

OBSERVATIONS OF NEW *RORIDULA* SYMBIOTES

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General overview of *Roridula* commensalism

The two species of *Roridula* are medium South African shrubs capable of trapping various small organisms on their resinous leaves. In its native range, the genus *Roridula* has been noted by various authors as having co-evolved with *Pameridea* spp. (Miridae) “mirid bugs” in an arrangement that allows the bugs to feed on the trapped insects, and for the plants to gain nutrients from the insects it traps via fecal fertilization courtesy of the mirid bugs (China & Carvalho 1951; China 1953). A third organism, a spider (*Synaema marlothii*), serves as a limiting factor on the *Pameridea* populations and is endemic to *Roridula* spp. in South African fynbos. This somewhat complex structure of inter-dependence was thought to be limited to the previously discussed three species through a textbook-perfect example of co-evolution and co-dependence between the aforementioned three organisms (Ellis & Midgley 1996). However, after recent observations by the author in Southern California, it appears that this commensal organization of [*Roridula* + Miridae + spiders] is less rigid in terms of which species participate than previously thought. In a broader sense, these and other to-be-discussed observations point to the idea that “assisted carnivory” in plants via generalist Miridae interaction is much more common than previously thought, and that mutualism between plants and Miridae bugs deserves greater scrutiny.

For example:

Native South African organization: (A) *Roridula dentata/gorgonias*, (B) *Pameridea roridulae/P. marlothii*, (C) *Synaema marlothii*.

Organization observed in Southern California: (A) *Roridula dentata/gorgonias*, (B) *Cyrtopeltis* sp. (Figs. 3 & 4), (C) *Peucetia longipalpis* (Figs. 1 & 2).

Roridula observations in Southern California

Over the course of the last 18 months (starting in September 2015), I have observed established, multi-generational populations of *Cyrtopeltis* sp. (Marsh 2016; Hand 2013) living on cultivated specimens of both *Roridula dentata* (a multi branched shrub ~1 m tall) and *R. gorgonias* (a small plant ~40 cm tall). This is a noteworthy observation, because according to Siggie Hartmeyer, a respected author on the subject, *Cyrtopeltis* are known to live on carnivorous plants with aqueous mucilage, while *Pameridea* are adapted to resinous glue, possessing an epicuticular greasy secretion to avoid sticking to the resin (Voigt & Gorb 2008; Hartmeyer 1996). On *Roridula*, these quick moving *Cyrtopeltis* insects are easily observed and are found most commonly around freshly-dead prey items, on the underside of leaves, or in leaf axils. The *Cyrtopeltis* average 4 generations of insects per plant per season, with population density peaking in the warmest summer months. Remarkably, as mentioned, observations conclude that these insects are completely uninhibited by the resinous glands of the *Roridula* plant that trap many other arthropods. The *Cyrtopeltis* nymphs tend to live closer to the main stem than adult counterparts. I have never seen *Pameridea* in person, but it appears that these *Cyrtopeltis* are inhabiting the exact ecological niche that has been exploited by *Pameridea roridulae* and *P. marlothii* in the veldts of South Africa.



Figure 1: *Peuceetia longipalps* resting on *Roridula dentata* in Long Beach, California.



Figure 2: *Peuceetia longipalps* and a shed skin, illustrating the fact that this spider does in fact live on, in, and amongst this *Roridula dentata* in Long Beach, California.



Figure 3: A *Cyrtopeltis* sp. nymph feeding on a prey item on a cultivated *Roridula dentata* in Long Beach, California.



Figure 4: A *Cyrtopeltis* sp. living on the underside of *Roridula gorgonias*.

In addition to the Miridae bugs, young *Peuceetia longipalps* spiders have been reliably observed living among my *Roridula* specimens. This species of spider appears uninhibited by the sticky glands of the *Roridula* plants. On my larger *R. dentata*, up to 2 spiders have been observed living together simultaneously. On my smaller *R. gorgonias*, only 1 young spider has thus far been observed. These *Peuceetia* spiders weave minimal web structure, and instead wait for the plants to trap small flying insects. Notably, the spiders have invariably left the confines of the *Roridula* plants as their maturity develops. I have never observed adult *Peuceetia* spiders on *Roridula*.

Whereas the *Cyrtopeltis* wait for the insects to die before swarming the body for consumption, *Peuceetia* seem attracted to the vibrations of struggling prey, and rush to consume recently trapped insects. Interestingly, I have observed *Peuceetia* preying on *Cyrtopeltis* nymphs which are unable to fly away from the larger predator. This behavior is similar to reports on the behavior of the native South African *Synaema marlothii* spider in relation to *Pameridea* bugs on wild *Roridula* stands (Lloyd 1934; Rice 2016).

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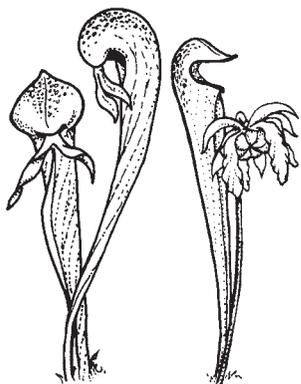
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Front Cover: Upper half: *Dionaea* habitat in the zone between a pocosin and longleaf pine savannah in the Green Swamp, Brunswick County, North Carolina in 1974. The young man in the photograph is Frank Lichtner studying the prey captured by *Dionaea*. Lower right: Another *Dionaea* habitat area, overgrown by grass that will eventually shade out the *Dionaea* if there is no fire. Lower left: A *Dionaea* plant in the Green Swamp (Cover of *Science* 1218(4577)10/12/1982. Reprinted with permission from AAAS). Article on page 44.

Back Cover: A three-year-old juvenile specimen of *Roridula gorgonias* in cultivation. Photo by Barry Rice. Article on page 74.

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