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Coexistence of *Asemonea* cf. *tenuipes* (Araneae: Salticidae: Asemoneinae) with *Crematogaster* ants (Formicidae: Myrmicinae) and a mealybug (Hemiptera: Pseudococcidae)

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The jumping spider genus *Asemonea* O. Pickard-Cambridge 1869 is widely distributed in the African and Asian tropics (Maddison 2015). It includes 24 species, with two species reported from India (WSC 2022). Of these, *Asemonea tenuipes* O. Pickard-Cambridge 1869, the type species, has an extensive distribution in India and South-east Asia (Abhijith & Hill 2018; Singh et al. 2020; Roy et al. 2016; WSC 2022).

I have frequently observed *Asemonea* spiders (most probably *A. tenuipes*) in my garden in Nagaon village on the Konkan Coast, Maharashtra, India. In the first five months of 2022, three immature individuals were observed in a teak tree, *Tectona grandis*, that also contains a nest of arboreal *Crematogaster* ants (not identified to species). The ant nest is inside a tree trunk hollow 1.5 m above the ground, with columns of ants moving up and down during the day and night. Each of the *Asemonea* cf. *tenuipes* spiders that I observed was under a teak leaf, inside a thin sheetlike silk shelter, typical of the species. They were all located 2.5-3 m above the ground, and at least 30-35 cm away from the ant nest.

Crematogaster is an aggressive, arboreal ant genus (Jackson, Nelson & Salm 2008). A few spider species are reported to prey on them (Abhijith, Hill & Pai 2020; Cushing 2012). A common food source for *Crematogaster* ants is honeydew, excreted by sap-feeding hemipterans (Carroll & Janzen 1973). They also take eggs and spiderlings from spider nests (Jackson, Nelson & Salm 2008). In November 2020 I photographed *Crematogaster* workers from another colony, opening an egg sac of an oxyopid spider (genus *Hamataliwa*) and removing all the eggs (Figures 7-8).

Many spider species have evolved associations with ants, either as ant mimics, or as predators of ants, or by living inside or close to ant colonies (Cushing 1997, 2012). However *Asemonea tenuipes* has not been recorded to have any kind of relationship with ants.

On 17 April 2022, at 11:00, I observed an immature male *Asemonea* cf. *tenuipes*, a mealybug (Hemiptera: Pseudococcidae), and a *Crematogaster* ant, all inside the silk shelter of the *Asemonea* under a teak leaf. This *Asemonea* had constructed its shelter over the mealybug. A single worker ant had entered the shelter and was tending the mealybug and collecting honeydew, in the presence of and quite close to the salticid. I could not measure the distance between the *Asemonea* and the *Crematogaster*, but would estimate this at about 1.3 cm. There was no direct interaction between the salticid and the ant. During a second observation period, this time at night (21:22-22:09; Figures 1-4), I photographed as many as three different *Crematogaster* workers entering the shelter of this *Asemonea* to tend to the mealybug, again very close to this spider. By this time the *Asemonea* had moulted to the penultimate stage, and two of the ants were seen attempting to carry away the exuvium, below the shelter (Figures 5-6).

Figures 1-2. Penultimate male *Asemonea* cf. *tenuipes* in shelter under a leaf of a teak tree, *Tectona grandis*, with ants (*Crematogaster* sp.) tending to a mealybug.

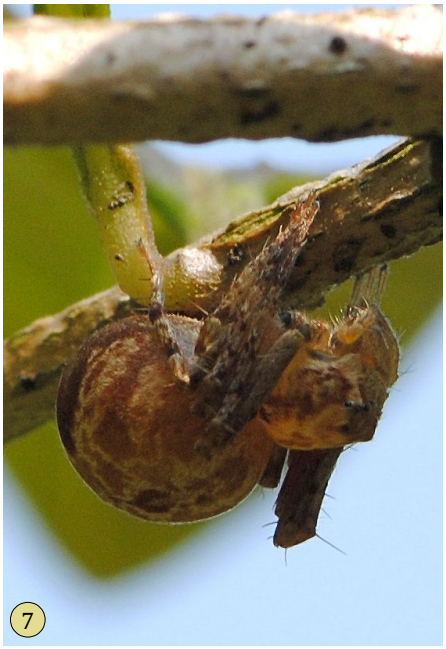
Figures 3-4. Penultimate male *Asemonea* cf. *tenuipes* in shelter under a leaf of a teak tree, *Tectona grandis*, with ants (*Crematogaster* sp.) tending to a mealybug.

Figures 5-6. Ant (*Crematogaster* sp.) with exuvium of the male *Asemonea* cf. *tenuipes*.

There was no direct interaction between the ants and the salticid during my 50 minutes of observation. The salticid did not display any signs of aversion or alarm, and it did not try to prey on the ants. The ants did not attack the salticid. On a single occasion when one of the ants happened to move closer to the salticid, the latter made a rapid twitching movement as though startled, but did not move away or leave the shelter.

Located approximately 30 cm from the *Crematogaster* nest, this *Asemonea* would have been regularly exposed to those ants. Salticids may have a limited reaction to certain arthropods when they are frequently exposed to them (Hill 2016). This would explain the spider's lack of alarm even when ants entered its shelter. The *Asemonea* may have also been protected by ants in its immediate vicinity, since they might attack other predators including araneophagic spiders, predatory insects such as mantises, and parasitoid wasps. Whether this association was intentional or accidential on the part of the salticid, this observation shows that some salticids can coexist with ants without preying on them, and without mimicking them, but may still benefit from their presence.

A possible spider-hemipteran association? While no interaction was observed between the *Asemonea* and the mealybug, the latter's position within the spider's shelter suggests an interesting possibility, specifically relating to the few records of salticid associations with sap-feeding hemipterans (Collart 1929a, 1929b; Salm 2005; Jackson, Nelson & Salm 2008; Abhijith & Hill 2021). These all involve trophobiotic relationships, with salticids collecting honeydew from hemipterans in the same manner as ants. Previously, in March 2022, I photographed a female *Telamonia dimidiata* (Simon 1899) female that had enclosed a mealybug in her shelter (Figure 9). Further observations may reveal whether these inclusions are purposeful or accidental, and could shed light on a little-known behaviour.



Figures 7-9. 7, Female oxyopid spider, *Hamataliwa* sp. **8,** Ants (*Crematogaster* sp.) feeding on *Hamataliwa* eggs. **9,** Female *Telamonia dimidiata* in retreat with mealybug (arrow).

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