Monarch Larva Monitoring Project

ACTIVITY #5: MONITORING MILKWEED FOR APHIDS

Objectives: We use data from this activity to document the seasonal and geographical spread of aphids and to test hypotheses about factors that affect aphid population growth, the extent to which they damage plants, and the ways the different aphids affect each other. There are three objectives associated with this activity. You may choose to record data for any or all of them.

Objective 1) For each species of milkweed at your site, identify the number of plants that support aphid populations of different species and sizes each week.

Objective 2) Record the number of plants of each species that are severely damaged due to aphids.

Objective 3) Estimate the number of mummies, ants, and insect predators found on each species of milkweed.

Methods: This activity is designed to complement **Activity 1 (Monarch Density)**, so you may use the same sampling scheme and monitor the same plants at the same time. As with monarchs, please record both the presence and absence of aphids on the plants. Aphids feed on stems, on top of and especially underneath leaves, and on the new leaves at the very tips of the plants. You can identify the aphids present in your site using the aphid identification cards. Three types of aphids are commonly found on milkweeds: the bright yellow aphid called *Aphis nerii*, the greenish/brownish aphid called *Aphis asclepiadis*, and the translucent or orange-striped aphid called *Myzocallis asclepiadis*. If you find a species of aphid that is not listed here, that's great! Please record as many observations as you can about this aphid species to share with us. If you can take a picture, we would also love to see that. The aphid identification cards also include pictures of some aphid predators, plants that are significantly damaged due to aphids (to help with objective 2) and parasitized aphid mummies (to help with objective 3).

DIRECTIONS FOR FILLING OUT DATASHEET #5

Write the name of the observers and site location at the top of your sheet. You will complete one column for each milkweed species at your site on each date. (So if you have only one milkweed species, you may use a single data sheet for 5 weeks, but if you have more than 5 milkweed species at your site, you will need more than one data sheet each week). At the top of the column, record the date and the temperature in the shade. In the next row, record the name of each milkweed species at your site, and the number of plants of that species that you observe at your site on that date. For each plant you observe, identify which species of milkweed it is, and record your data in the appropriate column.

Objective 1. Make one tally mark for every milkweed plant you observe. If there are no aphids on the plant, put a tally mark in the "0 aphids" box on the data sheet. If there are aphids on the plant, identify the aphid species and estimate the total number of living aphids. Do not count aphid exoskeletons, which are dry and gray or clear. Place a tally mark in the box with the appropriate range of aphid numbers on your data sheet. If there are more than one species of aphids on a single plant, write down the species names and abundance of each in the

"combinations" row of the data table. For example, a plant with 10-100 *Aphis nerii* and 1-10 *Aphis asclepiadis* would be recorded as "An 10-100+Aa 1-10". If you have multiple plants with the same combination of aphid species, use tally marks to identify the number of plants with each aphid combination.

Objective 2. Make a tally mark if the plant is significantly damaged because of the aphids. A plant can be identified as significantly damaged because of aphids if there is shiny honeydew or mildew on at least 2/3 of the leaves, and if the plant appears to be wilting or losing leaves as a result of this damage.

Objective 3. Keep an eye out for aphid mummies, ants, and potential predators on the plants. Parasitized aphid mummies look like swollen, brown or tan, shiny aphids. If you observe any mummies on a plant, please estimate the number and record that number in the box on the data sheet. Some ants will "tend" aphids, meaning they eat the sweet honeydew that aphids produce and, in exchange, protect the aphids from predators. If you observe any ants directly on the plants tending the aphids, please estimate the number of ants and record that number in the box on the data sheet. Many insects eat aphids, including ladybeetles and lacewings. If you observe any predators on the plant eating aphids, please estimate the number of predators and record that number in the box on the data sheet. If you can identify the predators, please include their names in your list of observations at the bottom of the data sheet.

Record any interesting observations at the bottom of the data table. Observations may include the identity of any of the predators, other herbivore species you observe on the plants, descriptions of plant quality, or aphid behavior. When aphids get crowded, they often develop wings, so this is something interesting to look for. Finally, if you take any action to remove aphids from your plants, such as using a stream of water to disperse them or killing them, please record that information as well.

Thank you for contributing to the aphid monitoring effort!

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Observers: _____ Site: _____

Codes: An=*Aphis nerii*; Aa=*Aphis asclepiadis*; Ma=*Myzocallis asclepiadis*.

	Date/Temp					
	Plant Species (#)					
Objective 1	1) 0 aphids					
	1) An 1-10					
	1) An 11-100					
	1) An 101-1000					
	1) An >1000					
	1) Aa 1-10					
	1) Aa 11-100					
	1) Aa 101-1000					
	1) Aa >1000					
	1) Ma 1-10					
	1) Ma 11-100					
	1) Ma 101-1000					
	1) Ma >1000					
	1) Combinations (list both aphid species and abundance for each)					
Obj. 2	2) Plants with aphid damage					
Obj. 3	3) Mummies					
	3) Ants					
	3) Predators					

On which dates, if any, did you first find aphids of this species with wings: An? Aa?
(Ma adults always have wings)

On which dates, if any, did you take action to control aphids at your site?

Observations (use back if necessary):

Three aphid species are commonly found on milkweed: A) the milkweed aphid *(Aphis asclepiadis)*, B) the oleander aphid *(Aphis nerii)*, and C) a light green aphid with no common name *(Myzocallis asclepiadis)*. *A. asclepiadis* is greenish-brown in color and often tended by ants. The ants consume the sugary honeydew that aphids secrete. *A. nerii* is bright yellow to warn predators that it has sequestered toxins from the milkweed. *M. asclepiadis* is almost translucent and sometimes has orange spots. All *M. asclepiadis* adults (but not the smaller nymphs) are winged, in contrast to the other aphid species where winged adults are rare. While *A. nerii* and *A. asclepiadis* tend to clump together, *M. asclepiadis* tend to spread out across a leaf. *A. asclepiadis* and *M. asclepiadis* are thought to be native to North America, but *A. nerii* was introduced from Europe, along with its other host, oleanders. Oleanders and milkweeds are in the same family. *Photos by K. Mooney and A. Agrawal.*

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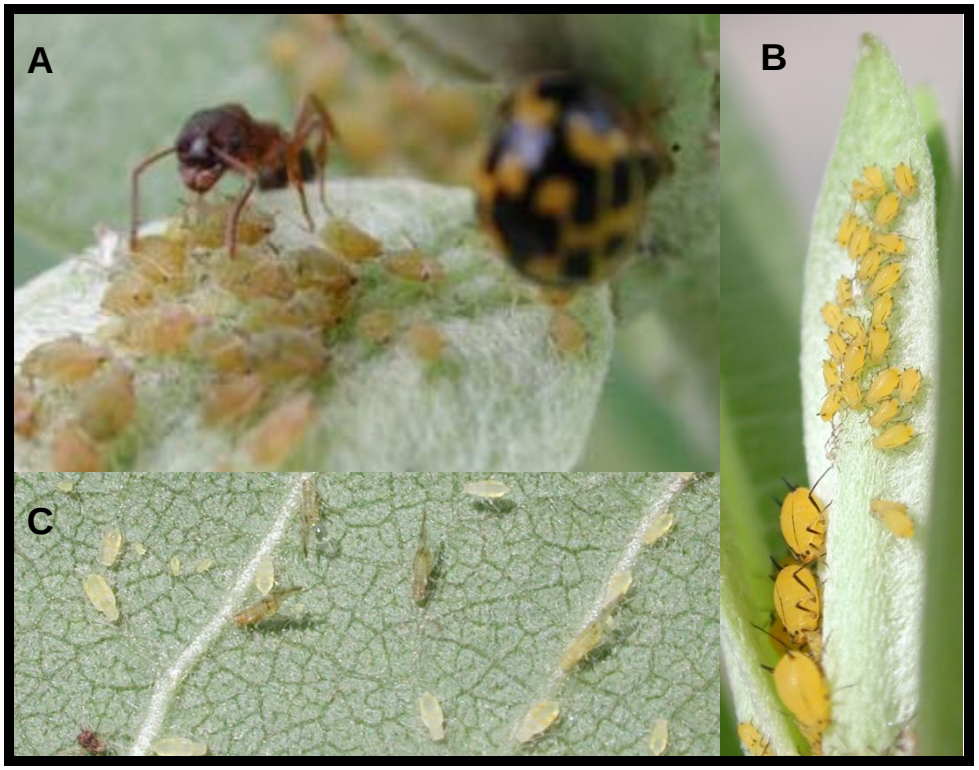

A) In most aphid species, adults are females that give birth to nymphs that are exact clones of themselves. This process is called parthenogenesis. In the fall, most aphids undergo a sexual reproductive phase, at which point they mate and lay eggs that overwinter. *A. nerii*, however, is an obligate parthenogen, so there are no males or eggs. B) Aphids molt 4 times between birth and their adult stage, leaving white exoskeletons behind on the leaf. This picture shows all 5 instars, or size classes, of aphids. C) As aphid nymphs mature, they must shed their old exoskeletons in a process called molting. This winged aphid emerges from its exoskeleton. D) Although all aphids have the genetic instructions for making wings, most adults do not have wings and stay on their original plant. When the population is overcrowded or the plant is stressed, more aphids develop with wings, allowing them to escape stressful conditions and colonize new plants. *Photos by E. Mohl.*

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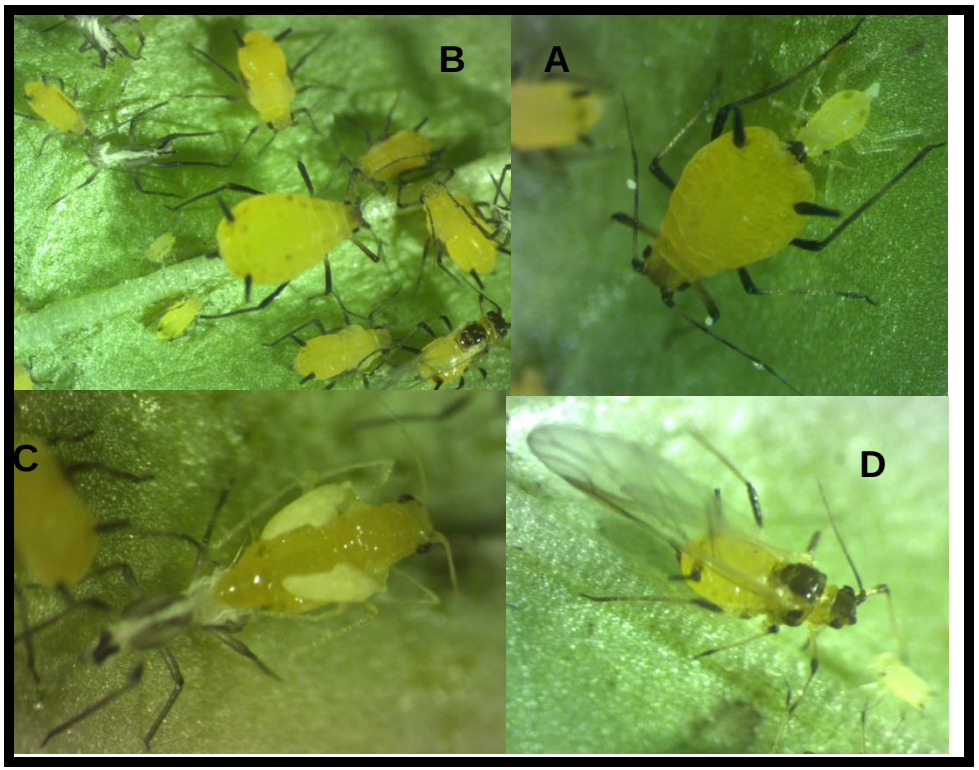

The native wasp parasitoid *Lysiphlebus testaceipes* is one of the most common natural enemies of *Aphis nerii* and many other aphids. A) A female parasitoid forages on the bottom side of a milkweed leaf for aphids to attack. B) A female "stings" an aphid by inserting her ovipositor into its body. She lays one egg inside each aphid she stings. *Photos by E. Mohl.*

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A) Over the course of about a week, the aphid's body swells up as the parasitoid wasp larva develops inside. B) The aphid dies and turns into a brown or tan "mummy" as the parasitoid completes its development. C) The wasp emerges from the mummy through a round hole as an adult, usually about 10-14 days after the aphid was first stung. Pictured here is an empty soybean aphid mummy. The soybean aphid is another exotic host to *L. testaceipes*. *Photos by E. Mohl.*

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Aphis nerii reproduce prolifically, sometimes covering a plant. A) *A. nerii* prefer new plant growth and often colonize the tips of plants. Shown here near actual size, these two leaves host approximately 750 aphids. As the aphids grow through 5 instars, they molt, leaving white exoskeletons scattered on the leaf. B) As their populations grow, *A. nerii* also colonize plant stems and the undersides of leaves. *Photos by G. Bowers and E. Mohl.*

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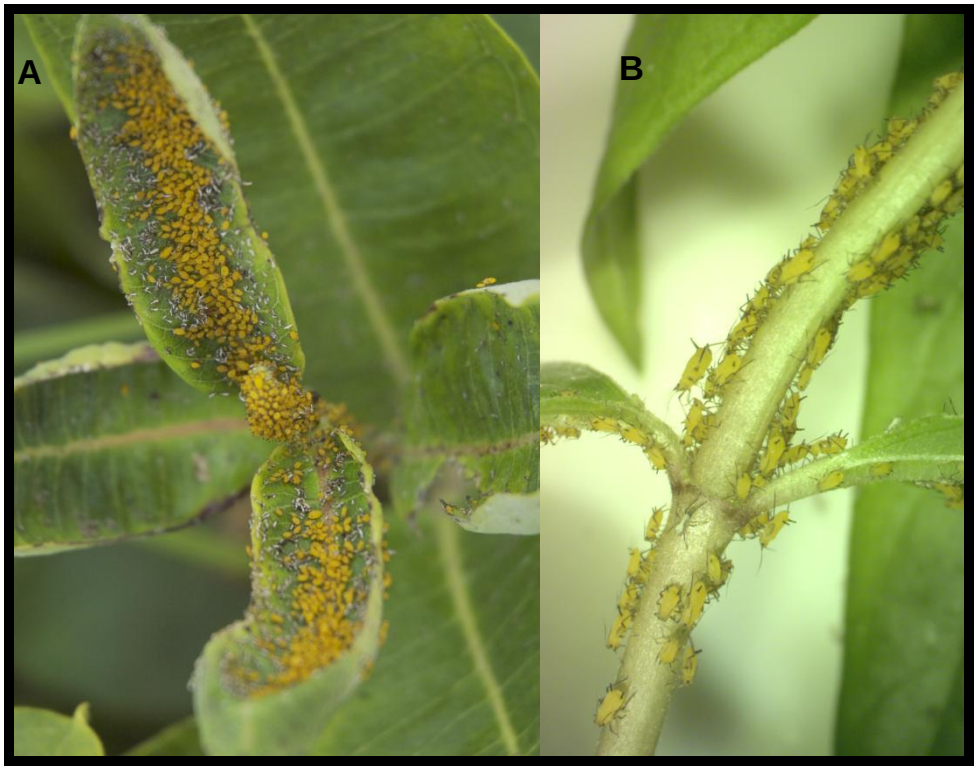

A) All aphids have mouth parts, called stylets, that allow them to feed on the sugars flowing through the vessels in the plant. B) Just as a mosquito is unlikely to do much harm to a person, a lone aphid will have little impact on a plant. However, when aphid populations grow, they can cover the leaves and stems and deplete the plant of important resources. Aphids can also transmit diseases between plants. C) Aphids do not need all of the sugar that they suck out of a plant, so much of it is secreted as sugary honeydew. Honeydew can cover leaves, making them very sticky. *Photos by E. Mohl.*

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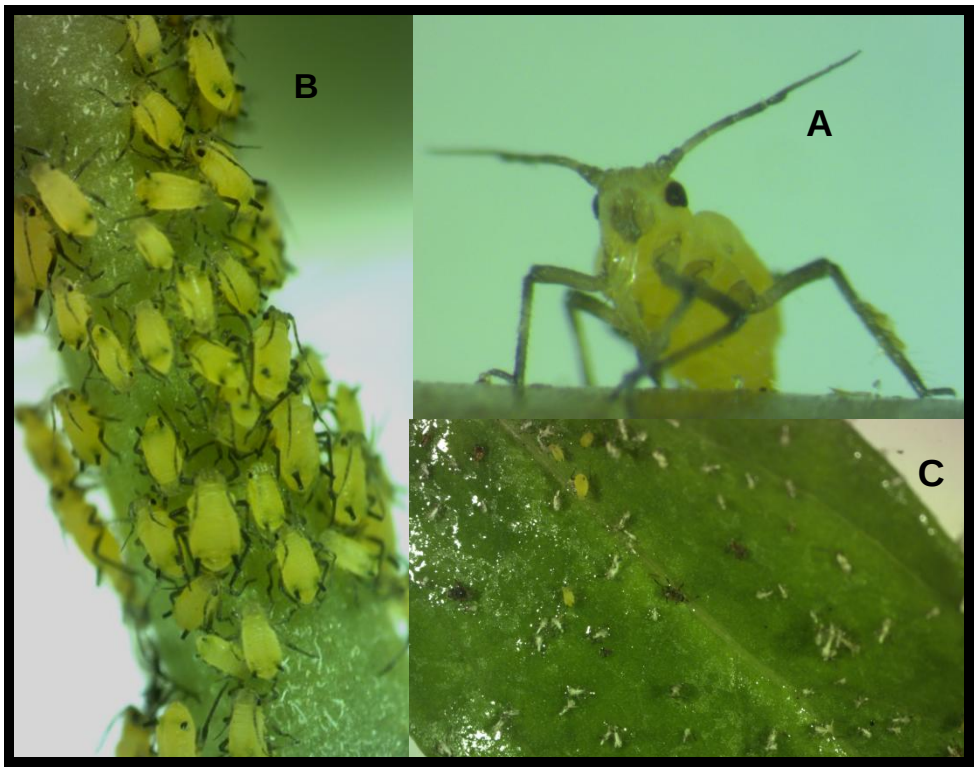

Many insect predators eat aphids. Some, like ladybeetles (A), consume the entire aphid. Ladybeetles often lay clusters of bright yellow eggs (B) on the underside of leaves on plants with aphids. Other predators, like fly larvae (C), pierce the aphids and suck out the juices. There are even some predators, like hunting wasps (D), that pick up aphids and carry them back to their nests to feed their young. *Photos by E. Mohl.*

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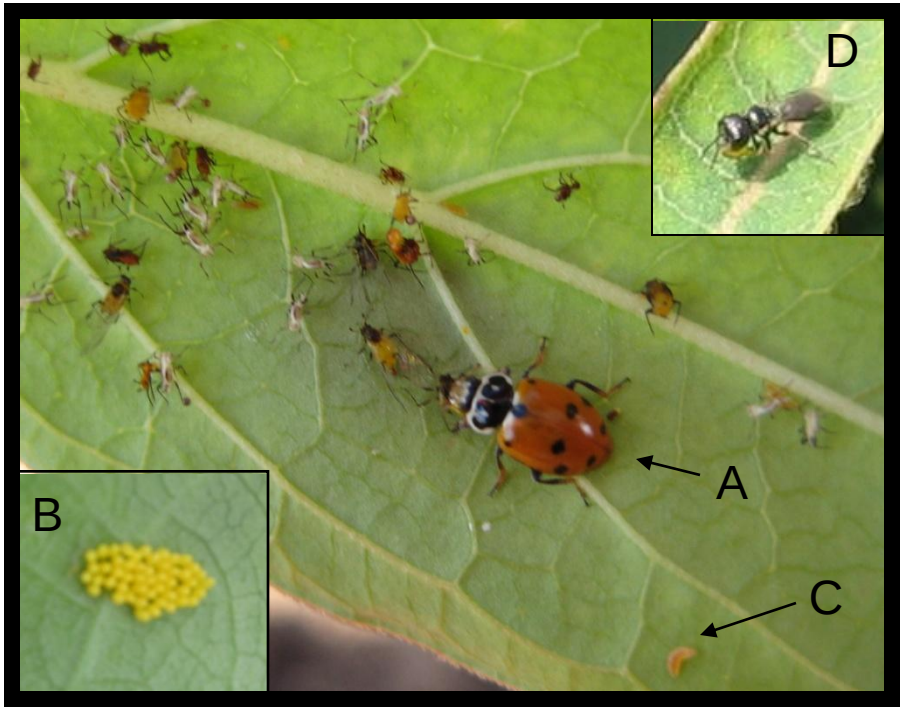

Aphids can significantly damage plants when they reach high densities. They suck the sugary fluid out of plants and excrete a sticky substance called honeydew. When enough aphids do this, the tops of leaves can become coated with the sticky honeydew and the plant starts to wilt (A). White or black mold can grow on the honeydew, preventing light from reaching the leaves. This can cause leaves to curl and become discolored (B). Ultimately, plants begin to lose their leaves as a result of aphid herbivory (C). Predators can benefit plants by consuming aphids, which often results in new plant growth. *Photos by E. Mohl.*

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