BULLETIN OF THE ALLYN MUSEUM

Published by
THE ALLYN MUSEUM OF ENTOMOLOGY
Sarasota, Florida

Number 9 11 December 1972

A NEW SUBSPECIES OF MEGATHYMUS URSUS POLING (MEGATHYMIDAE) FROM ARIZONA WITH OBSERVATIONS AND NOTES ON ITS DISTRIBUTION AND LIFE HISTORY

Ronald S., Joseph R.* and Dale Wielgus

3434 West Augusta Avenue, Phoenix, Arizona, 85021

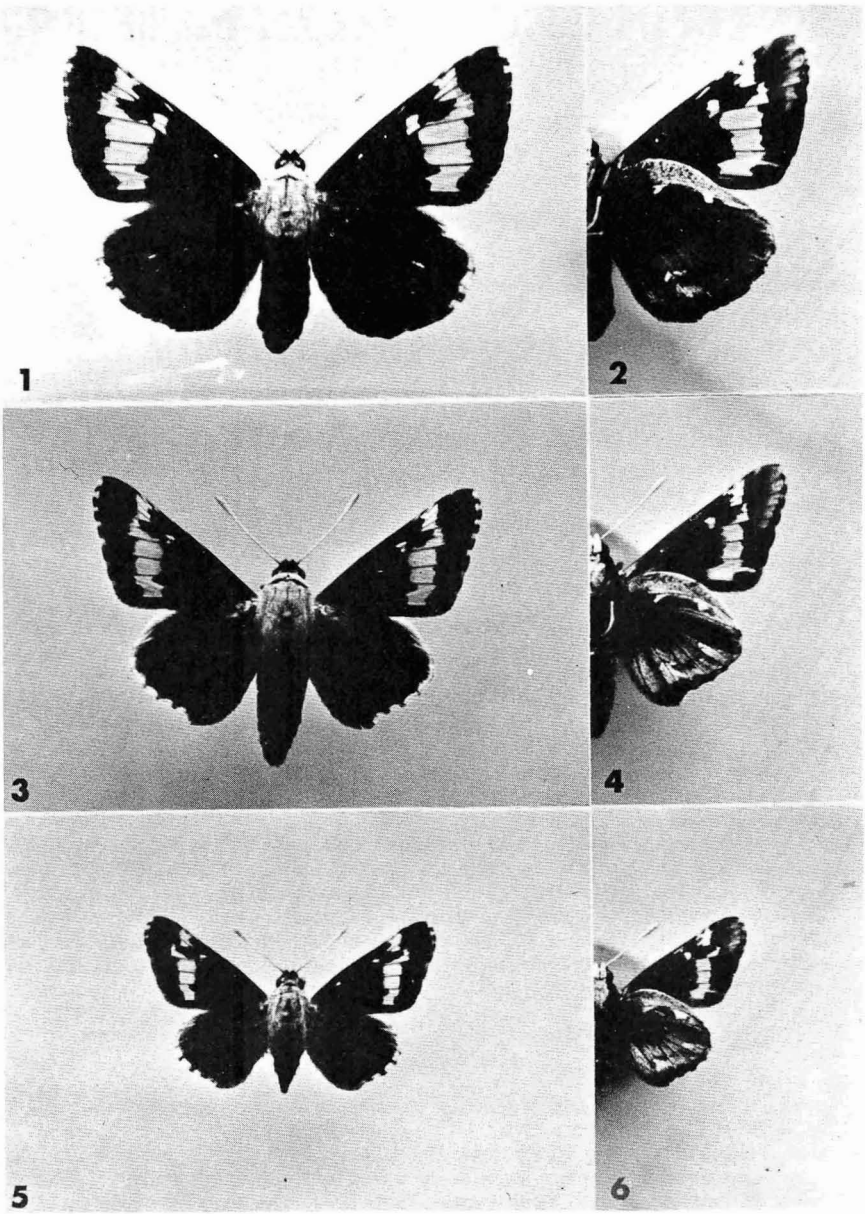
The typical subspecies, *Megathymus ursus ursus* Poling has not been recorded north of the Santa Catalina Mountains of southern Arizona. It is known to occur in steep-sided, mountain canyons above 5000 feet elevation where its larval foodplant, *Yucca schottii* Engelmann grows (Stallings and Turner, 1956, and personal observation). The new subspecies was discovered in a lower, desert situation approximately 120 airline miles northwest of the northernmost known *ursus* locality, utilizing another species of *Yucca* as a foodplant (Wielgus, et al., 1971). The first specimens were obtained in 1970 and sent to Mr. Don B. Stallings of Caldwell, Kansas, for examination. It was he who called the attention of the senior author to certain distinguishing characteristics, and felt that these specimens may represent a new subspecies (personal communication). Mr. Lloyd M. Martin of Prescott, Arizona, who also examined these specimens, shared this feeling. We have subsequently secured additional specimens and believe that the naming of this subspecies now will afford a necessary reference for those workers interested in establishing a more thorough knowledge of its distribution and life history.

Megathymus ursus deserti Ronald S., Joseph R. and Dale Wielgus, new subspecies

Female: Head: front and paraocular area black; vertex gray. Antenna: shaft white; base black dorsally; tip black. Palpus: very light gray. Thorax: gray above; blackish below. Abdomen: black dorsally and ventrally; gray latero-ventrally.

Upper surface of primaries: dark, shiny black, with small amount of white hairs at base of wing creating gray appearance in this area; apex very lightly overscaled with white just inside fringe. Spot 1 (cell spot) dark yellow. Spots 2, 3 and 4 (subapical spots) elongated, bottom two light yellow in color and top one white. Spots 5 and 6 (submarginal spots) dark yellow, rectangular, with spot 6 approximately twice as long as spot 5 and connecting with spot 1 by thin, dark yellow line

*Present address: 4315 West Las Palmaritas, Glendale, Arizona



Figs. 1-6, adults of *Megathymus ursus deserti*, new subspecies. 1, Holotype ♀, upper surface; ARIZONA: Maricopa Co.: 1/2 - 1 1/2 mi. N. Camp Creek on road to Seven Springs, 3500-3680 ft., 4 June 1971. 2, same specimen, under surface. 3, Allotype ♂, upper surface; same locality, 5 June 1971. 4, same specimen, under surface. 5, dwarf Paratype ♂, upper surface; same locality, 12 May 1971. 6, same specimen, under surface.

along vein M_3. Discal band composed of spots 7, 8 and 9 dark yellow. Spots 7 and 8 of approximately equal width and wider than 9. Spots 5, 6, 7, 8 and 9 toothed very slightly along outer edge. Fringe smoky, checkered at apex.

Upper surface of secondaries: dark, shiny black with small amount of white hairs at base creating gray appearance in this area. Two narrow yellow spots, at spots 11 and 12, with spot 11 more prominent than 12. Fringe smoky from anal angle to outer margin, becoming white with vein tips black at outer margin.

Under surface of primaries: black with tip and outer margin overscaled with white to vein Cu_1 giving that area gray appearance. All dorsal spots reappearing. Spots 1, 7, 8 and 9 dark yellow. Spots 2, 3 and 4 white. Spots 5 and 6 light yellow. Spot 9 (bottom spot) extending inwardly to barely beyond inner edge of spot 7. Spots gray-centered, ringed with black in cells M_2 through Cu_2, white-centered in cell 1A. Costal area heavily overscaled with white and containing two white spots.

Under surface of secondaries: black overscaled with white; white overscaling confined to limbal area, not invading cell, creating distinct, wide, gray postmedian-submarginal band following curve of outer margin from anal margin to vein Rs; outer edge of band curving to meet fringe at vein M_3. Veins not overscaled with white, contrasting with band. Faint postmedian spot band following curve of outer margin;

Length of forewing 37 mm to 41 mm, average 38.2 mm; measurements of Holotype: forewing, apex to base 38 mm, apex to outer angle 26mm, outer angle to base 27 mm; hindwing, base to end of vein Cu_1 24 mm.

Male: Head: front and paraocular area black; vertex gray. Antenna: shaft white; base black dorsally; tip black. Palpus: very light gray. Thorax: gray above; blackish below. Abdomen: Black dorsally and ventrally; light gray latero-ventrally.

Upper surface of primaries: dark black, with small amount of white hairs at base of wing creating gray appearance in this area; apex very lightly overscaled with white just inside fringe. Spot 1 (cell spot) usually twinned, light yellow. Spots 2, 3 and 4 (subapical spots) elongated, top two white in color and bottom one light yellow. Spots 5 and 6 (submarginal spots) dark yellow, spot 5 one-half or less width of spot 6 and deeply concave outwardly; spot 6 extending inwardly along vein M_3 to inner edge of spot 7. Discal band dark yellow, composed of spots 7, 8 and 9. Spot 7 slightly wider than spot 8, both spots rectangular. Spot 9 extending inwardly of spots 7 and 8 sharply pointed basally, concave distally. Spots 5, 6, 7, 8 and 9 toothed slightly along outer edge. Fringe at apex checkered smoky black and white, checkering usually not extending caudad of vein Cu_1; remainder of fringe smoky black to inner angle with thin line of gray at bases of fringe scales.

Upper surface of secondaries: dark black with small amount of white hairs at base creating gray appearance in this area; discal area with small amount of yellow-gray scaling intermixed distally, outer angle lighter due to presence of heavier yellow-gray overscaling. Fringe smoky at anal angle, light gray at outer margin, becoming whiter at outer angle; vein tips black at outer margin.

Under surface of primaries: black with tip and outer margin overscaled with white to vein M_3 giving that area gray appearance. Discal area with yellow scaling intermixed with black giving that area brownish color. All dorsal spots reappearing. Spot 1 white, cephalad; yellow, caudad. Spot 5 one-third width of spot 6, deeply concave outwardly, white. Spot 6 light yellow. Spots 7, 8 and 9 dark yellow; spot 9 extending inwardly of spots 7 and 8.

Under surface of secondaries: black, heavily overscaled with white in limbal area, white overscaling not invading cell, creating distinct, wide, light gray postmedian-submarginal band following curve of outer margin from anal angle to vein M_1; outer edge of band curving to meet fringe at vein M_3; veins not overscaled with white, contrasting with band. Heavy overscaling of white in anal angle and in cell M_2 producing distinct quadrate submarginal spot con-

trasting with band and distinct white discal spot in cell 1A. Costal area heavily overscaled with white and containing two white spots.

Length of forewing 30 mm to 33 mm, average 31.5 mm; measurements of Allotype: forewing, apex to base 32 mm, apex to outer angle 20 mm, outer angle to base 23 mm; hindwing, base to end of vein Cu_1 19 mm. Preceding ♂ forewing lengths based on ten normal-sized individuals. The following wing measurements are those of one dwarf ♂ included in the type series: forewing, apex to base 24 mm, apex to outer angle 15 mm, outer angle to base 16 mm; hindwing, base to end of vein Cu_1 13 mm.

Holotype ♀, and Allotype ♂: Arizona, Maricopa County, 1/2 - 1-1/2 miles north of Camp Creek on road to Seven Springs, 3500-3680 feet elevation (Figs. **1 - 4**). Described from 18 specimens (11 males and seven females) collected in the larval stage by Ronald S., Joseph R. and Dale Wielgus from November 23 to January 30, 1969, 1970 and 1972, from the following localities: 9 ♂ and 7 ♀, same locality as Holotype and Allotype; two ♂, 11.5 road miles southeast of the Camp Verde Ranger Station, along Fossil Creek Road (FH9), T13N, R6E, Yavapai County, Coconino National Forest, Arizona, at an elevation of 4000 feet. Specimens emerged in confinement from 12 May to 20 July, 1970, 1971 and 1972. Holotype ♀, 4 June 1971, and Allotype ♂, 5 June 1971, will be deposited in the Los Angeles County Museum of Natural History. Paratypes will be distributed as follows: one ♂ to the Los Angeles County Museum of Natural History; one ♂ and one ♀ to Mr. Don B. Stallings, Caldwell, Kansas; two ♂ and two ♀ to the American Museum of Natural History; two ♂ and two ♀ to the Allyn Museum of Entomology, Sarasota, Florida; one ♂ and one ♀ to the United States National Museum; the remainder, three ♂ and one ♀, will remain in the collection of the senior author. The larval skins, pupal cases and larval tents are hereby made a part of the type series.

Foodplant: *Yucca baccata* Torrey.

COMPARISON

The characteristics which distinguish *deserti* from typical *ursus* are most evident in *deserti* females. Principally, these are the narrow yellow spots at spots 11 and 12 on the upper surface of the secondaries and the distinct, wide, gray postmedian-submarginal band on the under surface of the secondaries. In typical *ursus* females, the upper surace of the secondaries is immaculate, rarely marked, and the white overscaling on the under surface is lightly and evenly distributed and does not present the appearance of a band. Male specimens of *deserti* are distinct from typical *ursus* in having spots 7, 8 and 9 slightly lighter on the upper surface of the primaries, and in the heavier white overscaling and the contrasting white, quadrate submarginal spot in cell M_2 on the under surface of the secondaries.

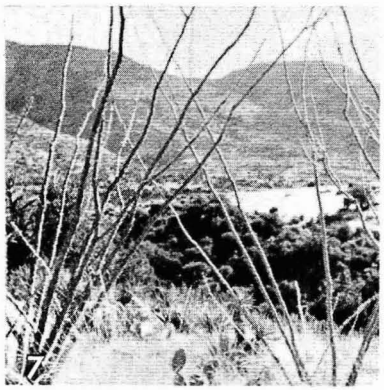
DISCUSSION

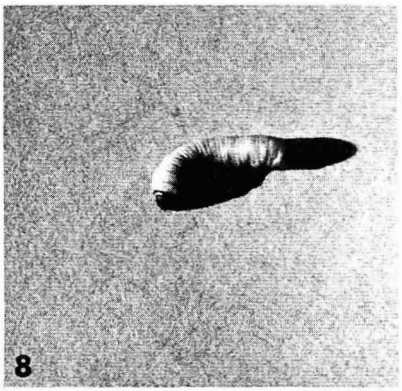
This subspecies was first encountered in December 1969 during the course of collecting larvae of *Megathymus coloradensis navajo* Skinner (Wielgus, *op. cit.*), which also utilizes *Y. baccata* as a larval foodplant in this location. Initially, we were unable to distinguish the first two collected *deserti* larvae from those of *navajo* and were not aware of their existence until after the *navajo* adults had emerged in February and March of 1970. The two *deserti* larvae continued to feed beyond the time expected for *navajo* larval maturation and, still not aware that these were not *navajo,* we were at a loss to explain such seemingly unorthodox behavior. One of the *deserti* larvae, moulting to final instar on 14 May 1970, fed until June 1970, whereupon it constructed a loose, silken closure over the tent open-

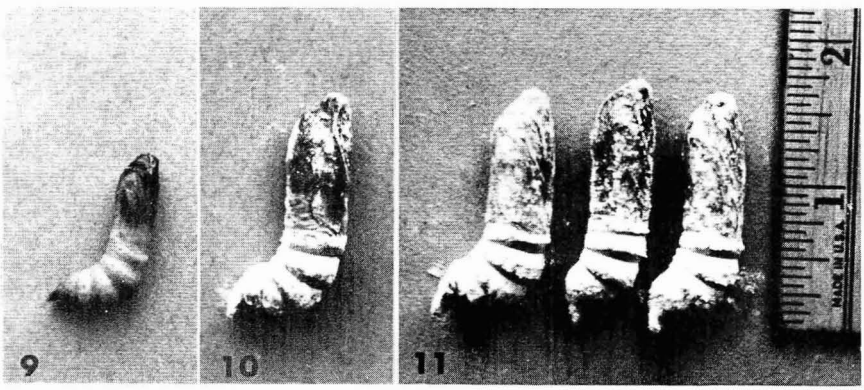
ing and very heavily powdered its burrow. Pupation followed on 13 June 1970, and eclosion of an adult female occurred on 5 July 1970. The other pupa eclosed a female on 20 July 1970.

Additional field collecting at the type locality in November and December of 1970, and January 1972, has revealed that *deserti* larvae generally occur in small to medium-sized *baccata* plants growing in deep shade under juniper trees (*Juniperus monosperma* [Engelmann] Sargent). In contrast, *navajo* here prefers open, sunny situations with a tendency to slopes with a southern exposure, but is also found in similar-sized *baccata* plants. The area is one of relatively steep, dry hills in the Upper Sonoran Zone (Merriam, 1898), 3400 - 4000 feet elevation, with dry washes estending west to east (Fig. **7**). In this area, *Y. baccata* grows abundantly in a strip approximately 1/2 mile wide and is roughly bisected by the north-south road (Fig. **12**). Daily summer temperatures exceeding 100° F. are common here throughout the months of June, July and August.

At the time of year that we collected larvae, *deserti* larval tents appeared similar to those of *navajo* but their burrows were unpowdered. Larval frass was generally smaller than that of *navajo* and was frequently incorporated in







Figs. 7-11, *Megathymus ursus deserti,* new subspecies. 7, habitat photo of type-locality. 8, third instar larva. 9, dwarf ♂ pupa. 10, normal-sized ♂ pupa of *M. u. ursus* Poling. 1, normal-sized ♂ pupae of *M. u. deserti,* scale graduation 1/16 inch.

the tent along with a resinous-appearing substance. In some cases, a leaf showed evidence of earlier larval feeding; excavation in the upper leaf surface and along the margin could be traced downward to the tent. This seems to lend support to our belief that the first instar larva feeds first upon the leaf prior to entering the caudex. In contrast, we have found many *Y. schottii* plants containing typical *ursus* larvae with the eggshell still attached to a leaf, and we have never seen any evidence to indicate earlier feeding on the leaf. First instar larvae of typical *ursus* apparently bore directly into the caudex shortly after hatching. We inspected several *deserti* larvae in the field by pulling off the tents and vigorously shaking them out. Those inspected appeared to be third instar and had piceous black head capsules, cervical shields and anal plates. These larvae were of a creamy, yellowish-white color, lightly clothed with fine black setae and were unpowdered (Fig. **8**), in contrast to the well-powdered *navajo* larvae. It was by these larval characteristics that we were able to distinguish *deserti* larvae from those of *navajo*.

In the middle of January of 1971 the *deserti* larvae were brought indoors, along with the *navajo* larvae, and kept at room temperature. All *Yucca* plants containing *deserti* larvae had been previously bagged in polyethylene plastic bags in December of 1970 in order to conserve plant moisture. In the case of small plants the caudices were, in addition to bagging, wrapped first with aluminum foil. All plants were subsequently rebagged but were first encased in damp pine sawdust, the foil haveing been removed before encasement. The plastic bag was tied tightly to the neck of the plant leaving the larval tent exposed. At the time of rebagging a few plants were deemed to be too small to provide sustenance and retain sufficient moisture, even with a damp sawdust encasement, throughout larvae development. In these cases, we transferred the *deserti* larvae to larger *baccata* caudices from which we had recently removed *navajo* pupae. Care was taken to insure the removal of exuviae, powder and other debris from the vacated burrows prior to the transfer. Each transferred larva accepted its new quarters and fashioned a new silken closure over the opening. Within 48 hours each transferred larva had commenced feeding. During the entire remaining larval period of approximately four months the plants containing the larvae were maintained at room temperature and no additional water was added to the still sufficiently damp sawdust. This rearing technique was also used with typical *ursus* larvae, omitting only the transfer method, and was sufficient for the additional month required for larval development.

On 24 January 1971, a comparison was made between *deserti* larvae and fifteen typical *ursus* larvae which had been collected in *Y. schottii* on 23 January 1971 from Peppersauce Canyon, 5600-6000 feet elevation, Santa Catalina Mountains, Pinal County, Arizona. Except for the fact that the *deserti* larvae were almost a full instar ahead of the typical *ursus,* all were similar in appearance.

From 31 January to 8 February 1971, one *deserti* larva was observed in the process of moulting. It did not feed during this period. We were acutely apprehensive at first, upon noticing this cessation of feeding for such an extended period of time, until we became aware of its significance. This larva remained relatively quiescent for five days, in a head-downward position, with only occasional movements up and down its burrow. At the commencement of moulting, the larva backed up to the burrow entrance, anchored its caudal prolegs in the silken lining, and began to contract rhythmically. Each contraction began at the first thoracic segment and proceeded wavelike to the anal segment. This process continued for several hours until the old larval skin parted at the cervical shield and midcranial suture. The larva then proceeded literally to walk out of its skin which remained anchored to the burrow wall. The entire larval color immediately after moulting is a creamy white, the areas destined to be black being only slightly darker. It took another three days before full larval coloration was assumed and feeding commenced. This larva appeared to have entered the fourth instar

and, though now larger, was colored and marked virtually the same as the others. Later observations of the other *deserti* and typical *ursus* larvae have confirmed that there is a span of at least eight days during the moulting period in which the larva does not feed.

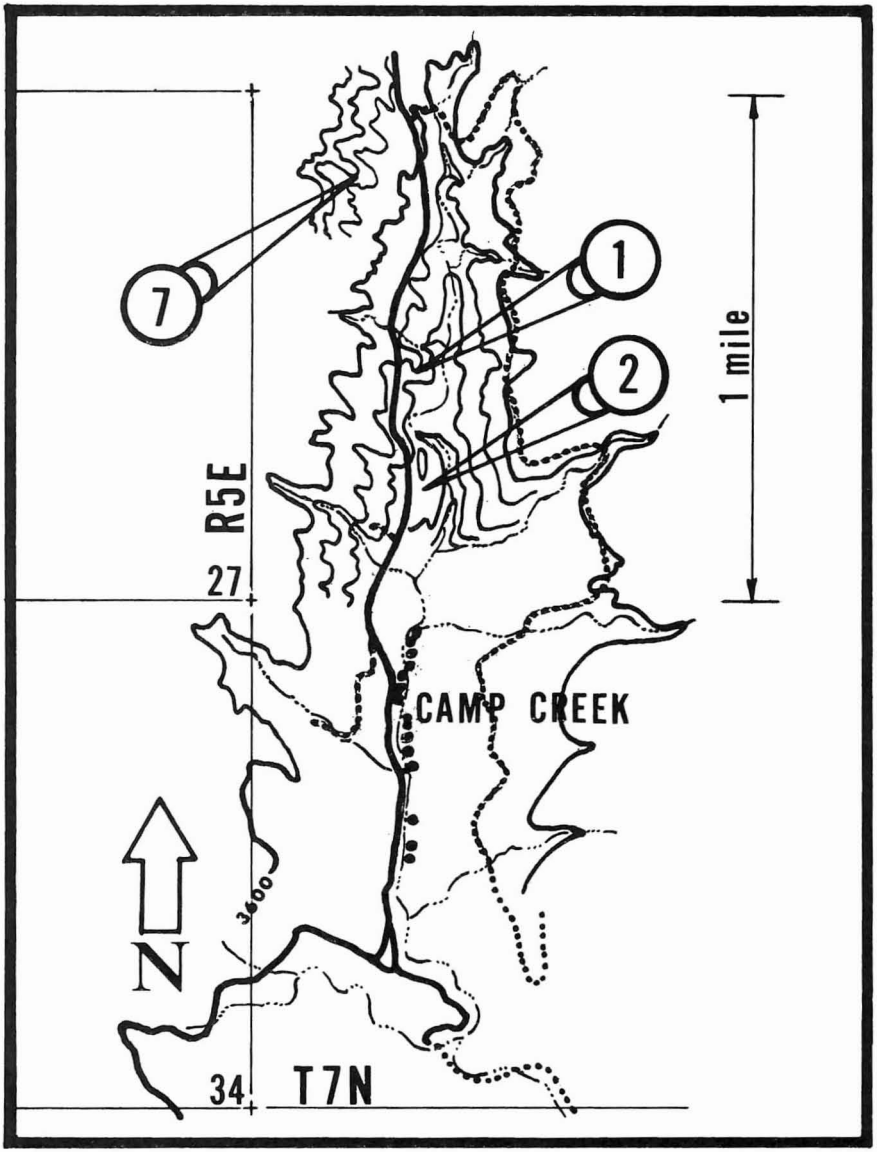


Fig. 12, topographic plan of type-locality of *Megathymus ursus deserti*, new subspecies (adapted from U. S. G. S. *Humboldt Mtn., Ariz.* quadrangle, 1: 24000) Sites yielding *deserti* in 1970 are indicated by arrows. Numerals in circles indicate number of larvae collected at each site.

Our limited observations of the habits of *deserti* larvae did not suggest an explanation for the prolonged larval development characteristic of members of this genus. We did note the rather casual manner of the larvae throughout their remaining larval period. In general, they appeared to spend approximately one-third of the time simply resting with very little moving about, one-third enlarging or rebuilding their tents and only the remaining one-third of the time in actual feeding (as evidenced by the expelling of frass). It must be borne in mind, however, that these observations were made on larvae maintained at room temperature indoors and thus do not necessarily apply to larvae under field conditions. We do believe, however, that rearing the larvae indoors at room temperature had the effect of accelerating larval development in spite of their apparently limited feeding habits. Emergences of one typical male *ursus* on 10 May 1971 and one male *deserti* on 12 May 1971 lend support to this belief. With only two exceptions, the *deserti* larvae were also observed to initiate powdering of their burrows well in advance of pupation; secretion of the powdery substance from the abdominal glands was noted to begin discretely three to five weeks prior to transformation of the larvae. This is in marked contrast to previously recorded observations on typical *ursus* larvae by other (Stallings and Turner, *op. cit.*). The two larvae noted as the exceptions pupated without ever having powdered up and one produced a dwarf male on 12 May 1971. The other pupa, also a dwarf, died prior to eclosion.

We noted that after larval feeding terminates a period of quiescence initiates, with larval activity virtually ceasing approximately ten days prior to pupation. In the advanced quiescent stage, the larva continues to secrete the white powdery substance. Its appearance one day prior to transformation is that of having been heavily coated with powdered sugar. In most instances the larva will, at this time, remain with its head at the tent closure. At the initiation of transformation, the larva generally drops to the bottom of its burrow. The newly formed pupa remains there until its integument hardens and darkens. The color of the pupa is a light amber immediately following the casting off of the larval skin. During the pupal period, the pupa usually moves up and down the burrow, propelling itself by rotating the end of its abdomen in a circle. Pupal duration at constant 80 degrees Fahrenheit was 22 - 26 days.

Measurements were taken of four *deserti* pupae, all males, two of which produced normal-sized individuals, the others being dwarfs. One of the dwarfs, as noted earlier, died prior to eclosion. The noraml-sized pupae measured 46 mm and 48 mm in length and 10 mm and 10.5 mm in width, respectively. The dwarf pupae measured 35 mm and 30 mm in length and 8mm and 7.5 mm in width, respectively. The figures illustrate a dwarf *deserti* pupa and three normal-sized *deserti* pupae. For comparison, a normal-sized male pupa of typical *ursus* is figured at the same relative scale (Figs. **9 - 11**).

DISTRIBUTION

We have not bee able to ascertain the limits of distribution of *deserti.* On 30 January 1972 the authors discovered two *deserti* larvae feeding on *Y. baccata* plants which were in a colony growing on a steep slope approximately 40 airline miles north and slightly east of the type locality. This is the Fossil Creek Road locality cited earlier. In the locality, both *deserti* and *navajo* utilize *baccata* as the larval foodplant. However, as they also occur at the type locality, the *deserti* larvae were found in *baccata* plants growing under the junipers. On this date, the *deserti* larvae appeared to be late third or early fourth instar, unpowdered, whereas all the *navajo* collected concurrently were pupae. Earlier, on 9 January 1972, the senior author collected three *deserti* larvae in *baccata* plants growing under junipers at the type locality. We believe that these findings afford significant clues to the distribution and habits of *deserti,* and appear to support our belief that *deserti* will be found in association with

navajo in favorable juniper woodland situations throughout central Arizona. Such appears to be the case for, on 5 February 1972, the authors found year-old larval tents and pupal cases in *baccata* plants growing under junipers on the steep slopes of Thirteen Mile Rock, 13 miles southeast of Camp Verde, Yavapai County, Arizona. This locality is slightly north and east of the Fossil Creek Road one but the habitat is similar.

We also strongly suspect that *deserti* occurs on the lower slopes of Pinal Peak, Gila County, at about 4000-5000 feet elevation where *baccata* grows in the pine forest (*Pinus ponderosa* Laws.). Support for this suspicion is based on the finding in 1970 of a year-old larval tent in a *baccata* plant growing in this locality; the diameter of the burrow was equivalent to those made by *deserti* larvae and allowed the senior author to insert his right index finger into the opening comfortably. He has not been able to do this with the burrow openings of *navajo* as they are considerably smaller in diameter. There is a remarkable similarity between this locality and the one in Peppersauce Canyon and we feel that concentrated field efforts here may yet turn up *deserti* though probably not typical *ursus,* this conclusion being based on our previous experience with the distribution of *navajo.* It is our belief that a distinct break between the northern and southern faunal and floral elements of Arizona takes place just to the south of Pinal Peak, probably at the natural division established by the Gila River drainage. This belief is supported in part by Kearney and Peebles (1960). The estimated range of *deserti,* and other *ursus* subspecies, is indicated on Figure **13.**

CONCLUSION

The adult flight period in the field has not been determined. However, in allowing for a certain amount of larval advancement in the laboratory, we suppose

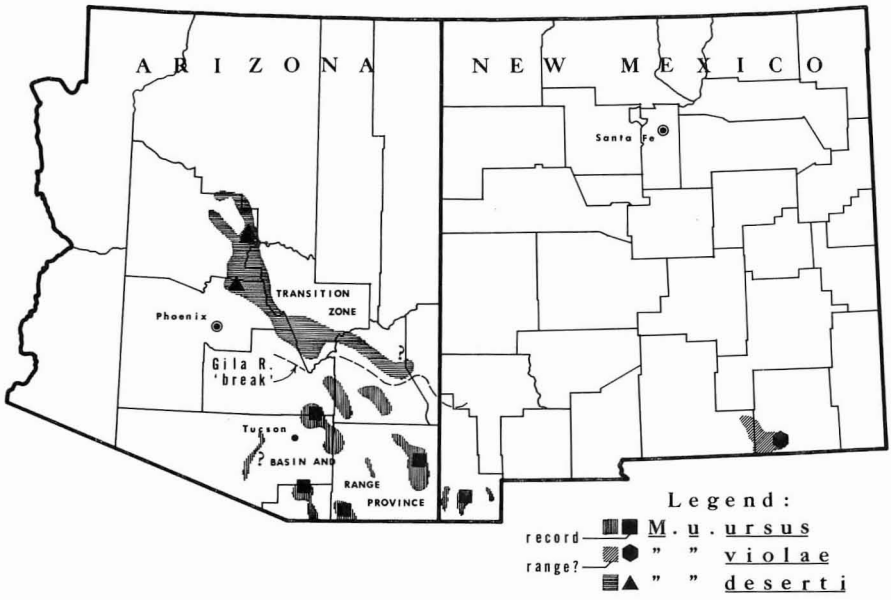


Fig. 13, distribution of the known subspecies of *Megathymus ursus.* Shading indicates estimated ranges; solid figures denote known collection records.

that the normal time for *deserti* adults in the field is from the middle of June through the end of July.

Several intensive collecting efforts at the type locality in late 1970, totalling approximately 126 man-hours, yielded only 14 *deserti* larvae (one died of parasitism in February 1971) in comparison to 80 *navajo* larvae collected concurrently. In view of this, and because of its competition with *navajo* for the same foodplant in highly localized situations, we believe the *deserti* will remain extremely rare in collections.

ACKNOWLEDGEMENTS

The authors especially wish to thank Mr. Don B. Stallings for generously devoting time and effort to examine *deserti* specimens and offer valuable comments and encouragement.

Thanks are also due to Mr. Lloyd M. Martin, Prescott, Arizona, for examining specimens and giving helpful information. To Dr. Frank F. Hasbrouck, Associate Professor of Zoology and Curator of Insects, Artizona State University, Tempe, Arizona, our warmest appreciation for critically reviewing the manuscript.

We also wish to thank the following persons for their helpful cooperation in granting collecting permits to remove *ursus*-infested *Yucca* for comparative studies: Mr. David G. Stimson, Superintendent, Chiricahua National Monument, Arizona; Mr. S. R. Albert, District Ranger, Douglas Ranger District, Coronado National Forest, Arizona; and Mr. R. A. Countryman, Chief, Division of Compliance, Arizona Commission of Agriculture and Horticulture. Mr. Michael Banville of Phoenix, Arizona, photographed the *deserti* larva; all other photographs by the senior author. Foodplant determinations were made by Mr. John Weber, Horticulturist, Desert Botanical Garden, Papago Park, Phoenix, Arizona.

We sincerely appreciate the generosity of Dr. Lee D. Miller and Mr. A. C. Allyn for making this publication possible and to them we extend our heartfelt thanks.

LITERATURE CITED

dos Passos, C. F., 1964. A synonymic list of the Nearctic Rhopalocera. Lepid. Soc. Mem., No. 1, New Haven, Conn. v + 145 pp.

Freeman, H. A., 1969. Systematic review of the Megathymidae. J. Lep. Soc., 23, Supplement 1, 58 pp., 1 pl.

Kearney, T. H., and R. H. Peebles, 1960. Arizona Flora. University of California Press, Berkeley. 1085 pp.

Merriam, C. Hart, 1898. Life zones and crop zones of the United States. U. S. Dept. Agric., Div. Biol. Surv. Bull. No. 10, 79 pp.

Stallings, Don B., and J. R. Turner, 1956. Notes on *Megathymus ursus,* with description of a related new species. Lepid. News, 10: 1-8.

Wielgus, Ronald S., Joseph R. and Dale, 1970 (1971). Additional notes on the distribution and foodplant preferences of *Megathymus coloradensis navajo* Skinner. J. Res. Lepid. 9(3):169-174.

POSTSCRIPT

The following information was received after the paper was in press: quoting Ronald Wielgus, "On this day, the 21st of November, we confirmed the existence of *ursus deserti* at the Thirteen Mile Rock locality cited in our paper by collecting four viable fourth-instar larvae feeding in *Yucca baccata* on the steep slopes. We also took out eight well-powdered *navajo* larvae concurrently. Three of the *deserti* larvae were

in very small caudices and will ultimately have to be transferred to larger ones. Field recognition of *deserti* [larvae] is easier now inasmuch as their burrows are unpowdered, tents are smaller and the larvae distinct from *navajo*. We inspect all larvae by pulling off the tents and peering into the burrows, using sunlight to illuminate the larvae at the bottom." -- Ed.