

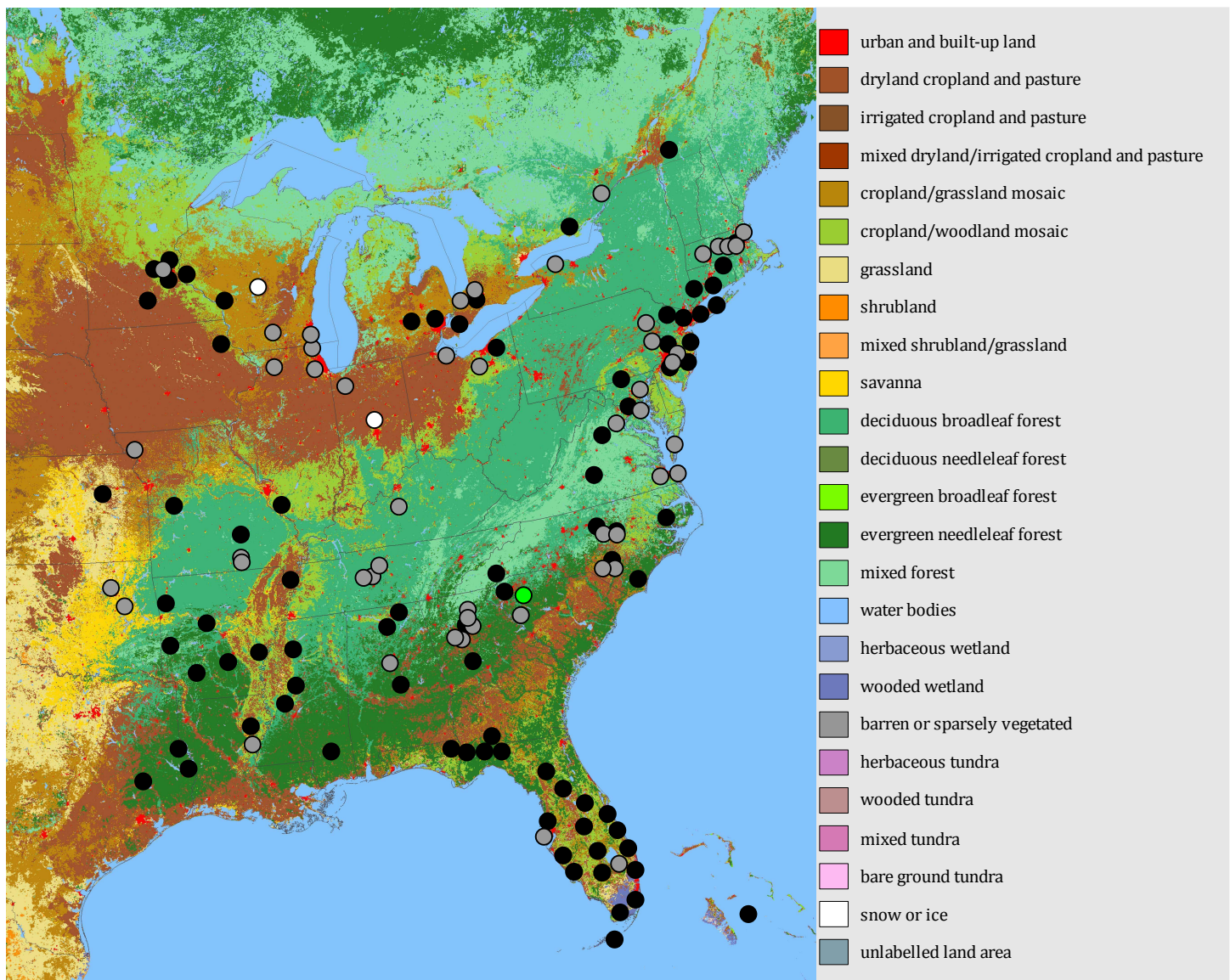
## Notes on *Hentzia mitrata* (Hentz 1846) (Araneae: Salticidae: Dendryphantinae)<sup>1</sup>

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The 21–22 known species of the dendryphantine *Hentzia* Marx 1883 have primarily a Caribbean to circum-Caribbean distribution (Richman 1989, 2010, Hedin and Maddison 2001, Platnick 2011, Prószyński 2011). Two related species placed in the *palmarum* group, *H. palmarum* (Hentz 1832) and *H. mitrata* (Hentz 1846) are widely distributed across eastern North America, both in association with shrubs and trees (Richman 1989, Figure 1).



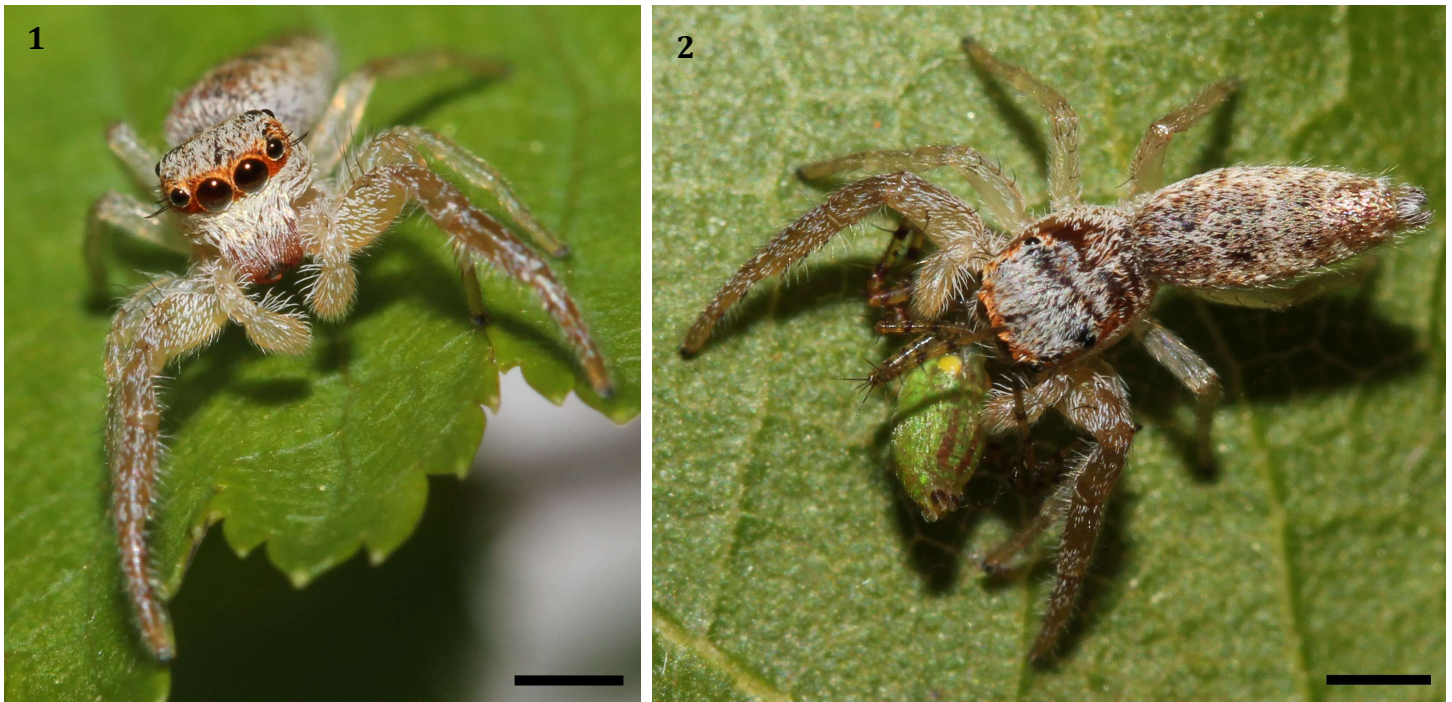
**Figure 1.** Distribution of *Hentzia mitrata*. Records presented by Richman (1989) are shown in black and white. Newer records posted with photographic documentation on the internet (primarily at FLICKR and BugGuide sites) are shown in grey. The Greenville County, South Carolina site associated with these notes is highlighted in bright green. The background image was created with a National Atlas tool (<http://www.nationalatlas.gov/mapmaker>) using USGS 1992 1 km landcover data.

*Attus mitratus* was originally described by Hentz (1846), and was still listed as a South Carolina spider under *Attus* by Howard (1883, attributed to Marx) when he first applied the generic name *Hentzia*, to *H. palmarum*. It was later placed in Howard's genus *Hentzia* by Chickering (1944). In Greenville County, South Carolina, I have found these spiders to be present in considerable numbers on shrubs and small trees in the broadleaf deciduous forest understory, particularly near sunlit forest margins, and near creeks. Adult males seem to be most plentiful here from April to early May.

Unless otherwise indicated, photographs shown here were taken indoors, with captured spiders released on plants similar to those on which they were found. Most individuals were captured in the penultimate instar, and reared in Petri dishes to maturity.

### *General appearance*

*Hentzia mitrata* is a relatively small (3–5 mm body length) salticid, but the males have impressive, long front legs with long white fringes and can appear to be much larger. These legs are boldly extended and waved as they move about on leaf surfaces. Representative spiders are illustrated in Figures 2–4. An introductory video of these spiders is also available on the internet (Walton 2001–2002).



**Figure 2.** Two views of a penultimate male *Hentzia mitrata*. Some of the orange carapacial scales (in a band, around the eyes) and the long white clypeal setae that are found in the adult can be seen at this stage, which otherwise looks much like an adult female. Similarity to an adult female may prevent competitive contests with other males in the vicinity. Note the characteristic dark, lateral carapacial setae behind the ALE, and beneath the PME. In (2), this spider was feeding on a captured spider (Oxyopidae: immature *Peucetia viridans*). As in subsequent photographs, unlabelled scale bars are 1.0 mm.



**Figure 3.** Three different (1–4, 5–6, 7–8) adult male *Hentzia mitrata*, showing some of their variation in size and appearance. As males walk about on plants, presumably in search of females or other males, legs I are often extended in a *calipers* position (3, 6), then suddenly separated to a wider position (7, 8). Slight banding of the opisthosoma as described for this species is only evident for the first male (1–4). Some males were even larger than the third one shown here (7–8). Light brown scales covered much of the ocular quadrangle of the first male. In some localities, brown scales may completely replace the orange scales. No prognathous males were found in this area.



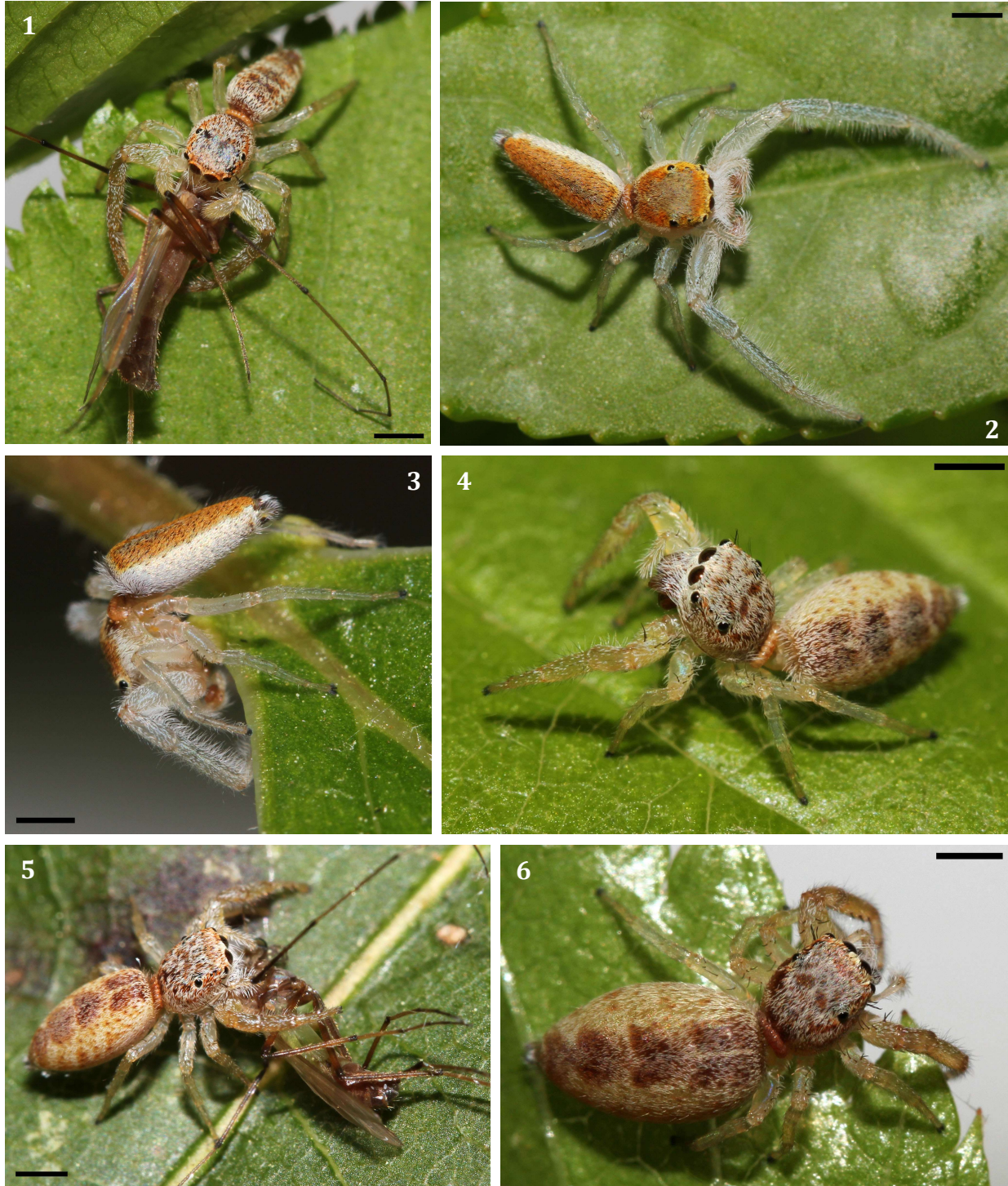
**Figure 4.** Three different (1, 2–6, 7–9) adult female *Hentzia mitrata*. Most individuals encountered were darker (1–6), but some bore more light-colored scales (7–9). In (4), you can see the characteristic dark carapacial setae behind the PLE. *Hentzia* have spatulate setae of unknown function under the femur and patella of leg I, and these can be seen for RI in (5). Females sometimes (9) displayed a *calipers* position with the relatively long legs I, similar to the calipers display of the male.

### *Mantispid infestation*

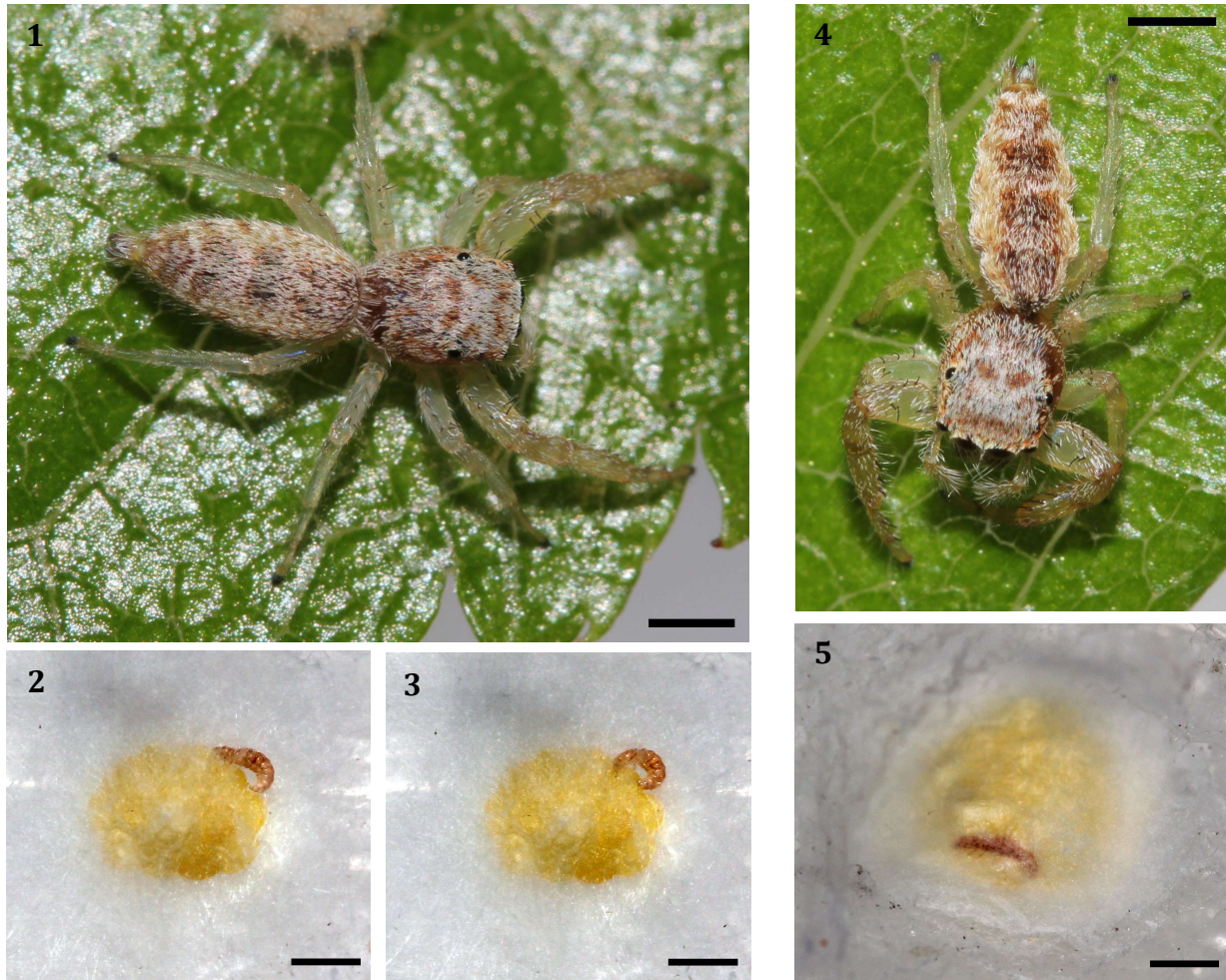
Of 12 *H. mitrata* that I captured locally for observation, 4 (1 penultimate male, 1 penultimate female, and 3 adult females) were each carrying a single first-instar triungulin larva of a mantispid (Neuroptera: Mantispidae), cf. *Leptomantispa pulchella* (Banks), around the pedicel (Figure 5). The only other salticid that I found carrying a similar triungulin larva was an adult male *Maevia inclemens* (Walckenaer 1837), in the same forest understory habitat. Triungulin larvae of mantispids are known to infest many different spiders, including a number of salticids (Rice 1985, Redborg & MacLeod 1984, 1985, Rice & Peck 1991, Cannings & Cannings 2006). There is good evidence that these larvae are not only phoretic with respect to the spiders that carry them, but also draw some fluid and nutrition (Redborg & MacLeod 1984).

Given the small size of *Hentzia*, I thought it unlikely that any of their triungulin parasites could survive to

maturity once they dropped off the females to feed upon their eggs (Figure 6). Redborg and MacLeod had previously (1985) reported that, although adult size was highly variable as a function of the quantity of spider eggs available, a minimum of 30 *Achaearanea* eggs was required for successful development of *Dicromantispa uhleri*. However, one mantispid (Figure 7) was able to reach maturity after feeding on a brood sac containing only about 15 *H. mitrata* eggs. Note that *D. uhleri* is viewed as a synonym of *D. sayi*, but this is not universally accepted (Norm Penny, personal communication).



**Figure 5.** *H. mitrata* carrying mantispid triungulin larvae. **1**, Penultimate male feeding on a nematoceran. **2–3**, The same male (**1**) as an adult several weeks later, still carrying the larva. **4**, Adult female. **5**, Penultimate female feeding on a nematoceran. **6**, The same female (**5**) as an adult several weeks later.



**Figure 6.** Two different female *H. mitrata* and views of their respective egg sacs after oviposition. **1–3,** Female shown in Figure 5 (4) after laying eggs. **4–5,** Female shown in Figure 5 (5–6) after laying eggs. Note the extreme shrinkage of the opisthosoma in this female. In both cases, the triungulin larva dropped off of the female and moved to the eggs in the respective egg sac soon after they were deposited. A comparison of (2) and (3) shows active movement of the larva, however this larva died without pupating and damaged few eggs if any. None of the eggs in this sac developed and it is likely that they were infertile. The second larva (5) fed on all of the available eggs, then formed a small cocoon, emerging as an actively-feeding adult about 22 days after it started to feed on the eggs (Figure 7). Each egg sac contained about 15 eggs.

The size of this adult mantispid, which agrees generally with the description of *Leptomantispa pulchella* (Banks) (Cannings & Cannings 2006, Crosswell 2011), was far below the minimum size reported by Redborg and MacLeod for *D. uhleri*. *L. pulchella*, known to parasitize salticids, is one of the smaller mantispids, typically with a body length of 12–14 mm (Crosswell 2011) Smaller individuals in the size range of this adult are known, however. Other mantispids found in South Carolina (Figure 7, 5–6) are larger, with more robust appendages. All are parasites on spiders.



**Figure 7.** 1–4, Four views of the small mantispid, *cf. Leptomantispa pulchella* (Banks) that emerged after feeding on the eggs of the female *H. mitrata* shown in Figure 6 (5). The same animal can be seen as a triungulin larva in Figure 5 (5–6). 1, Typical pose, ready to strike. This mantispid had recently devoured a nematoceran of its own size. 2, Grooming. 3, Stretching its raptorial legs I. 4, Drinking from a water droplet on the surface of a leaf. 5–6, Two other mantispids from Abbeville County, South Carolina, for comparison. 5, *Climaciella brunnea* (Say), a species that resembles a polistine wasp. 6, *Zeugomantispa minuta* (Fabricius) (= *Mantispa viridis*). All three species are known to parasitize spiders (Davidson 1969, Cannings & Cannings 2006). In upstate South Carolina, Brushwein *et al.* (1992) found *Z. minuta* in the egg sacs of four species of salticids: *Habronattus coecatus* (Hentz 1846), *Phidippus clarus* Keyserling 1885, *Phidippus mystaceus* (Hentz 1846) and *Plexippus paykulli* (Audouin 1826). Photos 5–6 Copyright © Kim Fleming, used under a [Creative Commons Attribution-NonCommercial-ShareAlike 2.0 Generic](https://creativecommons.org/licenses/by-nc-sa/2.0/) license.

### Bridging

Like the dendryphantines *Eris* (Hill 2008) and *Pelegrina* (personal observations), *Hentzia* frequently bridge between plants (Figure 8). This bridging behavior has three stages: 1, Fine silk released from the spinnerets is pulled out in the wind. Indoors, I have been able to pull out this silk mechanically and attach it to a nearby object. 2, The spider turns and winds up this silk to pull the bridge line taut. 3, The spider rapidly runs along the underside of the bridge line to the position to which the silk has attached. The distance thus attained varies from about 10 cm to several meters.

Bridging may turn into unintended ballooning if silk is caught up by a strong, rising air current. Thus the high frequency of ballooning behavior, along with the typical south-to-north movement of tropical storms and hurricanes in the Caribbean, may account for the wide distribution of *Hentzia* species across many Caribbean islands.



**Figure 8.** Bridging behavior by an adult male *H. mitrata*. **1**, Letting out silk lines in the wind. Often, this is done from beneath the edge of a leaf, with the opisthosoma in a vertical position above the leaf edge. **2**, Reeling in slack silk. This is wound into a compact mass beneath the spider.

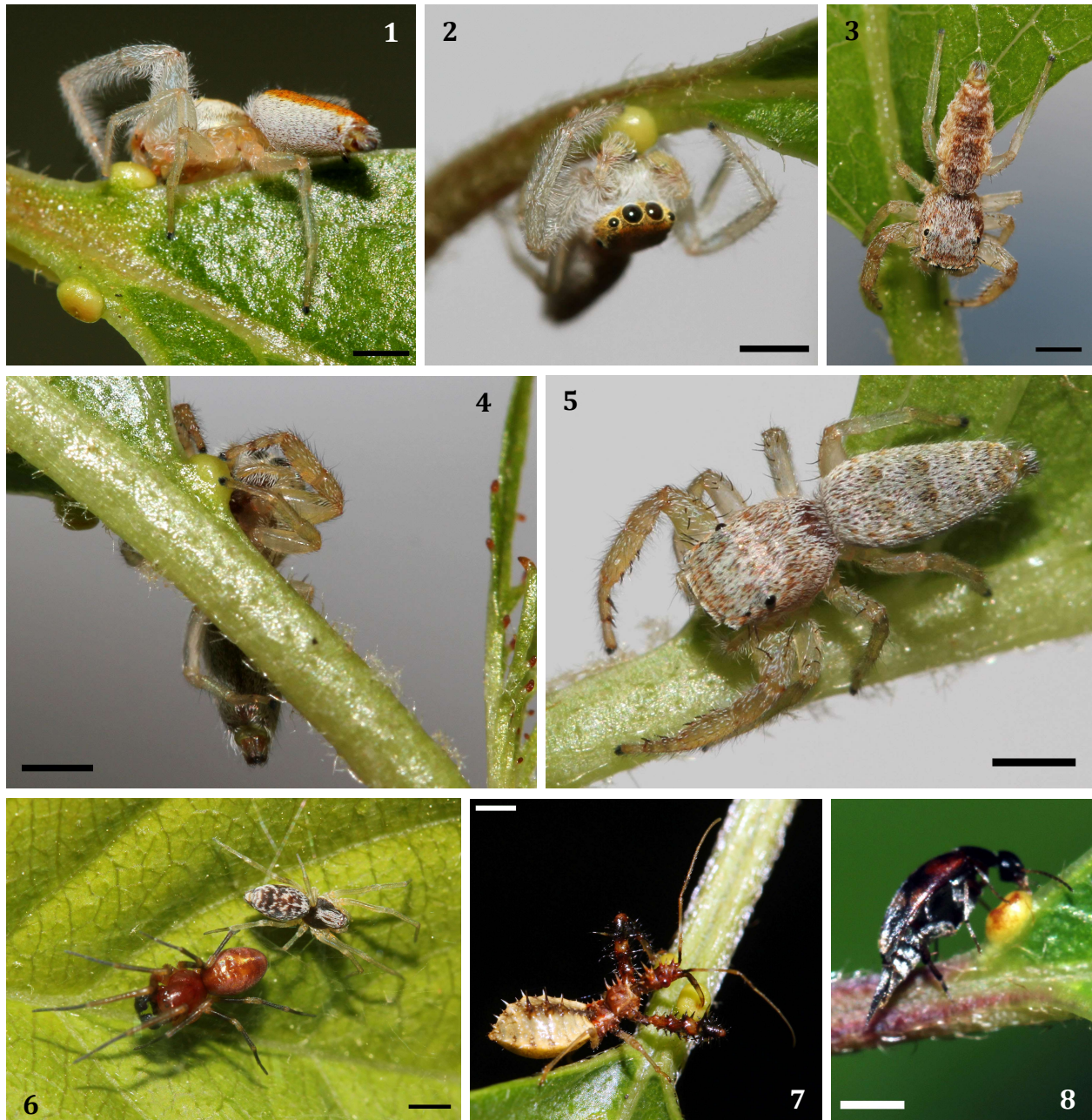
### Liquid intake

Anyone who has raised salticids successfully is aware of their requirement for water, usually provided with a piece of sponge or a cotton ball. Salticids in captivity will readily imbibe a number of different nutritious fluids (personal observations). Many spiders and insects, including salticids, are known to feed on nectar (Ruhren & Handel 1999, Jackson *et al.* 2001, Patt & Pfannensteil 2008, Taylor & Pfannensteil 2008, Taylor & Bradley 2009, Chen *et al.* 2010, Soren & Chowdhury 2011), and the presence of arthropod predators on plants that provide nectar is generally thought to protect these plants from herbivory (Mizell 2004, Matthews *et al.* 2009).

In my garden, adult *H. mitrata* males were seen running about on the leaves of a shrub or small tree that keys to *Prunus*. Detailed classification of wild *Prunus*, seeded in gardens by birds, can be very difficult because of the degree of hybridization or gene introgression that has taken place (Gradziel 2003). These *Prunus* generally bore paired extrafloral nectaries at the distal end of the pedicel, or at the base of the leaves. I observed one *H. mitrata* stopping several times at the sites of these nectaries. Indoors, this behavior was frequently observed when spiders were placed on the leaves of these plants (Figure 9). I have since seen similar behavior by the salticids *Peckhamia sp.*, *Pelegrina galathea* (Walckenaer 1837), and second instar *Thiodina sylvana* (Hentz 1846) when placed on these plants. In the garden, I have seen a number of different insects and spiders living on these plants; many, including ants, frequently drink from these nectaries (Figure 9, 6–8). As Mizell (2004) noted, there is a whole community of arthropods



that utilize these resources. Nectaries of *Prunus* provide more than just water or even sugars to arthropods. The exudate of *Prunus persica* nectaries includes fructose, glucose, and sucrose, but also at least 7 fatty acids and 17 amino acids (Caldwell & Gerhardt 1986).



**Figure 9.** Use of *Prunus* by *Hentzia* and other arthropods. **1–2**, Male *H. mitrata* at nectaries. **3–5**, Female *H. mitrata* at nectaries. **6**, Cohabiting pair of dictynids on a leaf. **7**, Predatory bug (Reduviidae) at nectary. This individual stopped at every nectary that it encountered as it moved about the plant. This species appeared in large numbers on these plants toward the end of May. **8**, Small beetle at nectary. Photographs 6–8 were taken with flash on, in the garden. All others were taken indoors.

At times, *H. mitrata* would also lower their mouthparts to the surface of a leaf, as if drinking some liquid or feeding on material on the surface of that leaf (Figure 10). I have observed similar behavior in several other salticids, including *Lyssomanes viridis* (Walckenaer 1837). Although at times a droplet of water or other exudate can be seen in association with this behavior, this is not always evident.



**Figure 10.** *H. mitrata* as they appear to feed on the surface of a leaf. 1–2, Males. 3–4, Females. Only in (3) can the liquid associated with this behavior be seen clearly.

### *Courtship and mating behavior*

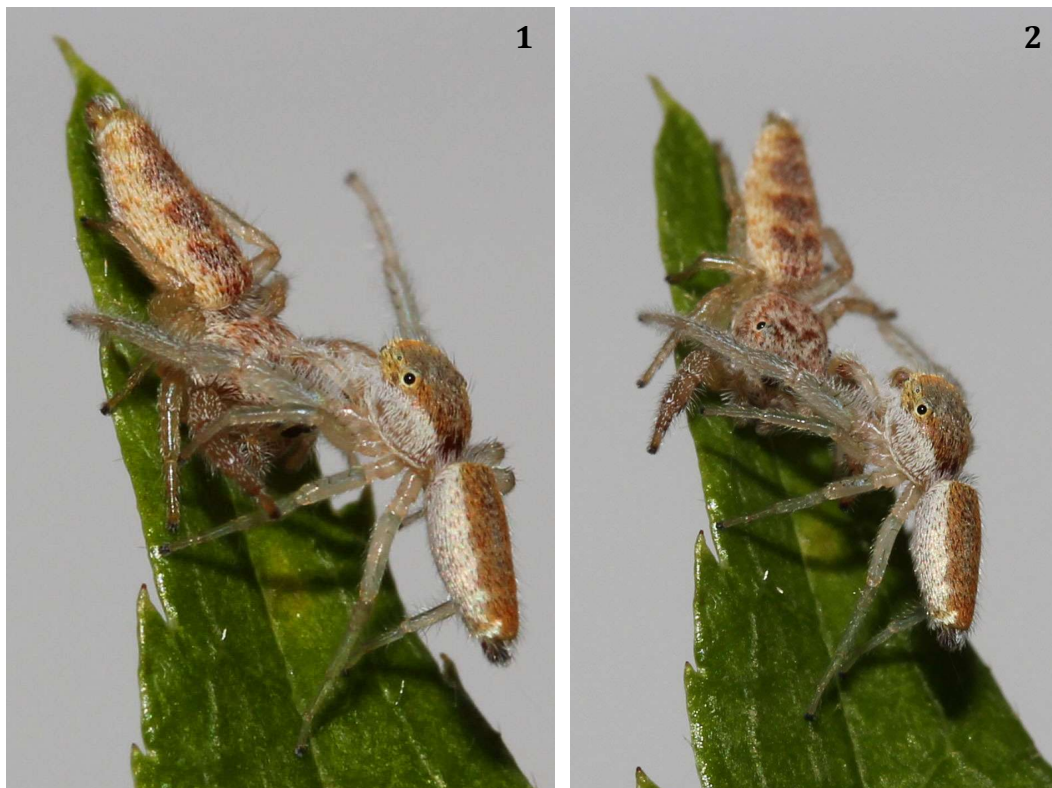
I placed several different virgin females on plants with adult males to observe their interaction. The result was successful mating in each case, and this supports the hypothesis that, as in many other dendryphantines, female selection may play a secondary role in *Hentzia mitrata*. The primary determinant of male success would be the ability of males to get to virgin females first. This would relate to the success of males in male–male contests, which have not been studied here. These contests have been described, however, in the related *H. palmarum* (Crocker & Skinner 1984).

Richman (1982) briefly described the approach of male *H. mitrata* to females, but did not observe any successful mountings. On plants (not flat surfaces or arenas), I observed little of the visual signalling with outstretched legs I (Figure 11), as these spiders hurriedly ran after virgin females that tended to run away and disappear behind leaves and stems. I did not observe any of the *calipers* movements associated with males displaying in the open, when they pursued females.

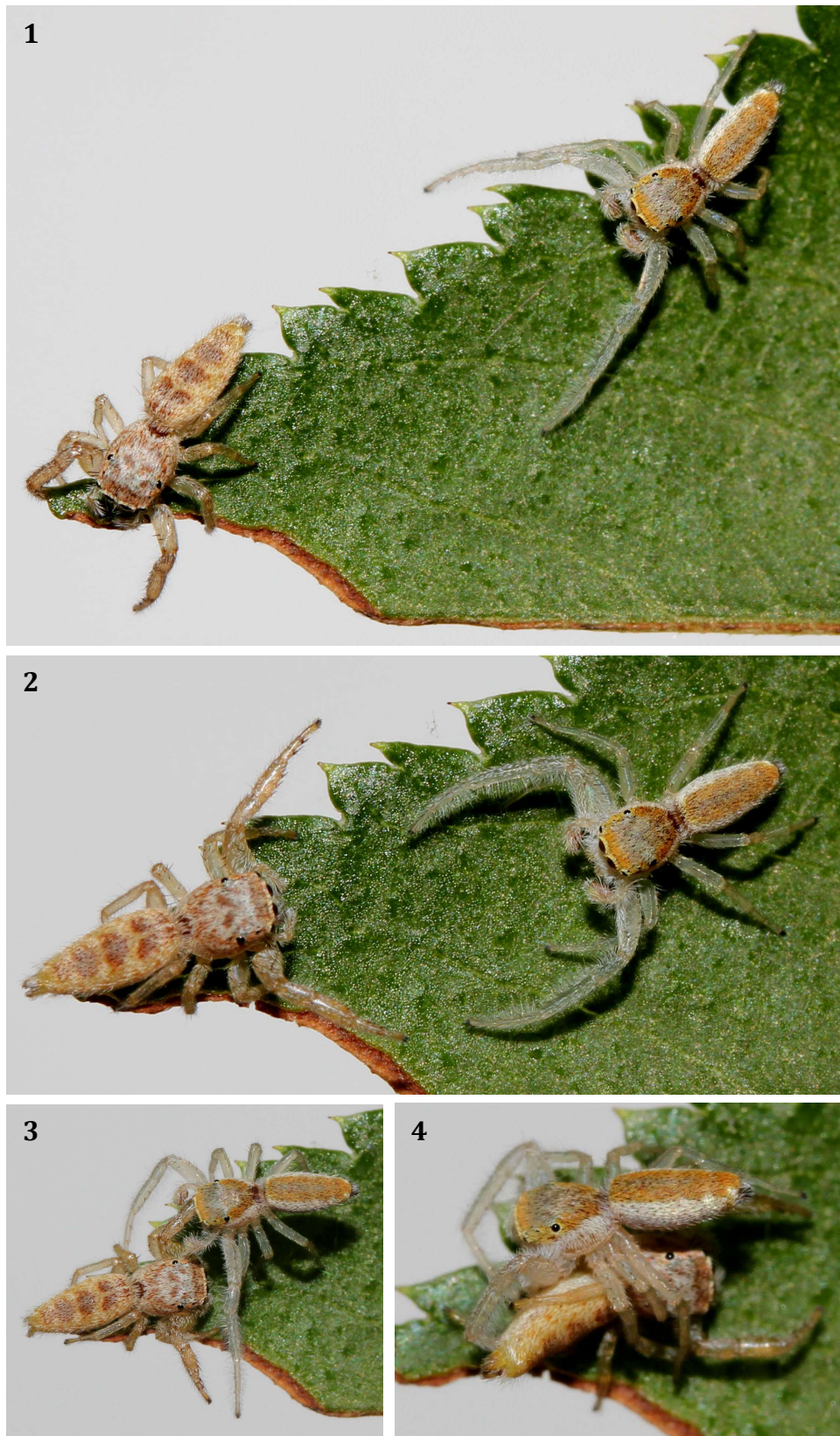


**Figure 11.** Two sequential views of a male *H. mitrata* signalling to a female sighted at a distance of about 10–20 cm. No more formal visual signalling was observed as males quickly ran to make contact with the sighted females with outstretched legs I.

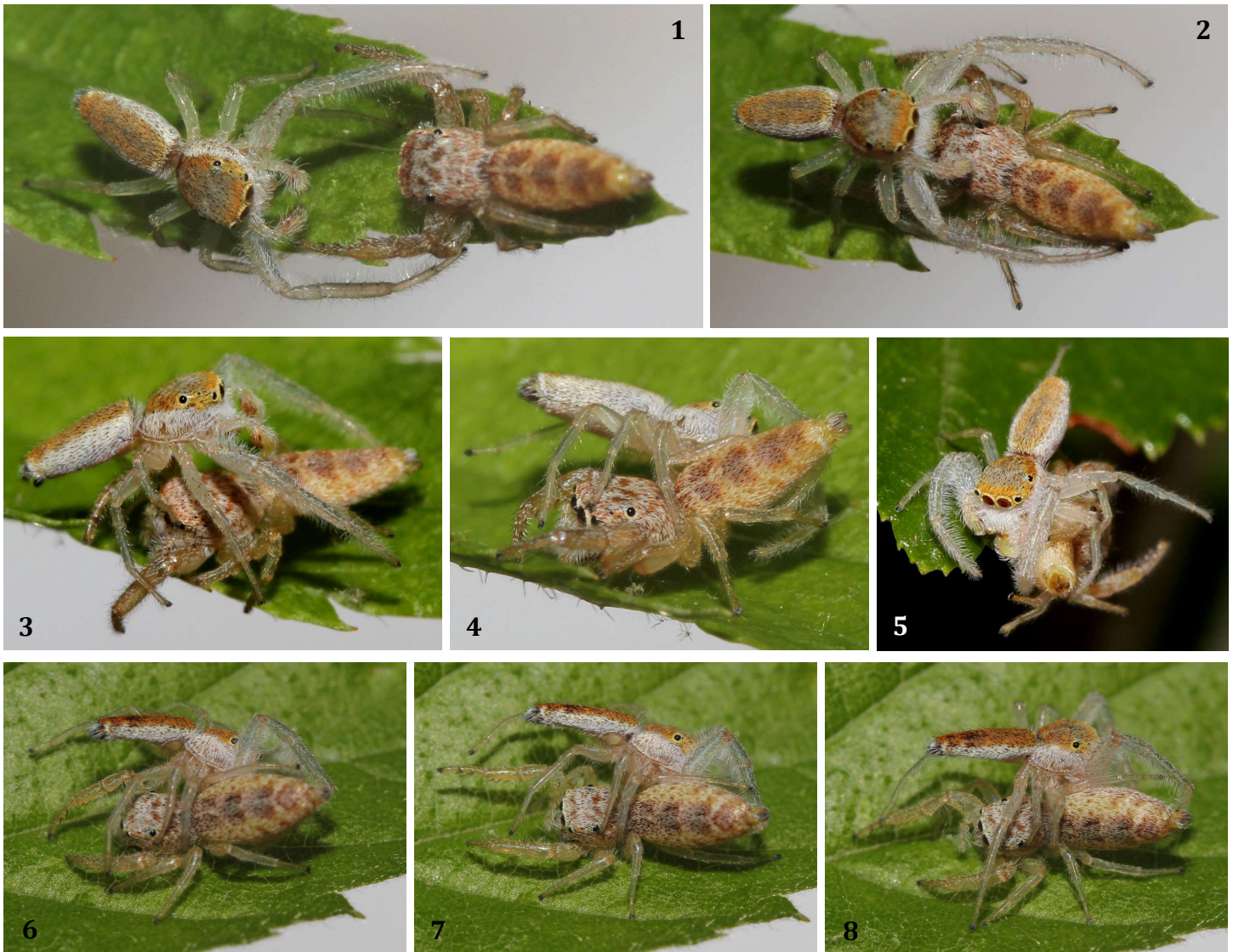
Once they sighted females, males moved *extraordinarily fast* as they ran after them, scarcely pausing to display or signal, but quickly finding the females and advancing to contact them nonetheless. Males would rapidly move to touch females with legs I waving frenetically, and if they succeeded in mounting and mating with a female, this would last only a few seconds until the female broke things off and ran away. The male would then chase the respective female, then mount and mate her again, generally in a contralateral position. One male successfully completed 5 different approach, mount, and mating episodes with a single virgin female in only a few minutes. Since I have observed the same behavior in multiple male-female pairs, I think this is a good indication of what happens generally when male *H. mitrata* encounter females in the open. Male approach to penultimate or adult females in resting sacs was not staged or observed in this study, but is nonetheless an important possibility to consider, and may be associated with a longer duration of each mating episode. Several examples of the approach and mating sequences that were documented in photographs are presented in Figures 12–14.



**Figure 12.** Two sequential views of a male *H. mitrata* rapidly touching female with legs I during approach that resulted in a successful mating.



**Figure 13.** Successful approach and mating sequence showing the female in a typical "defensive" posture as the rapidly moving male overcomes her resistance with flailing legs I (sequential images). In the left-side mating position (4), leg L1 held the opisthosoma of the female to the side, L2 and L3 grasp the female securely, and L4 stroked the carapace of the female.



**Figure 14.** Excerpted sequential photographs from four (1–2, 3–4, 5, 6–8) approach and mating sequences. 1–2, In response to rapid touching of the female by legs I of the male, the female relaxed (note extended legs III in 2) and allowed the male to mount her. 3–4, Right-side approach. 5, View of inflated bulb during left-side mating with female partly suspended over the edge of a leaf. 6–8, Typical mount during mating as described in Figure 12. Note the stroking movement of the male RIV over the carapace of the female during this right-side mating.

Stroking behavior (Figures 13–14) may be related to the presence of prominent setae on the carapace of females (Figure 4). These setae may provide sensory input to the female, and/or they may reduce damage to her carapacial scales by the rapidly moving leg IV of a mating male. Successful resistance of a previously mated female to the advances of a male is shown in Figure 15. In this case the persistent approach of the male compared to that seen in successful mating, but the female was also persistent in her resistance.



**Figure 15.** In this sequence, a previously mated female successfully resisted the advances of a persistent male even after he appeared to successfully mount her (2), by forcibly driving him further down the leaf with outstretched legs I (3).

### Acknowledgments

I thank G. B. Edwards for identifying the family (Dictynidae) of some of the small spiders associated with *Prunus*, and for his identification of the phoretic parasites as mantispid larvae. I also thank Norm Penny for his input to the identification of this mantispid, Kim Fleming for the use of her mantispid photographs from South Carolina, and both G. B. Edwards and David B. Richman for their critical reviews of the manuscript.

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