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BIO 205 AB

The Salticidae's Different Courtships and Ways to Find a Mate

In the taxonomic group of Arachnids, there is a unique family known as Salticidae (also known as jumping spiders) who "have a striking sexual dimorphism in which males possess species-typical, extravagant and exaggerated morphological modifications of limbs, pedipalps, mouthparts and abdomen, including bright and contrasting colors" (Elias et al. 2005). Known for their elaborate, complicated, and versatile courtship behavior, it was originally thought that their courtship was vision-based. The jumping spiders "possess a pair of large, frontal eyes (principal eyes) that form true images upon a retina and are specialized for high-resolution vision and include adaptations for color vision, image focusing, and a telephoto lens providing jumping spiders with visual capacities comparable to many vertebrate eyes" (Elias et al. 2005). Their secondary eyes (lateral and posterior median eyes) are "adapted for high temporal resolution and movement detection" (Elias et al. 2005). Their vision helps them in capturing prey and finding a mate. However, more studies showed that different genus of jumping spiders use different tactics in choosing their mate including using seismic signals (ground vibrations), odor, and silk-borne signaling.

Though jumping spiders have many ways of finding and courting a mate, they will rarely use two different ways in obtaining a mate. For example, because of their vision, one specie called the *Phintella piatensis* detects his mate based on what he sees (Nelson and Jackson 2008). He uses different types of courtships based on the female's location (away or in a nest) and on her state of maturity.

When a male encounters a female away from a nest, he begins in Position 2 ("legs held 45° to side; kept about parallel to substrate or angling up by as much as 60°") while the female watches ("anterior-medial eyes aligned with another spider") before going into Position 2 herself (Nelson and Jackson 2008). He would then perform zigzag dancing ("while raised, tiptoe or sprawled posturing, the spider rapidly and alternately walked in a smooth motion 5-20 mm to one side and then the other side"), tiptoe posturing ("all legs extended almost straight down with tarsi two, three, and four on the substrate"), a sprawled posture (second and fourth legs "extended widely out from the body with only slight flexion evident"), and Position 1 ("legs held parallel to substrate, or angling slightly down, and either extending almost directly forward or angling slightly inward toward each other") whenever he is close to the female (Nelson and Jackson 2008). While the female watches, the male twitches and flutters their abdomens. During this time, the female can flee which ends the mating session since the male will not go after her. If she does not, then the male will zigzag around her until she feels quiescent, and then they will mate.

If a male finds a female in a nest, then the courtship will start off the same way with the male being in Position 2. However, he will not perform a long courtship like he would if the female was not near a nest. He will maintain a tiptoe posture while "probing the silk with his pals, legs, or both" (Nelson and Jackson 2008). He will then ease his way towards the female. If he moves too fast, the female will become too agitated and will end the mating session. If the female remains quiescent, they will eventually mate.

Though both seem like effective mating methods, males are more likely to perform their courtship when females are in or near a nest due to their fear of predators. When the scientists tested the *Phintella piatensis's* nests, they discovered that it is a haven from predators since the only way they could break it is with scissors. Even though they are good at sensing movement, while performing their courtship outside of a nest, they are too busy focusing on their long and complex courtship which makes them vulnerable.

Similarly to those jumping spiders, another genus species known as *Myrmarachne assimilis* used vision when finding a mate outside of a nest and silk-borne signals when finding a mate inside or near a nest (Nelson and Jackson 2007). Though they had the same enemies as the *Phintela piantensis* and preferred to mate in nests to protect themselves, *M. assimilis* had a less likely chance of dying from their predator (*Oecophylla smaragdina* or the weaver ant) because their appearance closely resembles their enemy.

They also approach their mate in different ways. When a female is outside of the nest, the male will begin in Position 3 ("legs held 90º to side and about parallel to substrate or angling up by as much as 50º") and erect legs 1 ("all joints distal to the patella fully extended but femur-patella joint sometimes flexed") (Nelson and Jackson 2007). He will then flutter his abdomens, prevent the female from escaping, and then mating. When a female is inside of a nest, the male will stay by the door while fluttering his abdomens until the female is calm enough when he can mate with her.

Another way jumping spiders find mates (particularly, the *Portia* species) is based on "chemical traces left behind on draglines or nest silk" (Jackson and Cross 2011). Using the scent from the chemical traces, they can tell whether or not the other spider is a potential prey, a potential predator, or a potential mate. When scientists tested this, they found that it was mostly the males who used scent when finding a mate. Females did not react when they could smell the scent of males of their same species, but it could be because females are less aggressive in initiating courtship or because they are more choosy. On the other hand, when two males smelled a female of the same species as them, they would fight for her because females are an important resource to males.

Another genus species that uses scent when finding a mate is called *Cybra.* By using chemoreception (detecting chemical stimuli in an environment) and olfactory pheromones, they can "discriminate between conspecific (same species) and heterospecific (different species) individuals, familiar and unfamiliar rivals, and own an other conspecific individuals' eggs and draglines, as well as determining what a potential mate has been eating and even determining the fighting ability of a rival" (Cerveira and Jackson 2012). Because of this, a male is less likely to fight off other males for a female since chemoreception helps him in identifying his preferred mate. Another reason why the males use this strategy in finding a mate is because they live in a dimly lit microhabitat so they must rely on their sense of smell.

When scientists tested the odors with the males, the result was that the males would be attracted to conspecific females but not heterospecific females or conspecific males. They also found that females who mated prior to the experiment were less likely to court with males during the experiment. Although it is fully understood on how the "sense organs mediate chemoreception […], tarsal organs (small pits on the dorsal side of each leg tarsus) appear to function as primary olfactory receptors and specialized hairs (tip pore sensilla) on the distal segments of the spider's pals and forelegs appear to function as primary contact chemoreceptors" (Cerveira and Jackson 2012).

Another species, known as the *Habronattus dossenus,* finds their mate using seismic signals. While performing "stereotyped movements of their multicolored leg and body parts", they perform it to the seismic signals ("self-generated vibrations that are transmitted through a solid substrate such as soil, sand, plants, and so forth") (Elias et al. 2005). When scientists tested the effects of seismic signaling in mating, they found that the *H. dossenus* that were not mute (meaning that they could produce seismic signals) had a higher chance of copulation than those that were mute (could not perform seismic signals but could produce visual signals). However, there were some muted males that still had successful copulations which shows that seismic signals is not absolutely necessary. The results also showed two possible meanings of the seismic signaling. One meaning could be that it makes the species identity known. Another meaning could be that it shows the quality of the male which could be dangerous because usually a female will eat a low -quality male instead of mating with them. Also, a male that is in close proximity with a female can be dangerous since a male does it in order to try to mate with the female, but the female could end up eating the male.

The jumping spider is mainly known for their vision and has many ways of finding and courting with a mate because of it. However, because of the different species' preferences, the habitats that they live in, and where the mating is taking place, it is often common for them to use different strategies. Even though the *Phintella piatensis* and *Myrmarachne assimilis* use their vision in finding a mate, they may use silk-borne signaling when a female is in a nest in order to make sure the female stays in the nest. Because they live in a darker habitat, the *Portia* and *Cybra* use their sense of smell in finding a mate to make sure that their mate is not a predator. *Habronattus dossenus* use seismic signaling in order to let females know that they are not the enemy. Even though it may seem like one strategy is better than the other, in the end, they all reach their goal of mating with a female.

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Works Cited

Cerveira, A., & Jackson, R. (2013). Love is in the air: olfaction-based mate-odour identification by jumping spiders from the genus Cyrba. *Journal Of Ethology*, *31*(1), 29-34. doi:10.1007 s10164-012-0345-x

Elias, D. O., Hebets, E. A., Hoy, R. R., & Mason, A. C. (2005). Seismic signals are crucial for male mating success in a visual specialist jumping spider (Araneae: Salticidae). *Animal Behaviour*, *69*(4), 931-938. doi:10.1016/j.anbehav.2004.06.024

Jackson, R. R., & Cross, F. R. (2011). Olfaction-based mate-odor identification by jumping spiders from the genus Portia. *Journal Of Arachnology*, *39*(3), 439-443.

Nelson, X. J., & Jackson, R. R. (2007). Complex display behaviour during the intraspecific interactions of myrmecomorphic jumping spiders (Araneae, Salticidae). *Journal Of Natural History*, *41*(25-28), 1659-1678. doi:10.1080/00222930701450504

Nelson, X. J., & Jackson, R. R. (2009). The influence of ants on the mating strategy of a myrmecophilic jumping spider (Araneae, Salticidae). *Journal Of Natural History*, *43*(11/12), 713-735. doi:10.1080/00222930802610469