

# Local experts identify insect biodiversity in Catoctin Mountain Park

By Becky Loncosky

**C**ATOCTIN MOUNTAIN PARK has been expanding its knowledge of the biodiversity of invertebrates in the park through the help of local experts to inventory insects. At just 5,872 acres (2,376 ha) in size, Catoctin is a small park in northern Maryland surrounded by rural and suburban development. The park has been going through environmental changes related to white-tailed deer (*Odocoileus virginiana*) population reduction, and in 2014 completed the fifth year of reductions as prescribed in its deer management plan/environmental impact statement. This work has resulted in a decrease in white-tailed deer from 123 to 36 per square mile (319–93/sq km). Park staff are tracking the rate of tree seedling regeneration and have already seen the first signs of recovery.

But herbivores are not the only animals putting pressure on park forests. Pests and diseases also have had a negative impact, changing understory environments. Dogwood anthracnose (*Discula destructiva*) and hemlock woolly adelgid (*Adelges tsugae*), respectively, are responsible for the loss of many of the understory dogwoods (*Cornus florida*) and eastern hemlocks (*Tsuga canadensis*), which has led to a rise in stream temperatures. The emerald ash borer (*Agrilus planipennis*) is found within 50 miles of the park, and resource managers expect that ash (*Fraxinus*) species will soon decline.

As a result of this dynamic environment and in order to document future changes, the park realized it needed to determine what species of invertebrates live in the



**Figure 1 (above).** The southern pygmy clubtail (*Lanthus vernalis*), a dragonfly species, is listed as rare in Maryland but was collected as part of the dragonfly-damselfly inventory at Catoctin Mountain Park.

park. Insect biodiversity could increase as the forest recovers from deer overpopulation, but the only insect groups to have been studied previously in the park are butterflies and moths (Lepidoptera) and stream macroinvertebrates, from 1987 to 2004. We focused on dragonflies and damselflies (Odonata) initially, followed by ground-beetles and other select Coleoptera (Carabidae, Scarabaeidae, Geotrupidae, Trogidae, Tenebrionidae, Silphidae), and finally bees (Apoidea).

## Insect surveys

The surveys were funded through the regional portion of the Natural Resource Protection Program. Costs ranged from \$8,200 to \$18,800. We contracted two groups of researchers whom we learned



**Figure 2.** The sable clubtail (*Gomphus rogersi*) is listed as rare, in need of conservation, in Maryland. The nymph form is shown here.

about from staff at other parks in the National Capital Region and from our regional Natural Resource and Science office.

### Dragonflies and damselflies

Richard Orr of Mid-Atlantic Invertebrate Field Studies (MAIFS) conducted the survey for dragonflies and damselflies in 2009 and sampled all park wetlands, including Owens Creek, Big Hunting Creek, Lantz Marsh, Round Meadow Lagoon, Sawmill

NPS PHOTO



(INSET) JOHN S. STRAZANAC



Figure 3 (inset). *Chlaenius emarginatus* is one of the many ground-beetles inventoried at Catoctin.

Figure 4. One of the products of the bee survey was a voucher specimen collection prepared for incorporation into the park's museum collection. This is one of two drawers prepared in this manner.

Pond, and Hog Rock Seep. Adults, exuvia (the cast skins of the larvae), and larvae were included in the survey. In total, 28 species of dragonflies and damselflies were found to use park habitats. Two species (southern pygmy clubtail and sable clubtail, figs. 1 and 2) are of conservation importance because of their rarity in Maryland. Data collected from each individual included date, location, and other relevant information and were summarized in a spreadsheet for analysis. In addition, this information was augmented with data from a multiyear survey conducted by the Maryland Department of Natural Resources, which covered all the Catoctin mountains that occur in the state.

### Ground-dwelling beetles

The beetle survey was to be focused on wood-boring beetles because of the potential for the loss of so many tree species; however, we were not able to locate a researcher with the needed expertise for this survey. It is difficult to get insect experts to work in our small park. So we contacted researchers at the Smithsonian Institution who directed us to Cynthia Fitzler and John Strazanac. They were interested in doing a ground-beetle survey and had the necessary subject knowledge. This was a fortunate connection, and we used a sole-source contract to secure their involvement.

The researchers collected pitfall trap samples at 15 sites every two weeks for 15 consecutive sampling periods from 5 April to 3 November 2011. Ground-beetles (Carabidae) were the most abundant (3,800 individuals) and species rich (67 species) in six targeted families (fig. 3). Specimens in five other families were identified to species: (1) dung beetles, May and June beetles, and chafers (Scarabaeidae: 17 species collected, 523 individuals); (2) darkling beetles (Tenebrionidae: 8 species, 55 individuals); (3) earth-boring scarab beetles (Geotrupidae: 5 species, 219 individuals); (4) carrion beetles (Silphidae: 5 species, 1,019 individuals); and (5) hide or skin beetles (Trogidae: 1 species, 9

individuals). The researchers assembled a voucher collection that included one of each species of beetle. The final report includes maps of the collecting sites and a species list for each site.

For a park of its size, and compared with other surveys in the region, Catoctin Mountain Park has high species richness in ground-dwelling beetles. The researchers collected and identified 103 species in six families. Thus the park's ground-dwelling species list rose from 11 to 114—a 10-fold increase! This relatively high number of species may be the result of the diversity of the park's forest communities that are at different stages of succession. Recent natural perturbations, like tornadoes and charcoal logging before Catoctin became a national park, have created a dynamic and spatially heterogeneous forest.

### Bees

Catoctin personnel enrolled in a bee sampling and online identification class offered by the U.S. Geological Survey and carried out the bee-monitoring transect work in 2008. However, making identifications through online resources proved intractable. So we enlisted researcher Richard Orr (MAIFS), who carried out two additional years of bee surveys in 2012 and 2013. The researchers used bee bowl transects (one day or less sampling), propylene glycol cup transects (continuous sampling), and targeted netting during the survey. Catoctin biologists helped Mr. Orr with the bee transects in 2012 and 2013. We targeted various habitats for sampling, including areas that are heavily impacted by nonnative plants, those that were com-

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posed primarily of native plants, high- and low-elevation sites, and a location that had burned previously. The three sampling methods yielded 3,004 bees, representing 93 species or species groups. Additionally, 42 bee species had not previously been reported from Frederick County; one of the leaf-cutting bees, *Stelis nitida*, proved to be new for Maryland. Spring woodland native bees are negatively affected by Japanese stiltgrass (*Microstegium vimineum*) and white-tailed deer, which decrease native plant abundance in the park. The researcher provided the park with collection data in spreadsheet form along with a reference collection of the bee specimens (fig. 4, previous page).

## Conclusion

Before these surveys Catoctin had next to no information on these three groups of insects. On the original park insect list were only six dragonfly or damselfly species, 11 ground-beetles, and no bees. Now the insect list has been extended

from 364 to 588 species, greatly expanding our knowledge of these important insect groups. We are very happy with the products that have come from the surveys, as the species lists and insect collections have already been useful for public outreach and education and will be an important resource in the future when the park conducts repeat surveys.

## About the author

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