Traveling psyllids

An update on psyllid movement and potential non-host plant use to promote psyllid survival during migration

By Lukasz L. Stelinski, Xavier Martini and Kirsten S. Pelz-Stelinski

Over the past several years, we have been investigating the movement behavior of the Asian citrus psyllid (ACP). During the course of this research, we have found that ACP are capable of moving considerable distances (approximately 1.25 miles over 11 days) by their own power and without wind assistance. This is the farthest distance that we have been able to document scientifically, but we have not yet verified the absolute limits of psyllid movement capability. Also, taking wind-assisted movement into consideration, one may speculate that ACP can be transported during significant wind events much farther than by their own capacity.

The main factor that we found to cause psyllids to move, to date, has been availability of flush. Simply put, ACP tend to leave areas lacking flush, while they colonize areas that harbor flush. Of course, flush is the only place where eggs are laid and nymphs develop, and it is a very good feeding site for adults as well. Therefore, availability of egg-laying and feeding sites is closely tied to whether or not psyllids will move and where they might end up.

An interrelated question in our continuing research on psyllid movement is: How do non-host plants factor into movement of ACP? Specifically, can psyllids use various non-host plants as feeding sites? More importantly, can psyllids reproduce on non-host plants, if necessary? If either of these were possible, it may help explain how psyllids move across large areas of non-citrus habitat in Florida and elsewhere. A question that comes to mind in Florida, for example, is whether a Florida forested swamp is an effective barrier to psyllid movement? Also, should we consider managing ACP in non-cultivated citrus areas in the future?

Although ACP typically reproduce on Rutaceaes plants, reproduction on *Ficus carica* L., as well as feeding on hackberry and potato is known to occur. Therefore, ACP may feed on a wider array of alternative plants beyond the Rutaceae. Although most of these alternate host plant species may not be suitable for reproduction, they may serve as hosts for opportunistic adult feeding, which may prolong survival while psyllids are migrating across habitats that do not contain citrus. This could explain long-distance movement of ACP across Florida, impacting colonization of commercial citrus groves.

In July of 2012, we captured ACP in Lake Kissimmee State Park forest in Polk County. We asked the Florida Department of Agriculture and Consumer Services to further confirm the species identification we made, to be certain that we were in fact capturing ACP, given how surprised we were to find ACP in this location. The closest citrus grove from the location in the forest where we trapped psyllids was approximately 1.5 miles southwest, and this grove had been abandoned and was in significant decline. Within the forest where we conducted the trapping, we found only four non-cultivated tangerine trees along Rosalie Creek in a floodplain forest ecosystem, but these were over a half-mile away from where we captured the ACP in the forest.

Based on this initial ACP find, we began to monitor ACP in this forested location using yellow sticky traps. From July through October, we captured ACP in multiple locations within this forest with a peak capture of 1.3 ACP per trap and per week in July. Captured psyllids were also analyzed to determine whether they carried the Ca. *Liberibacter asiaticus* bacterium that causes huanglongbing (HLB). We found that 25 percent of the psyllids that we captured were positive for the bacterium. Therefore, psyllids were not only able to move through this forested swamp, but a portion of them was also potentially moving the HLB-causing bacteria. We also sampled the four non-cultivated tangerine trees found in the forest. ACP were never found on these trees and they were negative for the *Liberibacter* bacterium throughout the duration of the study. These results would suggest that the ACP that were captured originated from outside of the forest.

Our next questions were: Why were we finding ACP in this forest and how were they apparently surviving in the absence of citrus or other possible Rutaceous host plants? To determine whether alternative plants may harbor ACP in this forest, we conducted extensive sweep net sampling of four potential habitats in the area where we captured ACP: 1) grass, 2) small bushes (up to 4 feet), 3) small trees (up to 6 feet) and 4) large trees (over 6 feet). After extensive sampling, we were unable to find ACP on any of the non-host plants sampled in this forest.

Although we were unable to find the “smoking gun” or plant that harbored ACP directly in the forest, we wondered if ACP could survive on the most abundant non-host plants in the area where they were trapped for any extended duration. The plants tested were gallberry, Darrow’s blueberry and redbay. We used 2-year-old Valencia citrus plants as positive controls. A negative control consisted of no food for the psyllids with an unlimited supply of water delivered in a manner where ACP were able to access it. ACP were able to settle and feed on all of the plant species tested. Those ACP that were given water only and no access to a plant died within three days. Survival of ACP on each non-host plant was similar to that observed on citrus for the initial three days of the experiment and began to decrease by the fourth day as compared with citrus. However, there was some ACP survival (20 percent to 40 percent) on all non-host plants evaluated for up to seven days after the experiment was initiated. Survival on the citrus ‘positive control’ treatment was greatest, as expected, with more than 80 percent of ACP surviving at day 7, when survival on non-host plants was only between 20 percent to 40 percent.

We were surprised by these recent findings. We did not expect that ACP would be captured on sticky traps within a forest/swamp ecosystem located at considerable distance from citrus. Also, this was not a one-time random chance capture; it occurred over the course of the season, when we normally catch psyllids on sticky traps in commercial citrus groves. Also, the traps that we used are not exceptionally effective in attracting ACP, and only function as short-range visual attractants. Therefore, our maximal observed capture of more than one psyllid per trap per week in July suggests that there may have been a significant number of ACP flying through this area at the time of the study.

In this forest, only four citrus trees were found and no other Rutaceous plants were found within the trapping locations or in nearby (≈500 yards) areas. The complementary feeding assays that we conducted with non-host plants suggests that the alternative plant feeding range of ACP may be broader than previously expected. Although these non-host plants do not allow additional reproduction by psyllids and only prolong their lifespan by seven to 10 days in the absence of citrus, this may allow for significantly longer dispersal distance, even through dense forests in Florida up to 1.5 miles from large-area plantings of citrus.

Lukasz L. Stelinski is an assistant professor, Xavier Martini is a post-doctoral associate and Kirsten S. Pelz-Stelinski is an associate professor, all in the University of Florida’s Entomology and Nematology Department at the Citrus Research and Education Center in Lake Alfred.