

Conservation Matters:
Contributions from the Conservation Committee

Rearing Mitchell's satyr at the Toledo Zoo – a first step towards eventual re-introduction in secure habitats

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The Mitchell's satyr, *Neonympha m. mitchelli*, is a critically endangered butterfly that inhabits sedge-dominated fen communities in Indiana and Michigan. Recently discovered populations that may be this subspecies inhabit swamps and the margins of beaver ponds in northern Alabama and Mississippi (the taxonomic status of these populations is still uncertain) and valley wetlands in the Virginia mountains. Another subspecies, the St. Francis' satyr (*N. m. francisci*), occurs in North Carolina. Extirpated from Ohio, New Jersey, and possibly Maryland, the nominotypical subspecies is now the subject of considerable concern and study with an eye towards reintroduction to historically occupied sites in Indiana and Michigan. The effort to recover Mitchell's satyr is being led by the U.S. Fish and Wildlife Service's Mitchell's Satyr Working Group- a consortium of federal officials, state wildlife agencies, land conservancies such as The Nature Conservancy, and Zoos. A boost to Mitchell's satyr recovery came in 2006, when a grant to the Michigan and Indiana Departments of Natural Resources allowed development of a Habitat Conservation Plan (HCP) to provide a framework for managing prairie fens for Mitchell's satyr butterflies.

There is an insufficient understanding of the specific ecological conditions that the Mitchell's satyr needs to survive, but the prospects for recovery of this subspecies seem best in Michigan, where

there are more than 15 sites where the butterfly is still present. Michigan also has several additional localities that seem to possess the necessary hydrologic conditions and plant community structure to support the Mitchell's satyr, yet the butterflies are absent, and it is unknown whether their absence is due to chance or some inherent unsuitability as Mitchell's satyr habitat. To eliminate guesswork from the process of reintroduction planning, any successful attempt at reintroduction will depend on an understanding of which habitat attributes contribute to the successful retention or colonization of Mitchell's satyr in any given fen. One starting point we will use in evaluating potential habitat is determining the species of wetland grasses and sedges that are utilized by the larvae as host plants. Although Mitchell's satyr is usually found in sedge meadows and fens dominated by the tussock sedge, *Carex stricta*, (and some larvae undoubtedly feed on *C. stricta*), several reports indicate that early-instar larvae of the Mitchell's satyr feed on a variety of grasses and sedges.

Finding Mitchell's satyr larvae in the wild is challenging. Small and cryptic, the early instar larvae tend to remain at the base of the host plant, very close to the surface of the saturated substrate where humidity is the highest. Trying to inspect these areas in boot-sucking muck, surrounded by poison sumac (which offers the only solid hand-hold), while trying not to

trample the sensitive species around you is a character-building experience. Raising satyrs in a zoo setting eliminates some of the messier aspects of the grunt work while allowing more control over some of the sensitive variables associated with butterfly survival and fitness. At the Toledo Zoo, we decided to concentrate on two activities: finding a way to breed Mitchell's satyrs in captivity and testing the suitability of a variety of sedges and grasses for use as larval host plants. Instead of jumping headlong into satyr rearing, we decided to breed and raise a model species related to the satyr as first step- this would test our systems to determine their suitability and minimize risk to such a critically endangered species. We used the northern eyed brown, *Satyroides eurydice*, a common inhabitant of the same fens used by Mitchell's satyr- and one that likely uses the same host plants.

After raising three generations of eyed browns and several species of sedges we believed that we were ready to try our luck with the Mitchell's satyrs. We found that we could breed them easily in 100 cm x 200 cm x 31 cm polyethylene tubs covered with white poly mesh netting. Adults would mate inside the enclosures and oviposit on small forbs we provided, such as clearweed, *Pilea pumila*, and swamp violet, *Viola nephrophylla*.

Concurrently, with the aid of the Michigan Natural Features Inventory



Fig. 1) Captive mating pair of Mitchell's satyr (*Neonympha mitchelli*). **Fig. 2**) *N. mitchelli* ovae and larvae. **Fig 3**) Late instar larva on host plant. **Fig. 4**) *N. mitchelli* pupa. **Fig. 5**) Rearing cages/oviposition tubs for the reintroduction project.

and the Michigan Department of Natural Resources, we collected several species of potential host plants from the fens of Southern Michigan, grew them at the Zoo, then offered them to newly-hatched Mitchell's satyr larvae. *Carex stricta* was always offered as one of the four plant species available to the larvae, but we've found that they prefer a variety of foods: panic grass (*Panicum implicatum*), fowl bluegrass (*Poa palustris*), and bristlystalked sedge (*Carex leptalea*), as well as the expected tussock sedges. Some larvae selected spikerush (*Rhynchospora capillacea*) and rigid sedge (*Carex tetanica*), but

subsequently died. First instar larvae seem to prefer remaining on the selected host plant until the 3rd instar. By mid August most larvae had migrated to *C. stricta* to begin diapause. All in all, things have gone pretty smoothly with our conservation breeding efforts, but we have had some problems- predation of early instar larvae by miniscule theriid spiders being at the top of the list. We check the enclosure every day for potential predators, but the spiders are so small and the vegetation so relatively dense that it is very difficult to find them all.

Another problem is that newly-hatched larvae do not automatically go to host plants. Some just wander around on the substrate and die. Because we are testing host plant selection, we don't rescue them.

We have confirmed that 1st instar Mitchell's satyr larvae will select and feed upon several different grasses and sedges, not all of which can support successful development; in 2008 we will test even more species as we work on unraveling the complex puzzle of the Mitchell's satyr life history.

