FEATURE ARTICLE

Incredible Spiders

Conversations with a Naturalist

Susheela Srinivas

Spiders are exciting creatures. Love them or loathe them, they are here to stay.

WHAT is your reaction to spiders? Blow them away? Scream in terror? Alternatively, perhaps, like Garfield, you reach out for a wad of the newspaper? Well...whatever may be your reaction, it is very likely that you may have just squashed your chances of becoming the next big discoverer!

Like them or not, spiders are found just about everywhere in the world: from the frigid zones to the sizzling deserts, in households to dense forests, for spiders have been around for millions of years, exhibiting resilience and adaptability. In fact, isn't it surprising to know that their ancestors are older than the dinosaurs?

Despite such a wide distribution, arachnology (the study of spiders) is a poorly studied science, and very few records of their natural history exist today. Especially in India, this young science is in dire need of cataloguing.

I discovered many fascinating aspects of these tiny creatures during my talks with a naturalist and understand that there lies a huge lack of awareness about spiders. "They have not received their due importance," rues the scientist even though they play a critical role in the delicate balance of the ecology.

Arachnologist Javed Ahmed, a young and exuberant naturalist, is responsible for bringing to light many rare species of spiders in India. He specialises in Araneology – the study of small spiders (often just a few millimetres in length).

His passion for spiders grew organically and over the years urged him to give up a corporate job, and pursue studying environmental science. He is nocturnal – like the objects of his passion – scouring backyards, neighbourhoods and dense forests alike, looking out for these shy creatures.

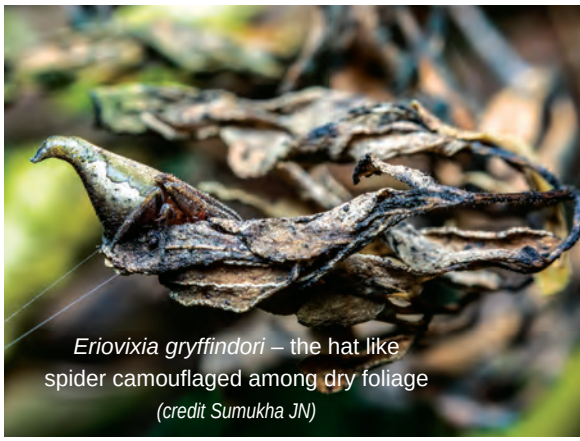
"You do not need to travel to exotic destinations to make discoveries. There exists a rich bio-diversity all around us if we care to look," observes Javed.

I listen in rapt attention as he unfolds fascinating details about the rare species of spiders he has discovered. The stunning images spellbind me; the adaptability displayed by these spiders amazes me and leaves me wondering about the marvellous craft of Nature.

Come, take a journey with me and get to know these eight-legged wonders; you will be astonished by how these tiny creatures have evolved strategies to survive and thrive in their surroundings.

Masters of Camouflage

Wilderness is harsh, especially for small beings like spiders. So it is evident that many species have learnt to mimic their surroundings to escape predation by insects, birds and bugs.



Eriovixia gryffindori – the hat like spider camouflaged among dry foliage *(credit Sumukha JN)*

Three rare species of spiders found in the forestlands of Kans in Shivamogga, Karnataka have however mastered the art of camouflage.

Paraplectana rajashree is a distinctive and dainty spider, and only a single female specimen has been found so far. This tiny critter has a striking resemblance to a beetle and easily blends among them. However, the colourful cloak it wears ensures its safety from insects while surviving

L- beetle, R- *Paraplectana rajashree* mimicking a beetle (*credit Sumukha JN*)

on an abundant food source. This orb-weaving spider is the first of its genus to be reported from India.

Following suit is *Cyrtarachne sunjoymongai,* which mimics a snail and prevents predation by birds.

Eriovixia gryffindori, however, steals the show with its unique appearance, bringing the world to focus on spiders. This spider resembles the sorting-hat from the Harry Potter series!

Gryffindori is just 7 mm in length, a nocturnal, orb-weaving spider imitating dry foliage for survival, going about its business in the forest tipping a distinctive hat! (*Science Reporter* reported the find in its February 2017 issue). Despite several visits to the forest, the team so far has discovered only the female of this species, while the male remains elusive.

Justifying their deviation from the usual etymological demands, the team that was unanimous in their decision, said, "The choice of the name was not only because of the resemblance but also a bid to create awareness about spiders." Moreover, their objective is well met as they receive numerous queries about spiders now.

These discoveries are published in *The Indian Journal of Arachnology*.

A Vegetarian Spider!

While spiders are usually carnivorous, *Bhageera kiplingi* a type of jumping spider is predominantly vegetarian. Native to Latin America, the spider feeds on a type of nutritious nectar stored by ants residing on the acacia trees.

Master Hunters

Spiders are master hunters, weaving webs to not only trap the prey but also use their silk in many ways to hunt for their food. They enjoy a wide variety on their menu: flies, bugs, ants and even other spiders. Spider cannibalism called araneophagy is another feature seen in some spider species. Many a time, the hunted is way larger than the hunter.

One of the first rare spiders discovered by Javed Ahmed was *Dictis mumbaienis*, in a populated area near Aarey Milk Colony, Mumbai.

"The colony is a cocktail of unique habitat. Earlier belonging to the Sanjay Gandhi National Park, a part of it was converted to grazing lands by clearing the forest. Now this colony is made up of open grasslands, wooded area and remnants of the forest," explains the scientist.

This rare jumping spider found in this environ is named after the city of Mumbai, and comes in hues of blue and brown and has a unique way of hunting. When spotted, *Dictis mumbaienis* belonging to the spitting spider group was seen devouring another larger spider. While the genus was the first to be reported from India, its araneophagy behaviour too was a first.

Another rare species found along with it is *Peucetia phantasma,* which lives and hunts solely on the ghost tree (a silver bark tree, botanical name *Sterculia urens*).

Thelcticopis kirankhalapi, rare species of spider found in the Kans forest (*credit Sumukha JN*)

Mistaken Identity

- Spiders are not insects. They belong to the group Arthropoda (scorpions, ticks and mites also belong to this group).
- Their body is divided into two segments: Cephalothorax and abdomen.
- They have four pairs of legs (insects have three pairs)
- The legs, eyes and mouthparts are situated in the cephalothorax.
- For spiders, the pedipalp – small pincer-like parts – are also the male genitals while in the female, the epigyne is located in the lower abdomen.
- The spinnerets which weave the silk are situated in the lower abdominal region.

Male (left) and female (right) *Brettus cingulatus* (*credit Sumukha JN*)

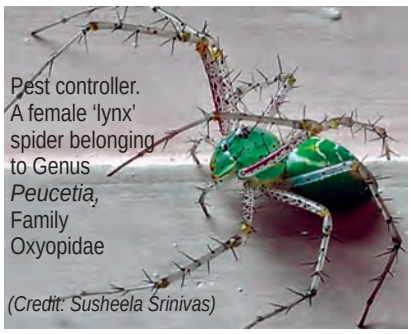
Brettus cingulatus snacking on a small spider

(credit Rakesh Kumar B)

A Backyard Discovery

Brettus cingulatus is a garden discovery. Recalling the circumstances, Javed says: "During one of my night prowls, I found the spider on the underside of a teak-leaf, in Rajashree's (co-researcher) backyard. Though I was happy to recognise it to belong to the *Brettus* genus it was only much later that we found that it was a re-discovery of the species after 122 years." (refer *SR* August 2017 issue)

This re-discovery also unearthed another startling information: *Brettus albolimbatus* till then classified as a separate species was in actuality the female of the *cingulatus* spider. The confusion existed for many years as *Brettus cingulatus* exhibits sexual dimorphism. In other words, male and females of this species are unlike in appearance (seen in humans too). *B. cingulatus* is a jumping spider which too exhibits araneophagy.



Pest controller. A female 'lynx' spider belonging to Genus *Peucetia*, Family Oxyopidae

(Credit: Susheela Srinivas)

Both these finds published in the journal *Peckhamia* in May 2017, were in collaboration with Dr. David E. Hill, an international expert on jumping spiders.

Under Their Prying Eyes

A question nags me: "How do they classify spiders?"

"Currently, the identification feature for spiders is by observing their genitalia and comparing them with existing records," clarifies Javed and the obvious way to scrutinise is by dissection. "The process of excising these spiders is laborious and critical. Often we have only a single holotype (specimen) at hand, and there is no room for mistakes," explains this self-taught naturalist, who admits to martyring two common household spiders during his learning period.

"The specimen is just a few millimetres in length, and their genitalia is minute. There is no scope for the lab to have air conditioners or fans as they can dry up or blow away the specimen. A typical dissection takes 4-5 hours, during which I am bending over the microscope, cramped and watchful not to breathe hard even!" says Javed.

The discomfort heightens during sweltering summers, "I do not hesitate to take my shirt off, for fear of losing the specimen, lest sweat messes with it," he elaborates. "All under their prying eyes!" he adds jokingly.

Did You Know?

Spiders have been to space! A type of jumping spider belonging to the *Phidippus* group was chosen for space travel along with astronaut Sunita Williams.

Conducting and recording the required experiments on the ISS, Ms Williams released some fruit flies into a container holding the spiders to observe the effects of the absence of gravity on the spider's ability to capture its prey.

Evaluating the results from the video recordings made, in 2016, Dr. David E. Hill published a paper in the journal *Peckhamia*. He concludes that though gravity plays a role in the orientation of this spider's (*Phidippus*) preying mechanism, they can adhere to surfaces in space by relying on the van der Waal's forces under their feet, which is still functional in microgravity. The recordings also indicate that the spider goes through a couple of trial and error sequences before mastering the jump.

Moreover, upon returning to earth, the spider experienced disorientation and had difficulty in repeating the jumps in the presence of gravity!

Expedition 33 Commander Sunita Williams displays spider habitats containing jumping spiders for the YouTube Space Lab winning project by Amr Mohamed

(Credit:NASA)

A Web of Wonder

- Spider silk is a natural protein, incredibly strong and durable, with high tensile strength, comparable to steel and Kevlar.
- A lot of geometry and physics goes into spinning a web.
- All spiders do not make similar webs. Some are horizontal while others are vertical. Some have different symmetry, shape and thickness of silks. Some species weave a 3D tent-like web while others lay sheets of webs.
- Caerostris darwini is an inch sized spider found in Madagascar and is seen to make the largest known web covering a 30 square foot area which hangs from an 80 feet long anchor line made of silk.

Cyrthrachne sunjoymongai – the snail-like spider *(credit Sumukha JN)*

A Delicate Role to Play

Spiders play an important part in the environment. "Spiders are beneficial in the domestic and agri-based environment as free pest controllers arresting disease-causing infestations. They, in turn, are a food source for bigger insects, birds and amphibians maintaining the delicate balance," explains Javed.

In a recent study released in *The Science of Nature*, it was shown that spiders eat an estimated 400-800 million metric tonnes of insects annually.

Habitats in Danger

My next query is evident: "Are the spiders at risk?"

"I would say their habitats are in danger. We are losing habitats at a faster pace than we are discovering species. It troubles me to realise that with rapid deforestation occurring all over, we may lose out on knowing many more fascinating creatures," expresses the concerned scientist.

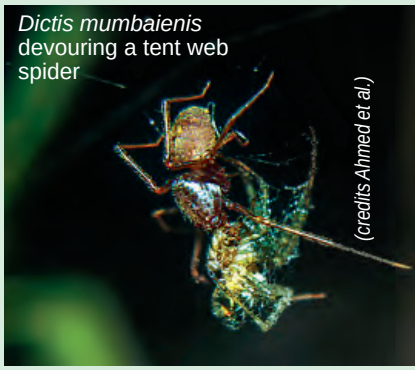
"While most conservation issues focus on large animals and their habitats, there is more to forests than the big animals. It is vital and equally important to pay heed to the habitats of the smaller creatures. Because without them there would be no pollination and in turn no forests! So these tiny organisms are the nuts and bolts of the eco-system, and if any one of them is undone, the entire system tumbles down," avers the biologist.

"Love them or loathe them, the cryptic vampires of the arthropods are here to stay," concludes the naturalist. I do not doubt the veracity of the statement.

By an uncanny coincidence, I spy a colourful spider, well concealed in the greenery in my garden, which rouses my curiosity. I wonder if it has a name. I ask, and get answers: it is a pest controller on board, saving my little green patch.

I silently offer my long overdue thanks.

Crafty Huntsmen and Non-fussy Eaters



Dictis mumbaienis devouring a tent web spider *(credits Ahmed et al.)*

Dictis mumbaienis, belonging to the group of spitting spiders, stands out for its unique way of hunting:

- Spotting a prey, the spider makes a quick run towards it, gauges the distance and runs back.
- Then it spits out its silk mixed with venom at the prey to stun and immobilise it.
- The spider then approaches the prey and injects the final dose of poison to kill it before having a lip-smacking dinner.

Some huntsmen type of spiders are web invading in nature:

- They evolve mechanisms to approach other spider webs and lodge themselves at the edge of it. (If the web is a clever trap for an innocent insect, it can be equally dangerous for a spider.)
- These spiders begin strumming the threads of the spider web in focus.
- At a particular frequency, they begin to imitate the vibrations of an insect struggling in the web. At this instance, when the spider comes out from the centre of the web to investigate it becomes the prey to the hunter.

Jumping spiders (*Brettus cingulatus* belongs to this group) are another group of master huntsmen.

- They have a remarkable orientation ability.
- To capture prey, they employ a mechanism taking gravity assistance.
- Using their silk as a dragline, they accurately calculate their jumps before pouncing on their victim and gobbling them up.

Opportunistic

Female spiders are much larger than the male spiders and also usually outnumber them. Growth in spiders is by moulting – casting off their carapace (exoskeleton). During such times, the female is weak and immobile.

The male spiders take this opportunity to mate with the females and run away quickly for fear of being eaten by them! This is another reason why male spiders are elusive, and unless the male and female are found together, biologists do not conclude them to belong to the same species.

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