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MEGAULROTIRIPS DISTALIS (THYSANOPTERA: THRIPIDAE) BREEDING IN THE FLOWERS OF KUDZU IN FLORIDA

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Three of the five species in the genus of Megalurothrips (Trybom) are easily recognized by an array of short, spear-shaped setae ventrally on the abdomen (Fig. 1). A further problem is recognition of the plant species on which these thrips can maintain a population. These thrips are highly vagile, and the females that predominate in all populations land on many plants on which they cannot breed (Mound 2013).

Thrips were sampled during Jun, Jul, and Aug 2012 by beating kudzu plants over a plate at locations in Gadsden and Leon counties (N 30° 32’ 52” W -84° 35’ 36” and N 30° 28’ 37” W -84° 21’ 30”, respectively). Thrips were transferred to 2-mL containers containing 70% ethyl alcohol using a small paint brush before being placed onto microscope slides for identification.

The adult thrips were identified to species by the keys contained in Mound & Marullo (1996) and Palmer (1987). Other species of thrips were Thrips hawaiiensis (Morgan), Frankliniella tritici (Fitch), F. bispinosa (Morgan), Hoplothrips gowdeyi Franklin, and Leptothrips mali (Fitch). Voucher specimens were deposited in the Florida State Collection of Arthropods, Florida Department of Agriculture and Consumer Services, Gainesville; in the Australian National Insect Collection, CSIRO, Canberra; and at the North Florida Research and Education Center, Quincy.

Six samples of 10 mature and 10 young leaves, 10 shoots, and 3 inflorescences (when available) were randomly collected on 11 dates in 2013 from the previous Gadsden County location. Samples were placed in 100-mL vials containing 70% ethyl alcohol. The numbers of adult and larval thrips of each species and the numbers of adult and nymphal Orius insidiosus (Say) (Hemiptera: Anthocoridae) were determined under a stereomicroscope at 17 to 230X magnification. Mean numbers on each plant part were compared using analysis of variance for a completely randomized design and the least significant difference at P = 0.05 using un-transformed data (PROC ANOVA, SAS Institute 2008). Because reliable morphological keys were not available to identify the thrips larvae, additional samples were taken to verify the species of larvae by rearing them to adulthood. Randomly selected flowers and shoots were clipped from the kudzu on 26 Aug and 7 Sep 2013, and the extracted larvae were placed individually in 30-mL plastic cups each containing a 2-cm section of green bean pod, Phaseolus vulgaris L. (Fabaceae). Male and female adults of M. distalis and S. aimotofus developed from the collected larvae. The morphology of first and second instars of M. distalis and S. aimotofus was distinctive from each other and from the larvae of the other species. Ratios of lar-

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vae per adult female of each thrips species of less than and greater than one were considered indicative of declining and increasing populations, respectively (Northfield et al. 2008).

The adults and larvae of *S. aimotofus* were highly aggregated in the kudzu shoots with a ratio of larvae to adult females of 2.6 (Table 1). In contrast, the adults and larvae of *M. distalis* were found only in the inflorescences. The mean number of adult and larval *M. distalis* and *S. aimotofus* per leaf, shoot, and inflorescence on sample dates during the flowering period are shown in Table 1. The ratio of larvae to adult females over all sample dates was 1.5, indicating an increasing population of *M. distalis* on kudzu. The total number of nymphs and adult *O. insidiosus* over all dates and plant parts was 15 and 22, respectively. This predator is capable of suppressing natural populations of *Frankliniella* species in Florida (Funderburk et al. 2000). Moreover, Viswanathan and Ananthakrishnan (1974) reported that the Asian anthocorid *O. minutus* L. is an effective predator of *M. distalis* and that predation is density-dependent.

The identity of the females of *Megalurothrips* reported by Diffie et al. (2008) remains in doubt due to the problems in identifying females in this genus. However, these females cannot be distinguished from those here identified as *M. distalis* through the presence of males, and it seems likely that this species is widely established across the southeastern USA.

**SUMMARY**

Two Asian species of Thripidae are reported breeding in northern Florida on kudzu (*Pueraria lobata*), *Salpingothrips aimotofus* Kudo in the shoots, and *Megalurothrips distalis* Karny in the flowers, the latter being a new record for North America.

Key Words: aggregated distributed, host-plant dependencies, *Pueraria lobata*, larvae to adult ratio
TABLE 1. THE MEAN NUMBER (SEM) ON ELEVEN 2013 SAMPLE DATES OF ADULT FEMALE, ADULT MALE, AND LARVAL *Megalurothrips distalis* AND *Salpingothrips amimotofus* PER *Pueraria lobata* PLANT PART IN GADSDEN COUNTY, FLORIDA (N FOR SHOOTS, MATURE LEAVES, AND YOUNG LEAVES = 6 SAMPLES OF 10 PLANT PARTS AND N FOR INFLORESCENCES = 6 SAMPLES OF 3 INFLORESCENCES, WHEN AVAILABLE). *F*- AND *P*-VALUES ARE FROM ANALYSES OF VARIANCE TO COMPARE MEAN NUMBERS ON DIFFERENT PLANT PARTS

| Plant Structure | Females | Males | Larvae | Females | Males | Larvae |
|-----------------|---------|-------|--------|---------|-------|--------|
| **3 Jun**       |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 4.1 a(1.6) | 0.1(0.1) | 6.6 a(2.4) |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Flower          | —       | —     | —      | —        | —     | —      |
| *F*             | 0.99    | 0.99  | 0.99   | 0.01     | 0.39  | 0.0006 |
| **10 Jun**      |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 6.7 a(2.2) | 0.2 a(0.1) | 22.0 a(8.3) |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Flower          | —       | —     | —      | —        | —     | —      |
| *F*             | 0.99    | 0.99  | 0.99   | 0.002    | 0.003 | 0.007  |
| **17 Jun**      |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 11.2 a(4.9) | 0.3 a(0.1) | 25.2 a(8.0) |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Flower          | —       | —     | —      | —        | —     | —      |
| *F*             | 0.99    | 0.99  | 0.99   | 0.02     | 0.03  | 0.002  |
| **24 Jun**      |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 9.9 a(2.8) | 0.1 a(0.1) | 30.0 a(7.2) |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0     | 0 b    |
| Flower          | —       | —     | —      | —        | —     | —      |
| *F*             | 0.99    | 0.99  | 0.99   | 0.0005   | 0.05  | 0.0001 |

Mean numbers in each column of the same sample date are not significantly different at *P* = 0.05 according to the least significant difference.
Table 1. (Continued) The mean number (SEM) on eleven 2013 sample dates of adult female, adult male, and larval *Megalurothrips distalis* and *Salpingothrips aimotofus* per *Pueraria lobata* plant part in Gadsden County, Florida (n for shoots, mature leaves, and young leaves = 6 samples of 10 plant parts and n for inflorescences = 6 samples of 3 inflorescences, when available). *F* - and *P*-values are from analyses of variance to compare mean numbers on different plant parts.

Mean Number of Thrips per Plant Part (SEM)

| Plant Structure | *Megalurothrips distalis* | *Salpingothrips aimotofus* |
|-----------------|---------------------------|---------------------------|
|                 | Females | Males | Larvae | Females | Males | Larvae |
| **1 Jul**       |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 15.3 a(5.0) | 0.2 a(0.1) | 37.4 a(13.5) |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0 b     | 0.1 b(0.1)  |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0 b     | 0.2 b(0.1)  |
| Flower          | 0.3(0.3) | 0    | 0      | 0 b      | 0 b     | 0 b      |
| *F* sub 3, 15   | 0.1     | 0     | 0      | 6.5      | 6.5     | 5.2     |
| *P*             | 0.99    | 0.99  | 0.99   | 0.005    | 0.005   | 0.01    |
| **8 Jul**       |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 13.8 a(2.6) | 0.2 a(0.1) | 37.6 a(8.0)  |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0 b     | 0.1 b(0.1)  |
| Young Leaf      | 0       | 0     | 0      | 0 b      | 0 b     | 0.6 b(0.2)  |
| Flower          | 0       | 0     | 0      | 0 b      | 0 b     | 0.1 b(0.1)  |
| *F* sub 3, 15   | 0.1     | 0     | 0      | 19.5     | 10.3    | 14.7    |
| *P*             | 0.99    | 0.99  | 0.99   | 0.0001   | 0.006   | 0.0001  |
| **15 Jul**      |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 10.8 a(4.7) | 0.1 a(0.0) | 37.2 a(4.7)  |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0 b     | 0 b     |
| Young Leaf      | 0       | 0     | 0.1(0.1) | 0 b     | 0 b     | 0.5 b(0.2)  |
| Flower          | 0       | 0     | 2.4    | 35.2     | 13.0    | 50.1    |
| *F* sub 3, 17   | 0.1     | 0     | 0.10   | 0.0001   | 0.0001  | 0.0001  |
| *P*             | 0.99    | 0.99  | 0.10   | 0.0001   | 0.0001  | 0.0001  |
| **23 Jul**      |         |       |        |         |       |        |
| Shoot           | 0       | 0     | 0      | 4.3 a(1.6) | 0       | 12.2 a(6.0)  |
| Mature Leaf     | 0       | 0     | 0      | 0 b      | 0 b     | 0 b     |
| Young Leaf      | 0       | 0     | 0 b    | 0.2(0.2) | 0.2 b(0.2)  |
| Flower          | 0       | 0     | 0.3(0.3) | 0 b     | 0 b     |
| *F* sub 3, 18   | 0.1     | 0     | 0.9    | 6.6      | 2.2     | 3.5     |
| *P*             | 0.99    | 0.99  | 0.5    | 0.003    | 0.13    | 0.04    |

Mean numbers in each column of the same sample date are not significantly different at *P* = 0.05 according to the least significant difference.
| Plant Structure | 29 Jul | 5 Aug | 29 Aug |
|----------------|--------|-------|--------|
| Shoot          | 0      | 0     | —      |
| Mature Leaf    | 0      | 0     | 0 b    |
| Young Leaf     | 0      | 0     | 0 b    |
| Flower         | 0.2(0.2) | 0       | 0.4(0.4) | 0.1(0.1) | 1.7 a(0.2) |
| F<sub>2, 14</sub> | 1.6 | 0.4(0.4) | 2.4 | 0.10 |
| P              | 0.23  | 0.10  | 0.01   | 0.0001 |
| Shoot          | —      | —     | —      |
| Mature Leaf    | —      | 0 b   | —      |
| Young Leaf     | —      | 0 b   | —      |
| Flower         | —      | 0.7 a(0.1) | 1.7 a(0.2) | 0.7 a(0.1) | 1.7 a(0.2) |
| F<sub>1, 8</sub> | 106.7 | 37.5 | 21.4 |
| P              | 0.0001 | 0.0003 | 0.002 | 0.0001 |

Mean numbers in each column of the same sample date are not significantly different at P = 0.05 according to the least significant difference.
RESUMEN

Adultos y larvas de *Megalurothrips distalis* Karny fueron encontrados agregados en flores de *Pueraria lobata* (Wildenow) Ohwi en el norte de la Florida. Este es un nuevo registro para América del Norte.

Palabras Clave: agregados distribuidos, dependencia de la planta hospedera, *Pueraria lobata*, proporción de larvas y adultos

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