

Citizen Science—Quantifying Food for the Fishes of the Grand Canyon

In the Grand Canyon segment of the Colorado River, the endangered humpback chub (*Gila cypha*) and other native fish rely on aquatic insects as a primary food source. Two insects are particularly important food items consumed by fish: black flies and midges. Adult midges and black flies are also important food items for terrestrial animals including spiders, birds, and bats. Midges and black flies spend part of their lifecycle in aquatic environments (egg and larval stages) and part of their lifecycle in the terrestrial environment (reproductive winged adults). Monitoring the abundance of these key food items consumed by fish helps scientists understand whether food availability is playing a role in the distribution or abundance of native fishes. Traditional insect monitoring programs typically involve monitoring the abundance of larvae in a river. However, collecting samples of larval midges and black flies from the Colorado River is extremely challenging because of swift currents, deep water (average depth is over 15 feet), and fluctuating river levels associated with hydropower generation.

Commercial river guides are participating in a citizen science project evaluating alternative techniques for monitoring midges and black flies. Tracking the abundance of adult midges and black flies caught in light trap samples. Additionally, light traps will catch terrestrial insects, which will provide scientists with data needed to monitor changes in the terrestrial environment. Citizen science light trap sampling occurs along the entire Grand Canyon segment of the Colorado River from the Lees Ferry boat ramp to Lake Mead; a distance of approximately 280 river miles.

Bugs, bugs, and more bugs! Common Terrestrial Insects Caught in Light Traps



Common Name: Midges (non-biting flies)

Scientific Name: Chironomidae (family)

Life History: Adult female midges lay their eggs on the water surface. The eggs sink to the bottom of the river and hatch to larvae within 2–7 days. Larvae then burrow into the river bottom or construct tubular casings on rocks and algae for protection. Larvae feed on organic matter and algae. The larvae can be found by picking up a rock from the river bottom and watching for movement. Anywhere from two to seven weeks after hatching, the larvae transform into winged adults and emerge from the river. Adult midges live for 3–7 days, which is the amount of time required for them to reproduce

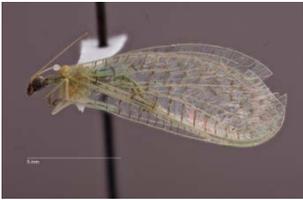
and lay eggs before dying. Since adult midges are short-lived, most do not eat during this lifestage.



Common Name: Black flies

Scientific Name: Simuliidae (family)

Life History: Black flies have a life history similar to midges, with adult females laying eggs on the water surface and larvae hatching a short time after. Like midges, black flies spend several weeks in the river as larvae. Black fly larvae (on the left) have a different feeding mode than midges; they have two fan-like structures on their head that are used to capture food particles carried by the water. Because black fly larvae rely on the current to deliver food to them, they are found in places with swift current such as cobble bars. Black fly larvae appear plumper and fatter than midge larvae. Adult black flies feed and live longer than adult midges. There are two different types of adult black flies (on the right) in Grand Canyon: (1) nectar and honeydew feeders (also known as sponge-feeders), and (2) blood-sucking black flies that pierce and suck blood from mammals. Sponge-feeding black flies are common throughout the Colorado River in Grand Canyon, whereas blood-sucking black flies are mostly found near tributaries, particularly Diamond Creek.



Common Name: Green lacewing

Scientific Name: Chrysopidae (family)

Ecological Role: Larvae are predatory, often feeding on aphids found on plants. Adults eat insects, or they eat nectar and pollen from flowers. Because larvae eat common garden pests like aphids, they are sometimes sold by nurseries as an alternative to pesticides.



Common Name: Antlion

Scientific Name: Myrmeleontidae (family)

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Ecological Role: Larvae live in the bottom of small pits that they dig in sand and loose dirt. When ants fall into the pit, the antlion larvae pulls them into the sand and eats them. Look for these pits in Grand Canyon, especially under overhangs that are sheltered from the rain. It can take up to 2 or 3 years for larvae to attain their maximum size because of the uncertainty of their food supply. Once maximum size is reached, larvae transform into the winged adults.



Common Name: Crane fly or mosquito hawk

Scientific Name: Tipulidae (family)

Ecological Role: Larvae can be aquatic or terrestrial. In either environment, they eat live and dead plant material. Despite their name, adult crane flies do not eat mosquitoes or bite humans—they feed on nectar or do not eat at all. Adult Crane Flies are widespread and can be found in both urban and natural settings.



Common Name: Angel Lichen Moth

Scientific Name: Erebidae (family)

Ecological Role: The larvae of these moths feed upon lichen or algae. Once adults, they feed on pollen and nectar. The Angel Lichen Moth has been one of the most common insects caught in light traps this spring.