

# Notes on the Agave Feeders of the Genus *Megathymus* (Lepidoptera, Rhopalocera, Megathymidae)

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Life histories of most of the species of *Megathymus* long have been associated with the genus *Yucca*; but John A. Comstock & Charles M. Dammers found that *Megathymus stephensi* Skinner has as its food plant a certain species of the genus *Agave* (Bull. So. Calif. Acad. Sci., XXXIII, 1934). Later, it was found that another species of *Megathymus* feeds in the larval stage upon agave. Although I have been unable to find any published note on the feeding of *Megathymus mariae* B.&B. upon *Agave lecheguilla* Torrey, lepidopterists have known this fact for a considerable time. There remain four species of *Megathymus* with unknown life histories. With this in mind I went, on a research grant, to Arizona this past summer, hoping to work out the life histories of the remaining agave feeders in this group of butterflies. Howell Daly, biology-student at Southern Methodist University, helped me very much on this trip, working at some of the problems of this particular study.

While most of the yucca feeders emerge in the spring, those feeding upon agave emerge in late summer or fall; it is thus easy to determine the rest of the species that feed upon agave.

*Megathymus neumoegei* Edwards

Food plant of the larvae.—*Agave palmeri* Engelman and *Agave chrysantha* Peebles.

Oviposition.—Several females were observed during oviposition, in Ramsey Canyon, Cochise County, Arizona, (Sept. 11, 12, 1950). The method of egg-laying was to flick the abdomen from side to side as they flew around the agave plants. The female attempted to flip the egg into the plant; the larvae then would not have to crawl far to arrive at food. No adhesive material is present on the eggs; so if thrown into the plant, they usually end up at the base of the outer first or second row of leaves (especially the second). The eggs are somewhat larger and slightly darker in coloration

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than those of *Megathymus stephensi* Skinner. I saw two females alight on the outer surface of a leaf of *palmeri*, but they made no attempt to deposit eggs in that position. When disturbed they flew away with a distinct clicking sound.

Adult larvae.—Because it was late summer when we were in the area of this species, only adult larvae were observed. These resemble those of *stephensi*, but are somewhat larger and sordid white in color. It was easy to detect the presence of larvae in the plants by looking for the brown doors which they build over the entrance to the internal tunnels. These larvae were usually present in the outer second or third row of leaves, and nearer to the bottom than the center or top of the leaf. The larvae did not seem to favor differentially either the inside or outside of the leaf. Usually only one larva was found in a leaf; but 16 leaves were brought home, each containing two larvae, and eight with three larvae—the largest number observed. When a longitudinal section was made through the tunnel of these larvae it was easy to measure their average lengths. While there was some variation, the average length was around 7 cm. The diameter of the opening to the tunnel averaged 7mm., and its door was usually about the same size.

I tried to ascertain the chemical composition of these peculiar brown doors, and applied Van Wisselingh's test for chitin, with negative results. The microscope showed these doors to have a hilum arrangement of rings with some silken threads present throughout. Possibly the basic substance is one of the scleroproteins allied to sericin.

The width of the tunnel at the place where pupation occurs (the lower third of the tunnel) varied from 14 to 18 mm. Its entire surface is covered with a flaky, silk-like material (which no doubt prevents the entrance of moisture while the insect is in the pupal stage, and also makes easier emergence of the adult from the tunnel).

Pupae.—When first formed, they are of a light tan, which after a day or so turns to a light brown. After about three weeks, the brown darkens, becoming nearly black just before emergence. For two or three days before emergence, the sex of the specimen can be learned by scrutiny of the wing cases, as the spots show through very readily. This species shows considerable activity during the pupal stage, and often for days before they emerge as adults one can hear them moving

about in the agave leaf, especially as it begins to dry out. Pupation usually takes place during the middle of September.

Emergence of the adult.—Just before the insect emerges from the pupal skin there is a short period of quiescence; the pupal skin then splits in two directions over the cephalic end, vertically and horizontally. This splitting is followed by a gradual withdrawal of the insect from the pupal skin. When the insect gets to the door at the outside entrance to its tunnel, it presses its head against this door and gently swings it open from the top side, leaving the bottom portion fastened to the edge of the tunnel as though on hinges. The first part to emerge is the head, with antennae held firmly against the sides of the head and thorax. As soon as the head is out, the insect moves its body from side to side. The antennae, thus exposed, immediately assume a normal position. The prothoracic legs then appear, followed soon by the rest of the insect. It does not stop when it leaves its tunnel until it has reached a position on the agave leaf about half way to the top. It then stops, with the small wings hanging loosely downward. Within five minutes, it starts pumping fluids into the veins, and the wings will begin to assume their normal size. (This process usually takes about 15 minutes for completion.) The insect usually remains in this position until the wings are dry enough to permit flight—a matter of some four hours. When raised in a breeding cage, the insects crawl to the top or screened side just before they are ready to begin flying.

*Megathymus evansi* Freeman

Food plant of the larvae.—*Agave parryi* Engelmann.

The only definite information on the life history of this species was observed in Ramsey Canyon. While we were in Arizona, most of the agave feeders were still in the larval stage, except in and around Ramsey Canyon. There, the adults had been on the wing for about three weeks and I could not get any of the larvae or pupae from the agave plants present. I observed in several plants of *Agave parryi* tunnels and empty pupal skins; and two female *Megathymus evansi* Freeman were observed flying around this species of *Agave*. I saw a female flip two eggs into one of the plants, so probably this is the species of *Agave* preferred by this species of skipper. Tunnels and doors found in and around

*Agave parryi* were very similar to those of *Megathymus neumoegei* in *Agave palmeri* and *A. chrysantha*. The eggs observed by me were also like those of the *neumoegei*. Since I got no *Agave parryi* around Tucson, I cannot be certain whether other species of *Megathymus* feed on it or not. I am sure that *evansi* larvae do not feed on *Agave palmeri* and *A. chrysantha* in the Santa Catalina and Santa Rita Mountains as well as in the Texas Canyon, Cochise County (as only *neumoegei* and *polingi* (?) adults emerged from the plants with larvae, that I carried home from those particular localities.)

*Megathymus polingi* Skinner

Food plant of the larvae.—*Agave palmeri* Engelm.

One female *polingi* emerged from an immature plant of *Agave palmeri*, which I collected in the Santa Catalina Mountains about 12 miles west of Redington, Sept. 9, 1950. The adult emerged from the pupa Oct. 13, 1950. I am not entirely satisfied with the status of *polingi*, as several females emerged *neumoegei* (from several localities in Arizona) showed the same arrangement of spots on the lower surface of the wing as was described in Skinner's original description of *polingi*. He makes his distinction between *polingi* and *neumoegei* principally on the basis of spot-arrangement, as well as on the smaller size and concolorous veins with the fulvous coloration of the wings. I have noted that very often immature plants give somewhat smaller individuals, with the markings more pronounced, especially on the lower surface of the wing. After having collected *Megathymus mariae* B.&B. from *Agave lecheguilla* I was of the opinion that *polingi* would be found in a similar plant in Arizona; so I collected at spots where *Agave schottii* occurred, and examined plants for signs of larvae. I saw at once that it would be most unlikely that *schottii* would be the host plant for any species of *Megathymus*, because of its very narrow leaves. Cross sections of several of the plants gave no signs of larval work. I found only several snout-beetles (Curculionidae) feeding on the soft basal part of the leaves. My data show that if *polingi* is a good species, it feeds on rather small plants of *Agave palmeri*. If it is not a good species it shows the same thing that occurs in Texas with the yucca feeder *Megathymus texana* B.&McD. The form *albocincta*

Holland of that species apparently emerges from immature or small plants of *Yucca glauca*. The insect in both sexes does not resemble the typical form of *texana*, yet they fly together and feed on the same species of plant. My single male specimen of *polingi* was collected about twenty-five years ago in the vicinity of Redington, Arizona, during September. We covered closely the Redington area and found there only three species of *Agave*: *palmeri*, *chrysantha*, and males emerged, and females that varied from nearly typical *schottii*. From the larvae collected there, only *neumoegeni polingi* to typical *neumoegeni*.

*Megathymus stephensi* Skinner

Food plant of the larvae.—*Agave deserti* Engelm.

The life history of this species of *Agave* feeder was well worked out by John A. Comstock & Charles M. Dammers.

Habits of larvae.—Similar in many respects to those of *Megathymus neumoegeni* Edwards.

Distribution.—South and southeastern California, with its best development in the vicinity of Mason Valley (La Puerla), San Diego County. There are Texas records for this species, but I have never seen an example from our State. It would not be unlikely that this species occurs in the southwestern part of Arizona; *Agave deserti* occurs in that area, and also just across the state line in California.

*Megathymus mariae* B.&B.

Food plant of the larvae.—*Agave lecheguilla* Torrey.

Oviposition.—I did not see females laying eggs; but from the position of the larvae in the plants, and the physical make-up of the host plant, it is most likely that the female flicks the eggs singly into the *Agave* plant with the result of the eggs' getting to the base of the leaves.

Adult larvae.—In July, 1949, I examined some larvae in *lecheguilla* plants 12 miles north of Van Horn, Texas. They were nearly mature and showed the same general characteristics as *stephensi*, but were somewhat smaller. In September, 1950 I brought home thirty larvae from El Paso, Texas, and observed their habits during pupation and emergence. When the young larva enters the leaf it bores into it about 5 to 7 cm. from the base. It forms a tunnel as it feeds, always large enough to let the larva turn around. When defecation occurs, the larva backs up the tunnel, and exposes

its last two or three segments through the outer opening of the tunnel. Defecation completed, the larva crawls down the tunnel, turns around, returns to the opening, and places some silken threads over the entrance to keep out moisture and such parasitic enemies as Tachinid flies (parasites on several species of *Megathymus*.) When the larvae stop feeding a few weeks before pupation, they construct a light tan door over the entrance to the tunnel, like that of the other agave feeders except for its much lighter coloration. These tunnels go down to the base of the leaf first entered by the larvae. Because of the small size of *lecheguilla* leaves in comparison with *palmeri*, *chrysantha* and *parryi*, the enlargement at the bottom, where pupation takes place, involves not only that leaf but the one just outside and the one just inside as well. This makes the collecting of larvae more difficult than in *neumoegeni* where you have to cut out but a single leaf at its base. In *mariae* you must collect the whole plant, otherwise the larvae will be destroyed in trying to remove the main leaf in which it is concealed.

Pupae.—Just before the larvae are ready to pupate, they become quiet and their sordid white skin appears wrinkled and lifeless. When the pupa is first formed its color is light green. After five days it turns light brown, and as it approaches the time of emergence it gradually darkens, until it is nearly black just before it hatches. Like *neumoegeni* one can determine the sex of the individual several days before emergence, by the size and shape of the spots on the primaries.

Emergence.—Like *neumoegeni* in many respects. Because of their smaller size, specimens of *mariae* are ready for flight earlier than *neumoegeni*. Specimens emerging at 7:00 a.m. are ready for flight by 10:30 a.m. This species usually emerges in October, but I have had specimens that hatched in September and November.

Distribution.—I found the larvae in *lecheguilla* plants from near Del Rio, and 40 miles west of Pecos across the Big Bend region to El Paso, and up to Carlsbad, New Mexico. Hoffman lists *mariae* from Chihuahua, Mexico, although there were no specimens of this species in his collection when it was purchased by the American Museum of Natural History.

*Megathymus smithi* Druce

Food plant of the larvae.—*Agave variegata* Jacobi.

The extreme scarcity of individuals and collecting data on this species of skipper prevents giving much information on its life history. There are only two males in the United States, one collected by Barnes in the vicinity of Corpus Christi, the other a reared specimen in the Los Angeles County Museum. For some unknown reason there are no collecting data on the Barnes specimen except "Corpus Christi"; the one in the Los Angeles County Museum bears the information, ex larva, "*Agave variegata (maculosa)*, east Bexar County, Texas, II-31-35." From the habits of all of the agave feeders, one would assume that the date is Nov. 31, 1935! Last year I made a trip to that part of Texas with the hopes of getting some more information on this species. I found a few scattered plants of *variegata*; and as these were in a well-stocked pasture, the only plants that remained were under clumps of cacti and were rather small. I dug up a large number of these and made cross sections, but saw no signs of larval work. Perhaps if a good stand of this plant could be located in an ungrazed area, better results would be obtained.

## NOTES

DISTRIBUTIONAL NOTES ON *PAPILIO PALAMEDES* DRURY AND ITS SUBSPECIES *LEONTIA* R.&J. (LEPIDOPTERA, RHOPALOCERA, PAPILIONIDAE).—*Typical palamedes* Drury is found rather abundantly in Florida; it extends northward to near Washington, D. C., and westward to north central Texas. From 1926 to the present date I have collected only two specimens of this beautiful swallow-tail in Arkansas, both individuals near the Arkansas river at North Little Rock. Apparently *palamedes* is very rare in Texas, as I have collected only one rather worn specimen near Dallas in June, 1938. Just east of Monterrey, N.L., Mexico (June, 1935), I collected two topotypes of the subspecies *LEONTIA* R.&J. This subspecies differs from typical *palamedes* in being somewhat smaller, with the discal spots reduced; and very often the cell spot on the upper surface of the primaries is absent. When present, it appears as a narrow line. The yellow submarginal spots on the lower surface of the secondaries are often heavily overscaled with orange. On April 7, 1950, Leonard Coleman with some other Southern Methodist University students collected a rather worn specimen of *leontia* R.&J. Rockport, Texas. This is the first record of this subspecies's collection in the United States.—H. A. FREEMAN, Instructor in Biology, Southern Methodist University.