Laelius utilis [Hym.: Bethylidae], a parasitoid ofAnthrenus fuscus [Col.: Dermestidae] in Iowa

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LAELIUS UTILIS [HYM. : BETHYLIDAE], A PARASITOID OF *ANTHRENUS FUSCUS [COL. : DERMESTIDAE]* IN IOWA(1)

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Larvae of *Anthrenus fuscus* Olivier, an Old World dermestid beetle, are established in Ames, Iowa, and are parasitized locally by the native bethylid wasp, *Laelius utilis* Cockerell ; this is a new state record. Life history and new host information for *L. utilis* is presented, as well as morphological and biological means for differentiating it from *L. pedatus* Say of similar appearance.

KEY-WORDS : *Laelius utilis*, morphogical and biological characteristics.

An Old World dermestid beetle, *Anthrenus fuscus* Olivier, is established in several buildings in Ames, Iowa, including the Insectary on the Iowa State University campus (**Mertins**, 1982). Larvae of *A. fuscus* were refractory to attack by a Wisconsin bethylid wasp parasitoid, *Laelius pedatus* Say, recovering from the venomous sting within 24 to 48 h (**Mertins**, 1980 ; **Mertins**, 1982).

Periodically, individual female *Laelius* wasps resembling *L. pedatus* have appeared in the Insectary Building. The 1st of these was found 17 November 1979 associated with a paralyzed *A. fuscus* larva ; 2 more living and 1 dead specimen were collected since. Each living female was challenged with *A. fuscus* larvae, which always were readily attacked and processed for oviposition. Unexpectedly, however, the paralyzed beetle larvae showed no sign of recovery from the parasitoid's venom. Table 1 shows several other biological, behavioral, and morphological discrepencies from the description of the life history of *L. pedatus* (**Mertins**, 1980), and these differences lead to a question of the identity of the Ames specimens of *Laelius*.

On the basis of **Evans'** (1978) key, **A. S. Menke** (pers. comm.) in Beltsville, Maryland, identified the Ames insects as *L. pedatus*, but agreed that, based on comparisons with known specimens, the determination was open to question. Specimens were sent to **Howard Evans** at Colorado State University, Fort Collins, and he (**H. E. Evans**, pers. comm.) agreed that their identity was a problem. He suggested that the lack of firm characters for separating *Laelius* spp. may make biological differences more useful than morphological information and, further, that the Ames insects probably are *L. utilis* Cockerell with unusually pale legs (at least in the females). To generalize from the morphological information in Table 1, one might say that the appendages of *L. utilis* are consistently darker than those of *L. pedatus*, and the Ames insects agree very well with **Cockerell's** (1920) original description.

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TABLE 1

Morphological, behavioral, and biological characters useful in differentiating studied populations of Laelius utilis *and* L. pedatus

	L. UTILIS		*L. PEDATUS*
1.	All coxae in both sexes black	1.	Coxal color varying from very dark brown to testaceous ; front coxae always darkest ; middle and hind coxae always at least partially brown or testaceous, especially so in the male
2.	Legs of male rufotestaceous beyond the coxae with meso- and meta- thoracic legs somewhat infuscate, and all femora dark ; legs of female ferruginous beyond coxae, with femora and tibiae variably infuscate, especially on meso- and metathorax	2.	All legs testaceous beyond coxae, brightly so in the male but slightly rufous in the female
3.	Forewings with distinct apical infuscation, darkest in female	3.	Forewings hyaline but sometimes faintly to moderately infuscate in female
4.	Labial and maxillary palps lightly infuscate	4.	Palps testaceous
5.	Antennal scape, pedicel, and 1st flagellar segment ferruginous in female, with rest of flagellum dark brown ; male antenna wholly dark brown, except pedicel sometimes paler	5.	Antennal scape, pedicel, and 1st flagellar segment testaceous in female, with remainder lightly infuscate ; male antenna wholly testaceous, with slight infuscation apically
6.	Copulation position (after genetalic linkage) with male above the female, sometimes grasping her abdomen with one or more pairs of legs and with his thorax parallel to her abdomen, or with his body axis vertically at 90° to her body axis and grasping her at most with his hind legs and claspers	6.	Copulation position end to end with male inverted (see **Mertins**, 1980)
7.	Depilation pattern on the ventor of the host usually extending across only first 3 abdominal sterna, occasionally partly onto the 4th ; caudal hastisetae often incompletely removed	7.	Depilation pattern on ventor of host extending posteriorly as far as the 5th or 6th abdominal sternum, caudal hastisetae substantially removed
8.	Suitable hosts include : *Anthrenus fuscus, A. verbasci, A. flavipes* LeConte, *Trogoderma variable* Ballion, and *T. inclusum* LeConte [as *T. versicolor* (Creutzer) in **Evans** (1978) ; occasional temporary interest and brief, but unsuccessful, attempts to sting larval *Thylodrias contractus* Motschulsky]	8.	Suitable host : *A. verbasci* [ready attack, but venom only temporarily effective on *A. fuscus* ; occasional attack on 4 spp. of *Trogoderma* with rare partial success ; unable to attack *A. flavipes* (**Ma** *et al.*, 1978) ; little or no interest in *Attagenus megatoma* (F.) or *T. contractus*]

In addition to the biological and behavioral differences listed in Table 1, there are other possible disparities between the 2 *Laelius* species. Although there is considerable variability, female *L. utilis* tend to deposit their eggs on the host in a slightly different pattern from that seen in *L. pedatus* (**Mertins**, 1980). In that species, the 1st egg occurs medially on the host, spanning the juncture of the metathorax and the 1st abdominal sternum ; the 2nd and 3rd eggs occur behind the 1st and, respectively, to the right and left of the host midline. Typically, the female deposits 3 eggs per *Anthrenus* host ($\bar{X} = 3.4$, $n = 62$) as in *L. pedatus*. The actual number once again varies (within limits) according to the size of the host, but the mean is larger for *L. utilis* (cf. 3.1 in *L. pedatus*) only because more large hosts (i.e., 50% > 4.0 mm in length, $\bar{X} = 3.9$ mm) were exposed in this study. One large *Anthrenus* host received 5 eggs, and 3 smaller larvae (i.e., < 3.3 mm) received 2 eggs each. (Attacks on larger *Trogoderma* spp. larvae, up to 7.6 mm in length, resulted in 5 or 6 eggs per host). The 1st egg is almost always positioned longitudinally across the ventral juncture between the

metathorax and the 1st abdominal segment and with its anterior-most end immediately adjacent to one of the host metathoracic coxae. The 2nd egg usually is deposited symmetrically across the host and adjacent to the other coxa or a bit more posteriorly. The 3rd egg typically occurs medially and posteriorly on the host, spanning the length of the 1st abdominal sternum or the juncture between the 1st and 2nd segments. When a 4th eggs is laid, it occurs a bit more posteriorly and either to the right or left of the 3rd. Almost invariably, only the last laid egg was a male, and the sex ratio of completely successful 3 and 4 egg clutches of prime females was 2.4 females : 1 male ; of 25 such broods observed, only 1 provided 2 males and 1 female.

Sufficient dermestid larvae were available to challenge 2 mated female *L. utilis* with a continual sequence of hosts throughout their lives. One female lived 56 days, paralyzed and prepared 27 hosts, and laid 81 eggs on 26 of them. The other female lived 40 days, paralyzed 20 hosts, and laid 62 eggs on 19 of them. Each female died without ovipositing on the last host that she paralyzed. The latter female behaved and functioned normally up to the end, but the former deposited a clutch of 4 all-male eggs on the 15th host and produced no female offspring thereafter. On the 22 host, she began to lay only 2 eggs per host. Neither female had any access to food or water, although each of them chewed the anterior abdominal sternum of 1 of their respective hosts sufficiently to injure it and explose some hemolymph that presumably was ingested.

Finally, unlike the observed bivoltine life cycle of *L. pedatus* (**Mertins**, 1980), no distinctly prolonged prepupal dormancy occurred in the cocoon of any generation of *L. utilis*. The culture passed through 7 complete generations in 1 year, with a life cycle time (oviposition to adult emergence) as short as 35 days in mid-summer and as long as 57 days in mid-winter. The average elapsed time between completion of the cocoon and adult emergence for all observed parasitoids was 33.0 days, with a minimum of 24 days in mid-summer and a maximum of 45 days in mid-winter.

To my knowledge, these observations constitute the 1st published account of life history and extensive host information for *L. utilis*, establishing that the Nearctic wasp readily accepts and attacks the adventive hosts, *A. fuscus* and *A. flavipes* LeConte. Both these species show nearly complete physiological, physical, or behavioral resistance to attack by *L. pedatus*. This work also establishes a new state distribution record for *L. utilis*, the 1st from northcentral U.S.A. Voucher specimens are depostied in the Iowa State Insect Collection and in the collection of H. E. Evans at Colorado State University.

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RÉSUMÉ

Laelius utilis [*Hym. : Bethylidae*], parasitoïde d'*Anthrenus fuscus* [*Col. : Dermestidae*] en Iowa

Les larves d'*Anthrenus fuscus* Olivier, dermeste de la région paléarctique se sont implantées à Ames, en Iowa et elles y sont parasitées localement par un bethylide indigène, *Laelius utilis* Cockerell ; c'est la première mention qui en est faite dans cet État. Des informations sur le mode de vie et les nouveaux hôtes de *L. utilis* sont présentées ainsi que des moyens morphologiques et biologiques pour le différencier de *L. pedatus* Say, similaire d'apparence.

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