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Captivity Induced Web Spinning of *Plexippus petersi (*Karsch,1878) (Jump/Zebra Spider) of Chennai, India

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

Plexippus petersi, common jump/zebra spider of Chennai households, belongs to the family of *Salticidae*. Though spinning of a web is considered to be an inbuilt feature of almost all the spiders, certain spiders do not spin typical webs, and *Plexippus petersi* is one of them. The present study was undertaken, to investigate if this species of spiders can build a web when exposed to any sort of calamity. In this regard, male and female spiders were carefully handpicked, identified and maintained under laboratory condition for a period of four days. After the experimental period, the spiders were relived from captivity and were individually photographed. During the experimental period, it was quite fascinating to observe that the female of this species, secreted silk threads from her abdominal glands, and were woven in to a sheet web. The silk of the web, was sticky in nature, white in color and was able to be molded in to long filamentous structure. This web spinning behavior was only observed in the female and not in male spiders. The results of this study precisely illustrate the fact that, when triggered under the pressure of a disaster, the female spiders can weave a web and evade any uncertainty This amusing observational study, gives a deeper acumen not only about the behavioral aspect, but also explains, the probable success of these tiny arachnids, in evolution which may be probably attributed to their jumping behavior and web building strategy of the females. The female spiders, seem to weave the web, not just for escape from predators, catching the prey, and protection of egg cases but also to escape from adversaries at uncertain times.

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1. INTRODUCTION

Spiders belong to arachnida of phylum arthropoda of invertebrates. The success of spiders in the evolution, may be attributed to their ability to produce silk which may have aided in adapting well to the ever-changing divergent environments [1]. Spiders have deeply ingrained the genes for silk production and web architecture in their genome, which over a period of time has contributed to their ecological succession [2, 3]. Spider webs are made of silk which has fibroin protein as its composition and is stored in specialized abdominal glands [4]. Silk production and web spinning is not just limited to spiders, dwelling in the open environment, but also can be observed in the smaller species, which regularly inhabit our common households. One such species which is quite frequent in Indian households particularly in Chennai, is the *Plexippus petersi,* commonly known as the jumping or zebra spider, belonging to the family of *Salticidae.* The male and females spiders of this species, measure approximately between 6mm-10mm in size, non poisonous, in nature and are frequently found on the walls and floors. As they jump when disturbed, they are often known as jump spiders. These spiders, possess abdominal silk producing glands [5], which help in spinning the web. They move freely on the floor and on the roof, capturing the prey, by sending out their silk thread secretions which almost dangle in the air to capture the prey [6]. As *Plexippus petersi c*aptures the prey using floating silk threads, and a typical conventional web may not be necessary for them. However, the females seem to weave a loose web, more like a retreat or to rest during night, and might later use the same to lay the eggs [7]. Jump spiders are grouped under the category of spiders, which don't establish conventional webs [8]. On the contrary there are many other spider species, which spin webs, to perform distinct tasks, such as capturing of prey, securing their off springs from dangers, and also as a safe rescue from predators [9]. There are instances, where some spiders spin eight different types of silk, which show properties such as flexibility, sticky web for capture of the prey, or sometimes, the silk may be strong and stiff so as to be constructed as a frame or as a safety line [10,11, 1,12]. All webs which are spinned by the spiders are not similar, in size or in shape and they can be of different types, such as, orb webs, cob webs, sheet like webs etc [13]. Apart from these, routine types, few other, intriguing categories of webs have also been identified *viz*: gum foot webs, platform webs, juvenile webs, and horizontal line webs [14]. Web spinning primarily may be for predation and safety, but there are certain bizarre instances, where in webs were spinned, when there was water flooding [15] and also when the spiders sense some kind of danger [16]. An interesting observation, by Anotaux et al. (2012) suggests that the pattern of weaving of webs, was influenced by the age of the spiders**.** From these studies, it is quite evident that webbing by spiders, is an integral trait, either for predation, safety or may be for breeding by the gravid females. However as there are also instances, where spiders have spinned webs, when threatened or during flooding, and therefore it may be hypothesized that, spiders might be able to spin webs, when encounter dicey situations such as captivity. To test this hypothesis, *Plexippus petersi,* was selected, as this spider is not a conventional web spinner, but to know, if would actually spin a web when in jeopardy*,* to avoid any adversity.

2. MATERIALS AND METHODS

Male and female Spiders were observed and identified using identification catalogues of Biswas and Biswas [17], Nentwig et al. [18] and Plantik (2007). The male spider is typically black in color characterized by vertical white color stripes, resembling zebra stripes and the female was dull brown in color without any such stripes on her body. Male and female spiders of the species, *Plexippus petersi* were frequently found in the floor and on walls of the interior of laboratory and often seen spinning webs on the walls. They were carefully picked using a dry soft paint brush. Later, were transferred in to two separate glass jars and the lids were closed. The lids were perforated with two fine holes for the easy passage of air. They were maintained under laboratory conditions for a period of four days (96 hrs). During this study, specifically no food was provided , as spiders are known to survive starvation but require water and this may be obtained from the moist web [19].During the experimental period it, was found that only the female spider had spun the web in the glass jar. After the experimental period, of 4 days, the male and female spiders were photographed using, Sanyo 24 Mega pixel camera of the make (VPCS1275) and the spiders were later set free.

No harm was caused to these arachnids during the observational study.

3. RESULTS

The present study was an observational analysis, where male and female spiders were separately maintained in different containers. After a period, of four days. it was found that the female spinned a visible dense sheet like web (Fig. 4) and this phenomenon of web spinning was not observed in case of males. This observation indicates that only the female can spin the web in captivity. The web was white in color, sheet like in appearance and sticky in texture. When the web was removed it was able to be molded in to long strand as presented in the Figs 6 and 7. Fig-6, depicts the loose web resembling sheet web, which was spinned by the female on the roof, when she was free. This resembles the sheet like web spinned by the female as in Figs-4 and 5.

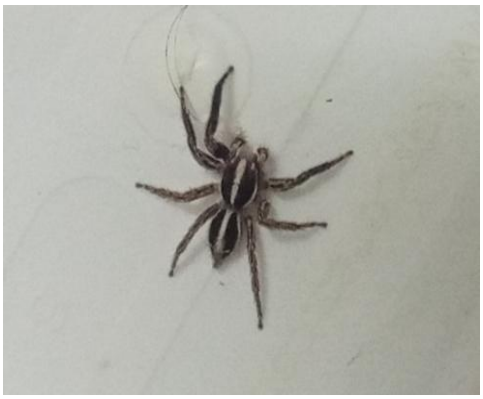

Fig. 1. (Male Dorsal View)

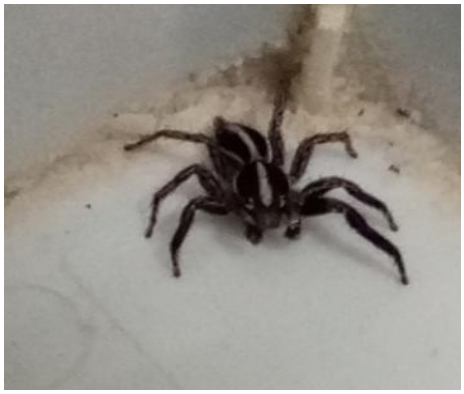

Fig. 2. (Male - Frontal View)

Fig. 3. Female spining the web

Fig. 4. Sheet like Web

Fig. 5. Female inside a web in captivity

Fig. 6. Natural web by the female

Fig. 7. Natural web, when removed was white in color

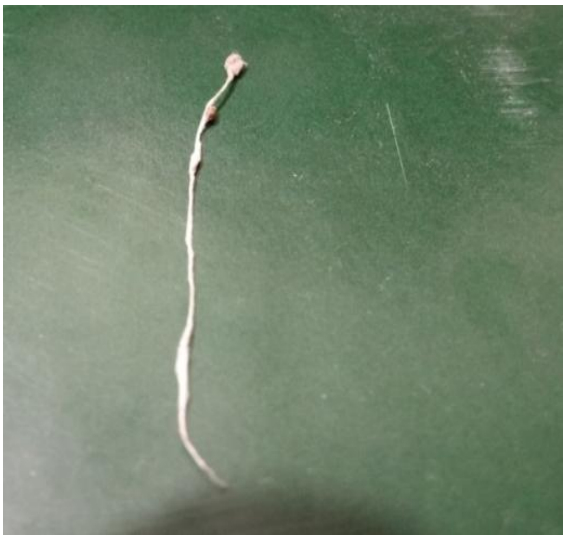

Fig. 8. Sticky web, molded as a thread/fibre

4. DISCUSSION

The present study, was an observational analysis, where in the web spinning behavior of male and female spiders of the species *Plexippus petersi* was studied under a simulated impasse i.e. captivity. The male and female spiders were maintained in captivity for four days. This study presented interesting results. The female spider alone, spinned a web around it, and males did not show this spinning behavior. The spinned web was made of silk, white in color and sticky in texture. When the appearance of the web was analyzed, it had a sheet like appearance which seemed to be similar to the webs of spiders belonging to the family *Lyniphidae* [13]. While the males which were in captivity did not show any kind of webbing. This discrepancy in web building, probably attributed to the general male behavior, of wandering around in search of mates, being mobile and majority of the them die after mating [10] and so don't seem to need a web. This is in sharp contrast to that of the female behavior which most of the time, is stationary and spinning a web either for predation, protection or for laying eggs. This is in accordance with the observation of Ben Cost, [15] who suggested that, spiders can spin long continuous webs, when they become vulnerable. In recent times, there was an instance, where in different species of spiders when exposed to flood waters have woven continuous long sheets of webs, which helped the spiders to move within the web, without actually being touched by waters. This bizarre observation was reported in June 2021, [20] in Gippsland, of Victoria in Australia. It was reported that, next day after heavy rains, the spiders in this region, reportedly indulged in a unique survival strategy known as "Ballooning", where the spiders weaved long veil like webs, from end of the tree to another. These webs were massive and some extended up to one kilometer and were sheet like in appearance. This ballooning phenomenon, played to the spiders advantage, as they could move along these webs, without absolutely being drenched in the waters. An interesting observation made by Gordus, [21] suggests that the abstract shapes, during web spinning, seem to be stimulated by some kind of spatial memory, rather than the visual stimulus. Therefore in the present observational study, as hypothesized females of *Plexippus petersi* weaved a web, in captivity, which may be due the hair sensors, or due to the spatial memory of the spider which might have triggered the spinnerets to spin a web. This sheet like web, seems to have provided a safe guard for the spider from unexpected, deadly mishaps. It is quite admirable to note that the jump spiders, which in actuality are not conventional web spinners, were able to weave a sheet like web, when there was an endangerment. Web spinning trait of *Plexippus petersi* seems to be restricted only to the females, probably because they are liable as the perpetuators of their own clan and males, on the other hand, were unable to spin a web, even in captivity, as they are mostly mobile and majority of times, die after mating as discussed earlier. In summary it may be said that the females of *Plexippus petersi* seem to be

better adapted to evade any crises, as they are bestowed with the capability to spin web whenever there is an urgency.

5. CONCLUSION

This observational study, gives a deeper insight in to the lives of *Plexippus petersi*. The common jump spiders of Chennai households. The success of these tiny arachnids in evolution may be attributed to their jumping trait, which enables them, to avoid danger and also the web spinning property as a effective game plan to evade any catastrophes.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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