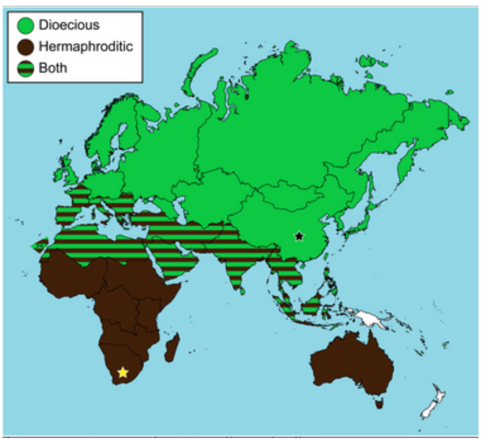
Highlighted Articles for February 2024

Recent evolutionary origins of dioecy in *Asparagus*



Philip C. Bentz et al. 2024. Young evolutionary origins of dioecy in the genus *Asparagus*. *American Journal of Botany* https://doi.org/10.1002/ajb2.16276

Dioecy (separate sexes) has evolved numerous times among angiosperms and is recently derived in many lineages. However, current understanding of the evolutionary mechanisms that drive the origins of dioecy in plants is limited. The recent and repeated evolution of dioecy across angiosperms offers an opportunity to study the factors influencing its evolution. *Asparagus* is an emergent model system for studying the evolution of dioecy in plants and the formation of sex chromosomes. Yet, estimates for the age and origins of dioecy in *Asparagus* are lacking. **Bentz et al. produced a plastome sequence phylogeny then performed divergence-time analyses and estimate that dioecy evolved once or twice approximately 2.78–3.78 million years ago in *Asparagus*,** which appears to be associated with rapid speciation and range expansion out of Africa. The authors also speculate that paleoclimatic oscillations throughout northern Africa may have helped set the stage for the origin(s) of dioecy in *Asparagus*. **The results reported in this study are foundational for future investigations of dioecy and sex chromosome evolution across the genus *Asparagus*.**

A rare carnivorous plant requires pollinators for sexual reproduction, but prey boosts reproductive success

For effective conservation management, it is important to understand the factors that limit the reproductive success of rare plants. In this study, H**amon et al. provided supplemental prey and pollen to wild Venus flytraps (*Dionaea muscipula*) to determine whether reproductive success in this rare carnivorous plant is more limited by insects as resources (prey) or as pollinators.** Plants that were given supplemental prey produced more flowers and had a higher overall estimate of reproductive success compared to control plants. The authors did not observe a significant effect of pollen supplementation on reproductive success. However, flowers that were bagged to prevent pollinator visitation produced almost no seeds, suggesting that *D. muscipula* reproduction depends on a mobile pollen vector. **By evaluating both sources of reproductive limitation simultaneously, these results point to the reliance of *D. muscipula* on insects as both prey and pollinators, and the need for conservation management that considers insect availability.**

Laura E. Hamon et al. 2024. As prey and pollinators, insects increase reproduction and allow for outcrossing in the carnivorous plant *Dionaea muscipula*. *American Journal of Botany* https://doi.org/10.1002/ajb2.16279

Glandular trichome evolution is a sticky subject

Glandular trichomes that emit sticky substances onto a plant's surface have long been thought to be involved in the defense of plants against herbivores. Few plants make a more exuberant display of sticky trichomes than the tarweeds (the Madiinae subtribe of Asteraceae), leading to the common perception that these trichomes must defend against the plant's main herbivores. **Using a combination of genetic correlations and within- and among-species comparisons of trichomes and herbivore resistance, Pearse et al. show that the reality is more complicated.** Within species, the main tarweed herbivores, caterpillars of Heliothine noctuid moths, are not deterred by stickier plant phenotypes. However, the among-species analysis found that stickier tarweeds were less palatable to these herbivores. This leads to a conundrum in which trichome stickiness helps determine herbivore pressure to a plant species, even if there is little evidence that selection due to those herbivores could result in that trait's evolution. **The authors hypothesize that glandular trichome exudates are likely related to other functions in tarweeds, such as indirect defense against herbivores and perhaps helping plants cope with hot, dry abiotic conditions.**
[Image credit: Ian Pearse (a flower bud of Calycadenia multiglandulosa*)]*

Ian S. Pearse et al. 2024. The evolution of glandularity as a defense against herbivores in the tarweed clade. https://doi.org/10.1002/ajb2.16281

After duplication, both *CYCLOIDEA* genes contribute to bilateral flower symmetry in Monkeyflowers

Taryn S. Dunivant et al. 2024. *CYCLOIDEA* paralogs function partially redundantly to specify dorsal flower development in *Mimulus lewisii*. https://doi.org/10.1002/ajb2.16271

Bilateral flower symmetry encourages precise interactions between flowers and pollinators, facilitating pollen movement and outcrossing. Most species in the mega-diverse lineage Lamiales (mints and allies) have bilaterally symmetrical flowers. *CYCLOIDEA* genes are known to be master regulators of flower symmetry in Lamiales, but multiple *CYCLOIDEA* gene duplications in this group raise the question of how symmetry development remains robust in the face of these genomic alterations. **Dunivant et al. used Lewis's Monkeyflower (*Mimulus lewisii*) as a model to determine how flower symmetry is properly patterned when duplicated *CYCLOIDEA* genes (*MlCYC2A* and *MlCYC2B*) are at play.** They used RNA interference to silence each of the duplicated genes independently and in combination. They discovered that while one of the gene copies (MlCYC2B) does most of the heavy lifting in shaping symmetry, both genes are still required for proper development of the Monkeyflower corolla. Additional results suggest a *MlCYC2A-MlCYC2B* regulatory interaction that may affect floral symmetry pathway homeostasis. **These results represent a valuable addition to our understanding of the functional consequence of *CYCLOIDEA* gene duplication in the Lamiales.**