayan pattern of distribution, however the known distribution of the genus suggests that it can be seen in the southeast Asian mainland and Borneo (Wijesinghe, 1991b). *P. lancearius (*Thorell, 1895) is a less recorded species known only from Burma and India. Even though this species is already reported from South part of India, record of *P. lancearius* from Kerala emphasize the occurrence of this species in the Southern part of India and the occurrence of the same species can happen in the other parts of Indian Subcontinent.

This study is about the first contribution of the distribution range of three species from India and one species from Kerala state of South India. The study locality is extremely important, since it is located in the Vembanad wetland system, a Ramsar site in the Kerala state of Southern India and long-term studies have been scarce in this area, more surveys are necessary in order to determine more precisely the structure of the spider community (e.g., habitat preference, prey availability and foraging behaviour), and also to obtain a better knowledge of the density, diversity and ecology of the Araneaofauna in this ecological zone. Despite Pathiramanal Island is not declared as a protected area, management plans and effective preservation efforts should be designed for the stability and sustainability of this fragile ecosystem.

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