



Dragonflies & Damselflies

Status and Trends

Insects in the order Odonata—encompassing dragonflies (Anisoptera) and damselflies (Zygoptera)—are a conspicuous and ecologically important component of aquatic and terrestrial ecosystems in Acadia National Park. Increasingly, dragonflies and damselflies serve as flagship species, used to engage the public and promote conservation efforts for plant and invertebrate communities; however, scientists still don't know which odonates use Acadia NP wetlands for breeding, and whether or not they are successful. In early 2009, Acadia NP teamed up with Unity College to conduct breeding assemblage and vehicle collision surveys to determine the conservation status of the Park's odonates.

Of the 158 Odonata species recorded in Maine, the Maine Department of Inland Fisheries and Wildlife lists one endangered, two threatened, and 25 "Special Concern" species. At least four Odonata species of Special Concern are expected to be found in Acadia NP. Investigating the extent to which Odonata species of Special Concern have or have not established breeding populations in seemingly appropriate habitats can help Acadia NP biologists manage, preserve, and protect these species and their habitats.

The fauna within Acadia NP receive relatively high protection from habitat loss, but pollution, introduced species, and human recreation can still threaten wildlife. Because roads function as warm, sunny clearings with ample flying insect prey, dragonflies often use them as resting and foraging sites. This behavior, coupled with high traffic speeds and volumes, may make roads an ecological trap for odonates. Ecological traps occur when environmental cues lure animals to poor-quality habitat, including harmful, artificial land cover types like roads. This ongoing monitoring project will provide information about the relative abundance and distribution of Odonata species, as well as the potential impacts of vehicle traffic on odonate communities in Acadia National Park.

Importance

Spending time in water and on land during their life cycles, odonates are an important link between aquatic and terrestrial ecosystems. Females lay thousands of eggs directly in open water or on submerged plants. After hatching in seven to eight days, odonates spend most of their lives in the subsequent larval stage growing and molting. Many ecological factors affect the distribution of larvae, including water acidity, temperature, water flow, the amount and type of aquatic vegetation, and the presence of fish and other aquatic predators.

After developing for one to five years, the nymph makes a final molt, emerging as an adult with functional wings. Changes in temperature serve as cues for dragonfly emergence. Cold, cloudy, or rainy weather directly impact the timing of adult emergence on odonate populations. In turn, this affects the animal populations that rely on the abundant food source provided by the emergence of dragonflies and damselflies. Adult odonates return to the water after one to two weeks to reproduce.

Changes in aquatic plant communities, such as plant removal to ease boat passage, mowing of shoreline vegetation or introduction of exotic species reduce the quality of odonate habitat. Because odonates play important ecological roles as both predators and prey, loss of odonate species could have a ripple effect (known in ecology as a *trophic cascade*) on terrestrial and aquatic food webs.



Dragonflies and damselflies are carnivorous generalists, feeding intensively throughout their short lives on whatever suitable prey are abundant. Odonate larvae attain a relatively large size and are often top predators in freshwater invertebrate communities, eating small invertebrates, such as mosquito larvae, and small vertebrates like fish and frogs. Keen eyesight and acrobatically agile flight help protect dragonflies and damselflies from predation; however, birds, frogs, spiders, fish, water bugs, and even other large dragonflies are all known to eat odonates (EduPic/W. Vann).

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What do we want to understand?

1. What is the relative abundance of emerging odonate species around wetlands in Acadia NP, and how does this change throughout the flight season?
2. Where are species of Special Concern breeding?
3. What is the extent of Odonata mortality due to collisions with vehicles on park roads?

Monitoring Program

In June 2009, researchers began surveying Odonata emergence and adjacent roadkill densities in Acadia NP. Researchers selected survey sites in two distinct habitats—small ponds and brackish wetlands—where breeding odonate communities may include four Special Concern species. At small pond sites, researchers monitor three species of Special Concern: *Libellula semifasciata* (painted skimmer), *Pantala hymenaea* (spot-winged glider), or *Tramea carolina* (Carolina saddlebags). *Enallagma durum* (big bluets) are monitored around brackish waters of small bays.

At each site, researchers establish a twenty meter linear transect along the water's edge. Researchers collect and identify all exuviae (cast-off skins) found along the ground surface, shoreline plants, and all emergent vegetation (plants growing in very shallow water) adjacent to the transect.

During the summer of 2009, each site was surveyed in late June, mid-July, and late July—the peak flight season of the species of Special Concern—to improve estimates of the total number of emerging individuals. All exuviae were collected in vials with 70% ethanol and preserved for identification using a dissection microscope.

To estimate the extent of odonate roadkills adjacent to freshwater breeding habitats in the park, researchers collected roadkilled dragonflies along stretches of high-traffic road approximately 0.5 kilometers long. Surveys are conducted after a period of dry



Researchers look for exuviae in vegetation along the edge of vernal pools in Acadia NP (Acadia Partners/S. Delheimer).

weather, so that most recent exuviae have not been washed off the road. Road surveys are repeated at least five times throughout the flight season to improve estimates of total mortality per meter of road.

Monitoring data will provide a baseline understanding of the status, distribution, and habitat details for Special Concern species and the relative abundances of all Odonata species. This data can be correlated with surveys of roadkilled odonates near aquatic habitat in Acadia NP to compare the effects of road mortality on different species and at different dates. Results will help Acadia NP manage and protect this flagship species.

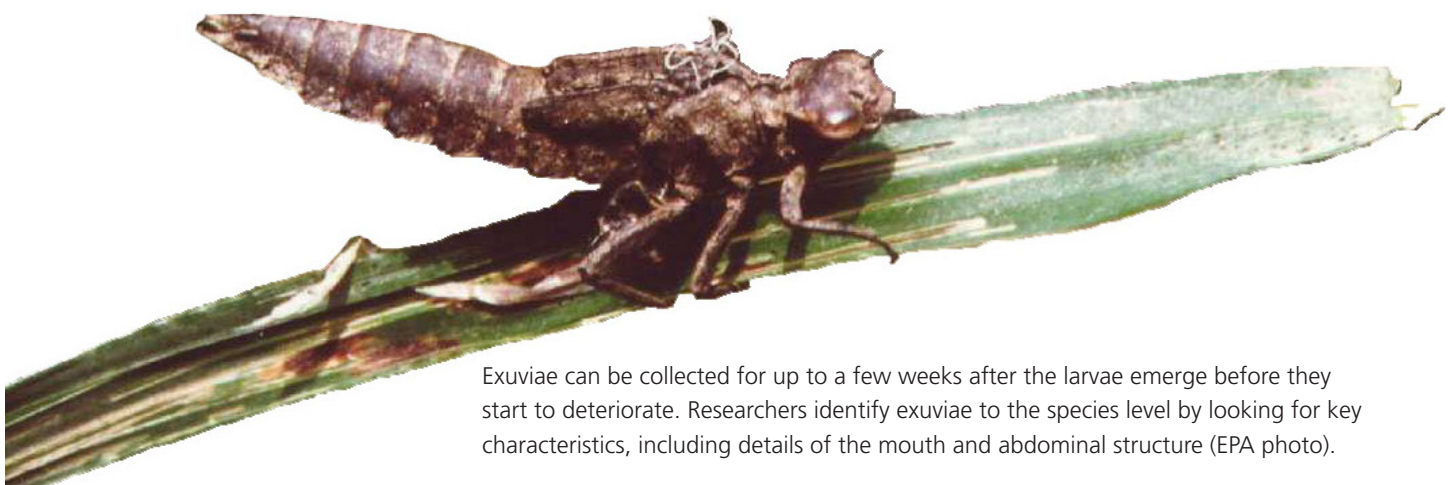
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Links & Resources

Maine Damselfly and Dragonfly Survey: <http://mdds.umf.maine.edu/>



Exuviae can be collected for up to a few weeks after the larvae emerge before they start to deteriorate. Researchers identify exuviae to the species level by looking for key characteristics, including details of the mouth and abdominal structure (EPA photo).