10-1-2017

Association of a White-banded Jumping Spider 'Hypoblemum albovittatum' (Salticidae: Araneomorphae: Aranaea) with an Anemone Stinkhorn Fungus 'Aseroe rubra' (Phallaceae: Basidiomycota)

Terry J. Annable

Avondale College of Higher Education, terry.annable@avondale.edu.au

Recommended Citation

Annable, T. J. (2017). Association of a white-banded jumping spider 'Hypoblemum albovittatum' (Salticidae: Araneomorphae: Aranaea) with an Anemone Stinkhorn Fungus 'Aseroe rubra' (Phallaceae: Basidiomycota). *The Victorian Naturalist, 134*(5), 150-152.

Association of a White-banded Jumping Spider *Hypoblemum albovittatum* (Salticidae: Araneomorphae: Aranaea) with an Anemone Stinkhorn Fungus *Aseroë rubra* (Phallaceae: Basidiomycota)

Introduction

Scientists have carried out research on the sensory biology of spiders for well over a century with some interesting results. Spiders in general are known now to have a good variety and number of sensory receptors. Most spiders have eight eyes, which in some species give nearly 360° vision, although other species have poor vision (e.g. Barth 2002; Framenau *et al.* 2014); cave-dwelling spiders may have little or no vision (Doran *et al.* 2001; Egan 2013; Framenau, *et al.* 2014). Certain spiders once were thought to be deaf (e.g. Pritchett 1904); but, some salticid spiders have a good sense of hearing, demonstrating an acoustic-triggered startle response (Shamble *et al.* 2016). The fact that some male salticids, e.g. *Maratus* species (Otto and Hill 2015), give remarkably colourful courtship displays suggests they have at least some degree of colour vision. This has been confirmed by several recent studies (e.g. Taylor 2016; Zurek *et al.* 2015). Salticid spiders are well-known to have elaborate vision-based predatory strategies (Cross *et al.* 2009; Zurek *et al.* 2015; Whyte and Anderson 2017). The giant-eyed Deinopidae species are also heavily dependent on vision for their net-casting behaviour (Whyte and Anderson, 2017). Spiders can discriminate between arthropod prey species, refusing to attack certain toxic species such as some cockroaches, butterflies and millipedes (pers. obs.; Vasconcellos-Neto and Lewinsohn 1984) suggesting they may have a sense of taste, although experiments by Toft (1999) suggest aversion memory is short-lived.

Spiders are well-known for their sense of temperature (e.g. Pocock 1893; Barth 2002). The detailed experiments conducted by Pritchett (1904) suggested the sense of smell is detected at numerous points of the body, including the legs. It now is believed that chemical communication probably is used by all spiders in functions such as attraction, detection, luring and avoidance (Cross *et al.* 2009; Uhl 2013). It is now known that a number of spiders use their olfactory senses to determine which prey to take, how much venom is needed for each, and even whether they have enough venom in their venom glands (Wullschleger and Nentwig 2002). The vital role of volatile pheromones in spider reproduction has been well studied in a number of species (Rao and Tietjen 1987; Prenter *et al.* 1994; Papke *et al.* 2001; Schulz 2004; Roberts and Uetz 2005; Gaskett 2007; Stoltz *et al.* 2007; Xiao *et al.* 2009; Chinta *et al.* 2010; Jerhot *et al.* 2010; Xiao *et al.* 2010; Hutton and Rypstra 2016). Spiders also have a number of well-developed mechanoreceptors (Barth 2002).

Observations

Around midday on 25 August 2016—a mild, dry, late-winter day with a temperature range of 2.9–26.6°C—a White-banded Jumping Spider *Hypoblemum albovittatum* was noticed jerkily moving around on a concrete tree-ring around the base of a small *Bougainvillea* bush in the author's back garden. The ring was surrounded by a Buffalo grass *Stenotaphrum secundatum* lawn and the soil inside the ring was covered by a layer of pine bark chips. The spider, although continuing to move around, remained in one area on the north-west margin of the ring. On closer inspection, a small but mature and colourful Anemone Stinkhorn *Aseroë rubra* was seen low down near ground level just inside the ring (Fig. 1). Observation over a period of half an hour showed that the spider remained mainly on the higher elevation concrete ring, but also moved around the fungus on the bark chips. The spider also moved over the outer rim of the concrete at times, where it couldn't see the fungus, but always returned closer to the fungus. At this point I had to leave but, on returning about 2 ½ hours later, it (apparently the same spider) was still near the fungus and remained in its vicinity for at least forty minutes. During the periods of observation, it never moved more than about 150 mm from the fungus, but it never came

Fig. 1. A 7 mm female White-banded Jumping Spider *Hypoblemum albovittatum* on the inside of a concrete tree-ring in close proximity to a mature Anemone Stinkhorn *Aseroë rubra* growing in bark chips.

closer than about 30 mm from the fungus. Two days later the fungus was decomposing and the spider could not be seen. At no time was the spider observed to capture any prey.

Discussion of author's observations

Hypoblemum albovittatum is one of at least 27 species of Salticidae observed in the Dora creek catchment in western Lake Macquarie (pers. obs.). This species has been observed frequently to range widely across the ground, up house walls, windows, trees, posts, fences etc. in pursuit of small arthropods such as chironomids (Chironomidae), mosquitos (Culicidae), ants (Formicidae), cluster bugs (Lygaeidae) and fungus gnats (Sciaridae) (pers. obs.). My observations of *H. albovittatum* show that its movements appear to be more or less random while foraging. It is evident that the spider observed here was not moving about randomly, but was persistently remaining within the vicinity of a sapromyiophilic stinkhorn fungus. Stinkhorn fungi of various species are known to emit volatile compounds such as oligosulphides, phenols, indoles, cresols and some of their derivatives (Johnson and Jürgens 2010; Pudil *et al.* 2014) that are malodorous to humans and act as attractants to flies. No other spider of any species was seen to exhibit such behaviour and no other explanation for this behaviour was thought likely. These observations suggest that salticid spiders such as *H. albovittatum* may not only have a good sense of smell but, possibly, an associated memory of smell. Whether the association of a smell with increased chance of catching prey is a learned behaviour or an instinctive behaviour is not known, but it is unlikely that the spider observed here had ever come in contact with *A. rubra* in the past as this is an uncommon fungal species in this area and was the first seen in this garden in thirteen years. It is possible that the spider had learned over previous hours or days that prey was more readily available near this particular stinkhorn. The fact that the spider moved out of the line of sight several times but then returned to close proximity suggests that it was odour rather than vision that was attracting the spider. As stinkhorn fungi decompose they are known to reduce their volatile emissions and to alter their composition (Johnson and Jürgens 2010), which may account for the absence of the spider at the fungus decomposition stage.

The increasing number of publications about olfaction within spiders suggest this sense is widespread in them. It is possible that any sense

of taste is associated with smell as both involve chemoreception and it is possible that spiders use both types of receptors in assessing the palatability of a given prey item. An observation of a possible unpalatability reaction was observed where a *H. albovittatum* spider was seen to pounce on a crawling termite but released it within about one tenth of a second.

References

Barth FG (2002) *A Spider's World: Senses and Behavior*, (translated from: *Sinne und Verhalten aus dem Leben einer Spinne*, 2001). (Springer-Verlag: Berlin)

Chinta SP, Goller S, Lux J, Funke S, Uhl G and Schulz S (2010) The sex pheromone of the wasp spider *Argiope bruennichi*. *Angewante Chemie International Edition*. **49,** 2033–2036.

Cross FR, Jackson RR and Pollard SD (2009) Vampire spiders: the advantage of being smelly. *American Arachnology* **78,** 15.

Doran NE, Richardson AMM and Swain R (2001) The reproductive behaviour of *Hickmania troglodytes*, the Tasmanian cave spider (Araneae, Austrochilidae). *Journal of Zoology* **253,** 405–418.

Egan J (2013) Cavern Creatures. *Australian Geographic* **112**, 22.

Framenau VW, Baehr BC and Zborowski P (2014) *A Guide to the Spiders of Australia.* (Reed New Holland: Sydney)

Gaskett AC (2007) Spider sex pheromones: emission, reception, structures and functions. *Biological Reviews* **82,** 26–48.

Hutton BA and Rypstra AL (2016) Courtship and the use of pheromones by *Pholcus manueli* (Araneae: Pholcidae). Short Communications. *Journal of Arachnology* **44,** 92–95.

Jerhot E, Stoltz JA, Andrade MCB and Schulz S (2010). Acylated serine derivatives: a unique class of arthropod pheromones of the Australian Redback Spider, *Latrodectus hasselti*. *Angewante Chemie International Edition* **49**, 2037–2040.

Johnson SD and Jürgens A (2010) Convergent evolution of carrion and faecal scent mimicry in fly-pollinated angiosperm flowers and a stinkhorn fungus. *South African Journal of Botany* **76,** 796–807.

Otto JC and Hill DE (2015) Two new peacock spiders of the *calcitrans* group from southern Queensland (Araneae: Salticidae: Euophryinae: *Maratus*). *Peckhamia* **121,** 1–34.

Papke MD, Riechert SE and Schulz S (2001) An airborne female pheromone associated with male attraction and courtship in a desert spider. *Animal Behaviour* **61**, 877–886.

Pocock RI (1893) Further notes and observations upon the instincts of some common English Spiders. *Nature* **49,** 60–63.

Prenter J, Elwood RW, Montgomery WI (1994) Assessments and decisions in *Metellina segmentata* (Araneae: Metidae): evidence of a pheromone involved in mate guarding. *Behavioural Ecology and Sociobiology* **35**, 39–43.

Pritchett AH (1904) Observations on Hearing and Smell in Spiders. *American Naturalist* **38**, 859–867.

Pudil F, Uvira R and Janda V (2014). Volatile Compounds in stinkhorn (*Phallus impudicus* L. ex pers.) at different stages of growth. *European Scientific Journal* **10**, 163–171.

Rao L and Tietjen WJ (1987) Preliminary isolation of male-inhibitory pheromone of the spider *Schizocosa ocreata* (Araneae, Lycosidae). *Journal of Chemical Ecology* **13**, 237–244.

Roberts JA and Uetz GW (2005) Information content of female chemical signals in the wolf spider, *Schizocosa ocreata*: male discrimination of reproductive state and receptivity. *Animal Behaviour* **70**, 217–223.

Schulz S (2004) Semiochemistry of spiders. In *Advances of chemical ecology*, pp. 110–150. Eds RT Cardé and JG Millar. (Cambridge University Press: Cambridge, UK)

Shamble PS, Menda G, Golde JR, Nitzany EL, Walden K, Beatus T, Elias DO, Cohen I, Miles RN and Hoy RR (2016) Airborne Acoustic Perception by a Jumping Spider. *Current Biology* **26**, 2913–2920.

Stoltz JA, McNeil JN and Andrade MCB (2007) Males assess chemical signals to discriminate just-mated females from virgins in redback spiders. *Animal Behaviour* **74**, 1669–1674.

Taylor LA, Amin Z, Maier EB, Byrne KJ and Morehouse NI (2016) Flexible color learning in an invertebrate predator: Jumping spiders can learn to prefer or avoid red during foraging. *Behavioral Ecology* **27**, 520–529.

Toft S (1999) Prey choice and spider fitness. *The Journal of Arachnology* **27**, 301–307.

Uhl G (2013) Spider Olfaction: Attracting, Detecting, Luring and Avoiding. In *Spider Ecophysiology*, pp. 141–157. Ed W Nentwig. (Springer: Berlin, Heidelberg)

Vasconcellos-Neto J and Lewinsohn TM (1984) Discrimination and release of unpalatable butterflies by *Nephila clavipes*, a neotropical orb-weaving spider. *Ecological Entomology* **9**, 337–344.

Whyte R and Anderson G (2017) *A Field Guide to Spiders of Australia*. (CSIRO Publishing: Clayton South, Victoria)

Wullschleger B and Nentwig W (2002) Influence of venom availability on a spider's prey-choice behaviour. *Functional Ecology* **16,** 802–807.

Xiao Y-H, Zhang J-X and Li S-Q (2009) A two-component female-based pheromone of the spider *Pholcus beijingensis*. *Journal of Chemical Ecology* **35**, 769–778.

Xiao Y-H, Zhang J-X and Li S-Q (2010) Male-specific (Z)-9-tricosene stimulates female mating behavior in the spider *Pholcus beijingensis*. *Proceedings of the Royal Society*, Series B **277,** 3009–3018.

Zurek DB, Cronin TW, Taylor LA, Byrne K, Sullivan M and Morehouse NI (2015) Spectral filtering enables trichromatic vision in colourful jumping spiders. *Current Biology* **25**, 403–404.

Terry Annable
Avondale College of Higher Education
582 Freemans Drive
Coorangbong, NSW 2265
tannable@avondale.edu.au