

At maturity the larvae become very flaccid, are restless, cease feeding, release their grasp and roll off the branch or rachis of the host tree and drop to the soil. Upon reaching the ground the larvae remain quiet for 3–4 s then begin to wander, finally burrowing into the litter and soil where pupation occurs. Their flaccid condition suggests that the digestive tract is purged before dropping and this probably offers some protection against injury upon landing.

The larvae generally pupate 1–3 cm deep in sod, 1–7 cm in loose soil and in heavy litter on the ground. They do not spin a cocoon before pupating. A cell is made in the soil or litter around the pupa by larval/pupal movements made during the pupation process.

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ANTS ASSOCIATED WITH *HARKENCLENUS TITUS*, *GLAUCOPSYCHE LYGDAMAS*, AND *CELASTRINA ARGIOLUS* (LYCAENIDAE)

Larvae of many lycaenid species are associated with ants. The latter feed on secretion from the larvae and presumably offer them protection against predators and parasitoids. Despite the fact that a number of North American lycaenid larvae are reported to be myrmecophilous, with few exceptions, the associated ants are largely unknown. During 1976 and 1977, we made observations of *Harkenclenus titus* (Fabricius), *Glaucopsyche lygdamas* (Doubleday), and *Celastrina argiolus* (Linnaeus) at several localities in Washtenaw Co., Michigan. Although all of these species have long been known to be myrmecophilous, there are few published records of the species of ants involved (see below). These preliminary observations are presented in the hope that they will stimulate further observations on this facet of lycaenid biology. Ants tending late instar larvae were collected at one locality in Washtenaw Co., in the vicinity of Embury Road (T1S R3E sect. 15), during 1977. Unless otherwise indicated, all identified ants are from this locality. The following summarizes our results.

Harkenclenus titus. Several late instar larvae were found feeding on the green fruits of *Prunus* sp. (possibly a hybrid between *P. serotina* Ehrh. and *P. virginiana* L.) (Rosaceae) on 22 May. Some were tended by *Formica subsericea* Say, and others by *Camponotus nearcticus* Emery. There are no previous reports of identified ants associated with this species.

Glaucopsyche lygdamas. The larvae of this species feed on the inflorescences of *Lathyrus venosus* Muhl., *Vicia caroliniana* Walt., and *V. villosa* Roth. (all Leguminosae) at various localities in Washtenaw Co. On 22 and 28 May, late instar larvae were found feeding on the flowers of *V. villosa*, an introduced species that occurs in open fields. Some of these larvae were tended by *Formica subsericea*, and others by an undetermined species of *Formica* in the *microgyna* or *rufa* species group.

Myrmecophily in this species was first noted by Brower (1911, Entomol. News 22: 359–363), but only Downey (1965, Entomol. News 56: 25–27) has identified ants involved. He found three species (*Formica comptula* Whlr., *Formica* sp. ? *rufa* group, and *Tapinoma sessile* (Say)) tending larvae feeding on *Lupinus argenteus* Pursh at one locality in South Dakota.

Celastrina argiolus. Females of the spring flight oviposit on the flower buds of sev-

eral species of shrubs that occur at the borders of marsh habitats. We have observed oviposition, and raised larvae to adults, on *Cornus alternifolia* L.f., *C. stolonifera* Michx. (Cornaceae), and *Viburnum lentago* L. (Caprifoliaceae). At one locality, both *C. stolonifera* and *V. lentago* grew together and were used by *C. ladon*. Larvae feeding on the young fruits of *C. alternifolia* on 29 May were tended by *Formica subsericea*.

Adults in subsequent flights of this species are much less common than in the spring, and we have only one hostplant record for these. In late July at Embury Road, females were ovipositing on the flower buds of a small herb, *Collinsonia canadensis* L. (Labiatae), which grows in the forest understory. On 9 August several mature larvae were noted feeding on the flowers of these plants. One was tended by two *Lasius alienus* Foerster, and another on a plant several meters away was tended by three *Camponotus nearcticus*.

In addition to the observations in Michigan, one of us (D.J.H.) observed *C. ladon* ovipositing on *Verbesina virginica* L. var. *virginica* (Compositae) at Florida Caverns State Park, Liberty Co., Florida, on 15 September 1976. A search of the inflorescences yielded several mature larvae being tended by *Crematogaster lineolatus* (Say), which also tended aphids on these plants.

An excellent account of the behavior of ants and larvae of *C. ladon* is given by Edwards (1878, Can. Ent. 10: 131-136), who reported that ants were "indifferent" to larvae feeding on *Cornus*, but that they "eagerly" tended those on *Cimicifuga racemosa*. However, in our experience, larvae are very attractive to ants regardless of the hostplant being used (whether *Cornus*, *Viburnum*, *Collinsonia*, or *Verbesina*). Clark (1936, Nat. Geog. Mag. 69: 679-692) gives the only previous record of an ant species associated with *C. ladon* in North America, *Crematogaster lineolatus*.

Although most of our data for these three lycaenids are limited to one locality, it is presumed that the association of their larvae with ants is opportunistic and dependent on the exploitation of the association by the ant. (The association may be more properly termed "lepidopterophily" on the part of the ant rather than myrmecophily on the part of the butterfly.) Each lycaenid was tended by several species of ants, and we suspect that further observations would reveal a greater number of ants associated with each of these in Washtenaw Co. In addition, *Formica subsericea* and *Camponotus nearcticus* (neither of which has been previously reported tending lycaenids (Downey, pers. comm.)) attended several of the lycaenids. This argues against a strict species to species relationship between ants and these larvae, although such relations often occur in the Old World (see Hinton, 1951, Proc. Soc. Lond. Entomol. Nat. Hist. Soc. 1949-1950, pp. 111-175). However, the report of pupae of *G. lygdamas* in an unidentified ant nest (Tilden, 1947, Pan-Pacific Entomol. 23: 42-43) suggests that more complex relations may occur in North America.

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