

Journal of the Lepidopterists' Society
44(1), 1990, 33-34

LYCAENA HYLLUS (CRAMER) (LYCAENIDAE): NEW HOST AND
MATING BEHAVIOR IN A DROUGHT-INDUCED
POPULATION EXPLOSION

Additional key words: dispersal, parasitism, *Aprostocetus*, Eulophidae, *Polygonum natans*.

On 24-26 August 1988, we observed a large population of the bronze copper, *Lycaena hyllus* (Cramer), in a wet meadow approximately 4-5 ha at the north end of Carnelian Lake, Stearns County, Minnesota. The lake has no natural outlet and fluctuations in the lake level are due to differences between precipitation and evaporation. The area was observed again in August 1989. Weather conditions during both years were warm and sunny with daytime high temperatures of 23-26° C.

In 1988 the wet meadow inhabited by *L. hyllus* consisted of a dense herbaceous community of *Polygonum coccineum* Muhl., *P. natans* Eat., *P. persicaria* L., *Rumex* spp., grasses, and sedges. *P. coccineum* grew in dense stands up to 1.5 m tall. The shorter *P. natans* covered areas as large as 9 × 15 m. First instar as well as older larvae and pupae of the bronze copper were found on *P. natans*. This is a new larval foodplant record for *L. hyllus*. Plants previously reported as larval hosts are *Rumex crispus* L., *R. obtusifolius* L., *R. longifolius*, *R. patientia* L., and *P. coccineum* (Scott, J. A., 1986, *The butterflies of North America: A natural history and field guide*, Stanford Univ. Press, Stanford, California, 583 pp.). Both *P. coccineum* and *P. natans* exhibited extensive feeding damage assumed to have been caused by larvae of the bronze copper. We did not observe females ovipositing on either plant but one was seen crawling about the base of *P. natans* plants. On 13 September 1988, 35 adult parasitoids of an undetermined species of *Aprostocetus* (Hymenoptera: Eulophidae) emerged from two pupae collected on *P. natans*. This is the first report of *L. hyllus* as a host of any species of *Aprostocetus* (M. E. Schauff, Systematic Entomology Laboratory, PSI, pers. comm.).

Males and females of the bronze copper nectared on the abundant flowers of *P. coccineum*. Both males and females rested and basked on *P. natans* with open wings; the males apparently engaged in perching behavior to await females. Perching behavior is typical of species in which the distribution of foodplants throughout the normal flight area is spotty (Scott, J. A., 1975, *J. Res. Lepid.* 14:1-40). Males in the vicinity of *P. natans* behaved markedly differently from those on the taller *P. coccineum*. Large numbers of males, estimated between 15-25/10 m², were observed patrolling 0.5-1.5 m above large patches of *P. natans*. Many fewer females were observed in these areas. Males, which did not interact outside of *P. natans* patches, sometimes chased each other in groups of 10 or more and often reached heights of 2-3 m. Males flew into and crawled beneath *P. natans* plants and several were observed to land on pupae attached to leaves, suggesting that females probably are mated soon after emergence.

Courtship behavior and mated pairs were observed from 0930-1200, but were more common from 1300-1500. Males sometimes chased females, but behavior that culminated in mating was not observed. Only 10 mated pairs were encountered in this gigantic population, suggesting intense competition among males for receptive females. Males that attempted to mate landed next to a resting female and both sexes began to flutter their wings rapidly. The male moved rapidly around the female and, when behind her, placed his head and antennae beneath her wings, i.e. male nudging (Scott, J. A., 1973, *J. Res. Lepid.* 11:99-127; Scott, J. A., 1974, *Pan Pac. Entomol.* 50:9-22). The female's abdomen remained horizontal to the leaf surface throughout the entire courtship. Attempts by the male to copulate by moving the abdomen laterally were apparently blocked by the open position and fluttering of the female's wings (Scott, J. A. & P. A. Opler, 1975, *J. Lepid. Soc.* 29:63-66). Female fluttering is a rejection dance in *Lycaena* (Scott, J. A., 1974, *J. Lepid. Soc.* 28:64-72), indicating either that females were not old enough to mate or that they had previously mated. Occasionally the male closely followed the female down into

the vegetation. After approximately 1 min of this rejection dance by the female, the male flew. Five males in succession were rejected by one female. Males that landed near a mated pair flew off after several seconds of wing fluttering by all three.

Estimates of the density of adult butterflies in the wet meadow in August 1988 ranged from 1 to 25/10 m² (1000 to 2500 adults/ha) in areas with large *P. natans* patches. The population explosion of *L. hyllus* may have resulted from the effects of the extreme drought conditions throughout central Minnesota during the spring and summer of 1988, which exposed shoreline that was colonized by *P. natans* and *P. coccineum*. These *Polygonum* have both terrestrial and aquatic forms (Gleason, H. A. & A. Cronquist, 1963, Manual of vascular plants of northeastern United States and adjacent Canada, D. Van Nostrand Co., Princeton, NJ, 810 pp.) enabling them to invade rapidly and dominate. We did not observe large numbers of bronze coppers in 23 previous years of normal and above normal precipitation. The presence of several female bronze coppers visiting flowers approximately 1 km from the meadow suggests that dispersal may be an important means by which this butterfly exploits temporary wetland habitats.

After twelve additional months of below average precipitation, the lake level had dropped several more feet by 20 August 1989, exposing additional shoreline. Areas that had been newly exposed in 1988 were extremely dry. Plant diversity had increased at the expense of the *Polygonum* species. The dense stands of *P. coccineum* observed in 1988 were greatly reduced except for newly exposed areas of the slough and shoreline. Searching the area on 20, 21, 22, and 26 August 1989 revealed only 10 adult male *L. hyllus*. Explanations of the population crash may include parasitism and a reduction of suitable larval foodplants.

We thank Dr. M. E. Schauff, Research Entomologist, Systematic Entomology Laboratory, Plant Sciences Institute, USDA, Beltsville Agricultural Research Center, Beltsville, Maryland for identification of the *Aprostocetus* sp. parasitoid and Dr. James A. Scott, Lakewood, Colorado, for reviewing the manuscript.

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Received for publication 21 November 1988; revised 18 September 1989; accepted 15 January 1990.

Journal of the Lepidopterists' Society
44(1), 1990, 34–36

SEASONAL VARIATION OF OCCURRENCE OF DEFORMED COCOONS
OF THE TASAR SILK MOTHS *ANTHARAEA MYLITTA* (DRURY)
AND *ANTHARAEA PAPHIA* (L.) (SATURNIIDAE) IN INDIA

Additional key words: bipupate, bishellate, flimsy cocoons.

The tasar silk moth, *Antheraea mylitta* (Drury), is trivoltine in India and is reared in the Rainy season (July–August), Autumn (September–October), and Winter (November–December). By contrast, *Antheraea paphia* (L.) is reared only during the Autumn season; although it multiples in nature during the Rainy and Winter seasons, its economic performance at these times is poor. Tasar culture is an age-old practice in Orissa and good cocoons are more highly valued in tasar commerce than deformed cocoons because of the former's better reusability (ability to be spun onto a reel with a continuous filament for production of fine fabrics). Although the occurrence of deformed cocoons in the tasar crop is a common phenomenon, the seasonal variation of their occurrence has not been