

## **Unusual Wing Coloration in Female Karner Blue Butterflies, *Lycaeides melissa samuelis* (Lycaenidae) in Minnesota**

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UNUSUAL WING COLORATION IN FEMALE KARNER BLUE BUTTERFLIES,  
*LYCAEIDES MELISSA SAMUELIS* (LYCAENIDAE) IN MINNESOTA

**Additional key words:** Endangered species, conservation.

*Lycaeides melissa samuelis* (Nabokov) (Lycaenidae) is a bivoltine butterfly inhabiting oak-pine savanna or pine barren habitats. Historically this subspecies' range extended from the northeastern United States to southeastern Minnesota and southern most Ontario, Canada. Its current distribution is much reduced and fragmented (U.S. Fish and Wildlife Service 2003). The dramatic population decline of *L. m. samuelis* over the last few decades and its listing as a federally endangered species has attracted considerable conservation attention. Habitat loss and degradation are the two main reasons for population decline range-wide. *Lycaeides m. samuelis* has become a symbol of this endangered ecosystem, and efforts to save the butterfly will assist conservation of this ecosystem (U.S. Fish and Wildlife Service 2003).

For two summers (2002, 2003), co-authors Guiney and Andow conducted a captive rearing project to augmentation local populations of Karner blue butterflies (Permit 2002: USFS MNDNR/ agreement CA30181-0-J014; Permit 2003: MNDNR Fed. ES permit #TE697830-5 subpermit 03-16). The study was conducted on a small population of Karner blue butterflies at the Whitewater Wildlife Management Area in Minnesota, which is the western most extant location of the subspecies.

On the hind wing, Karner blue females typically have several orange crescents near the margins on both the dorsal and ventral sides (Nabokov 1943, 1944, 1949; Fig. 1.) During the first summer, we caught three females with unusual wing coloration. One butterfly (wild caught female #8) lacked any orange crescents on the dorsal edge of her hind wings, but did possess the typical orange crescents on the ventral side (Fig. 2). Another (wild caught female #5) had partial expression of a terminal orange bar on the forewing (Fig. 3), a trait typically seen in *L. m. melissa* (Fig. 4), but not in the Karner blue. We also captured one (wild caught female #9) with partial expression of the usual hind wing orange crescents. We did not notice any unusual wing color patterns in the summer of 2003. In his original and subsequent treatment of the subspecies, Nabokov (1943, 1944, 1949) did not report these aberrant female color patterns.

All three females described above were captured for the captive rearing project and were brought into the

lab to obtain eggs on 17 June 2002. The female that lacked orange on the dorsal hind wing bands laid 112 eggs, more than any other female collected during a three-day interval. The female with partial expression of a terminal orange bar on the forewing laid 7 eggs, and the female with partial expression of the usual hind wing orange crescents laid 12 eggs. These three females died before they could be released and are now deposited in the University of Minnesota Insect Collection. Label



Figs. 1–4. *Lycaeides melissa* subspecies. **1**, *L. m. samuelis* with typical female wing coloration (dorsals left, ventrals right). **2**, *L. m. samuelis* female lacking orange crescents on dorsal hindwing margin (same surfaces). **3**, *L. m. samuelis* with partial expression of typical female wing coloration for *L. m. melissa* (dorsals). **4**, *L. m. melissa* with typical female wing coloration (dorsals). All specimens are from Minnesota and are stored in the University of Minnesota Insect Collection.

data for the female that lacked orange on the dorsal hind wing bands are as follows: **label 1** – USA: MN: Winona Co./ Whitewater Wildlife Mgnt. Area/ Cuthrell valley. 17 June 2002/ 44°8'15"N, 91°58'45" W/ M. Savanick coll.; **label 2** – Wild caught female #8. Life/history info: laid 112 eggs, 17-21/ June in cage, single eggs, death 21/ June 2002. Aberrant hind wing/ color; **label 3** – Karner Blue *Lycaeides melissa/ samuelis* USFS MNDNR/ agreement CA30181-0-J014 det./ M. Savanick Guiney. The two other females have similar label information but different wild caught female numbers.

We did not keep exact records on the aberrant females' progeny, but resultant reared females (pooled from five breeding females) did exhibit a mixture of color patterns. Some individuals had all their orange crescents and some had partial expression on the dorsal hind wing. The captive-reared offspring were released back into Whitewater Wildlife Management Area on either 22 or 26 July 2002. In both 2002 and 2003, a total of 348 butterflies, from 13 females, were reared and released as adults. Any adults that did not survive until their release were frozen and subsequently vouchered in the University of Minnesota Insect Collection (23 males, 6 females, 1 sex not determined due to crumpled wings).

There are no published studies specifically addressing the causes of *Lycaeides melissa samuelis* wing color variation, but wing patterns of other butterfly species have been studied by evolutionary and developmental biologists (Beldade & Brakefield 2002; Parchem *et al.* 2007). The uncommon female wing patterns found in this Karner blue population could be due to inbreeding. Past hybridization with other *L. melissa* subspecies is unlikely because of this population's isolation.

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