

Friend, foe or freeloader:

Using molecular methods and community science to investigate the ecological outcomes of a potential arachnid-plant commensalism

The flower crab spider, *Misumena vatia* (Clerck, 1757), is a classic character in spring and early summer invertebrate communities in the south of the UK. These spiders, notable for their colour changing camouflage (Packard, 1905; Riou & Christidès, 2010), spend their days hiding out atop open flower heads, legs outstretched ready to ambush unsuspecting flower visitors.

My work at Newcastle University focuses on commensalisms, an often overlooked and mischaracterised interaction in ecology (Mathis & Bronstein, 2024; Veiga, 2016) where one individual benefits, and the other is neutrally or not affected. In the case of *Misumena vatia*, they engage in a potentially commensal relationship with the flowers they sit atop. In this relationship, the spiders gain access to nutritious prey, but we have no idea whether this is to the detriment of the flower they occupy by limiting visits by potential pollinators.

In early May last year, I launched a community science scheme titled “Spider Spies” (<https://foragingecology.com/spider-spies/>) in which I’m asking members of the public, researchers and amateur arachnologists/entomologists to take photographs of flower crab spiders on their flowers. If they are willing, I am also asking people to send samples of flower crab spiders to us for molecular dietary analysis.

Community science projects such as this are a brilliant way of allowing people from all over the country to engage with nature and participate in research, whilst simultaneously collecting data across a range of locations that simply couldn’t be visited by a small research team. I’ve even had submissions from Spain and the USA! From the photographs submitted as part of this project, we can begin to understand the range of flowers that these spiders use and whether the spiders have preferences for certain species. I am also collecting data on the nutrients in the nectar of different flowers and the insect species that visit those flowers in fieldwork I am carrying out in Cornwall. By bringing these data together, we can start to piece together the factors influencing a flower crab spider’s choice of flower.

Although field observations and photographs are incredibly valuable, the spiders are the real stars of the show when it comes to information we can gain. In the Foraging Ecology Research Group, we specialise in using molecular analyses to understand interactions between species by studying the DNA within the guts of small invertebrate predators like spiders. We have been really lucky so far and have had requests for sample kits to collect *Misumena* individuals from all across England and Wales, I’ve been busy back and forth to my local post office shipping them out. With the spiders returned to us, we can use DNA metabarcoding, a technique that uses modern DNA sequencing methods to identify prey DNA from the spiders’ guts, to determine what they have been eating. We will be able to use this information to understand which prey the spiders prefer or avoid, and potentially why. In turn, we hope to be able to say something about whether the spiders are ‘friends’ to the flowers by protecting them from pests, whether they are ‘foes’ which preferentially eat the pollinators that are beneficial to the flowers, or whether they are in fact ‘freeloaders’, gaining access to invertebrates but having neither positive nor negative impacts.

We have had great engagement with the project so far! *Misumena vatia* activity is going to continue to peak through June, and some females will hang around well into autumn. So, if you’re out and about and see one of these crafty camouflage experts, please snap a photo of them and send it over using the link or QR code included in this article. If you are happy to collect spiders for us, use the same link to get a postage address or request a sample kit and return envelope.

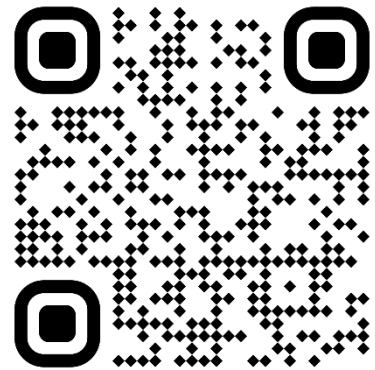
If you are not able to find any this year, then fear not! The project will be back next year too, when we hope to carry on this success.



Figure 1. Misumena vatia female with legs outstretched in wait for potential prey on a buttercup flower. Splattenridden Farm, Cornwall



Figure 2. Misumena vatia female processing a Rhingia campestris on a red campion flower. Splattenridden Farm, Cornwall



References:

- Mathis, K. A., & Bronstein, J. L. (2024). *Our Current Understanding of Commensalism*. 30, 49. <https://doi.org/10.1146/annurev-ecolsys-011720>
- Packard, A. S. (1905). Change of Color and Protective Coloration in a Flower-Spider. (Misumena vatia Thorell). *Source: Journal of the New York Entomological Society*, 13(2), 85–96.
- Riou, M., & Christidès, J. P. (2010). Cryptic Color Change in a Crab Spider (Misumena vatia): Identification and Quantification of Precursors and Ommochrome Pigments by HPLC. *Journal of Chemical Ecology*, 36(4), 412–423. <https://doi.org/10.1007/S10886-010-9765-7/FIGURES/5>
- Veiga, J. P. (2016). Commensalism, Amensalism, and Synnecrosis. In *Encyclopedia of Evolutionary Biology* (pp. 322–328). Elsevier Inc. <https://doi.org/10.1016/B978-0-12-800049-6.00189-X>