BULLETIN OF THE ALLYN MUSEUM

Published by
THE ALLYN MUSEUM OF ENTOMOLOGY
Sarasota, Florida

Number -- 17 12 APRIL 1974

A NEW SANDY-DESERT SUBSPECIES OF MEGATHYMUS COLORADENSIS (MEGATHYMIDAE) FROM EXTREME NORTHERN ARIZONA

Ronald S.[1] and Dale Wielgus

3434 West Augusta Avenue, Phoenix, Arizona 85021

Recent descriptions in the genus *Cercyonis* (Satyridae) by Emmel & Emmel (1969; 1971) and Emmel & Mattoon (1972) have shown the existence of distinctive whitish races adapted to arid alkaline flats of the western deserts of the United States. Such environmental adaptation appears to extend to a population of *Megathymus coloradensis* Riley inhabiting a sandy-desert area of extreme northern Arizona. The discovery of the subspecies described herein was a result of our initial investigations into the biology of *Megathymus streckeri* (Skinner). The purpose of this paper is to describe the new population and to note its life history. This study considered the following subspecies: *Megathymus coloradensis navajo* Skinner, *Megathymus coloradensis arizonae* Tinkham, *Megathymus coloradensis reubeni* Stallings, Turner & Stallings, *Megathymus coloradensis coloradensis* Riley and *Megathymus coloradensis browni* Stallings & Turner.

Megathymus coloradensis albasuffusa Ronald S. and Dale Wielgus, new subspecies.

Female. Head: vertex grey, Palpus: white, with some black-tipped scales. Antenna: shaft white distad, ringed with black basad; club black. Thorax: grey dorsally with long greenish-brown hairs caudad, blackish ventrally. Abdomen: black dorsally, grey ventrally.

Upper surface of primaries: black, with heavy amount of light yellowish-brown hairs at base of wing; heavy line of white to yellowish-white overscaling just inside fringe along outer margin, from apex to inner margin and extending inwardly to spots 5 and 6; spot 1 (cell spot) deep yellow, squarish, with prominent

[1]Museum Associate in Entomology, Natural History Museum of Los Angeles County

white to light yellow spot distad on costal margin; spots 2, 3 and 4 (subapical spots) white, nearly three times as wide as high, with spots 3 and 4 equal in size and spot 2 smaller; spots 5 and 6 broad, light yellow, sharply toothed outwardly; spot 6 extending inwardly along vein M3 almost to inner edge of spot 7 in some specimens; spots 7, 8 and 9 broad, light to deep yellow; spot 7 rectangular, twice as wide as high, extending inwardly almost to cell spot and outwardly half way under spot 6; spot 8 rectangular, wider than spot 7, both spots with outer edge in straight line; spot 9 sharply toothed inwardly and projecting slightly beyond spot 8, outer edge angled inwardly; fringes white with vein tips thinly black, appearing lightly checkered.

Upper surface of secondaries: black, with medium amount of light yellowish-brown hairs at base of wing; light to deep yellow spots of discal band, a phantom spot followed by well-defined spot below, then followed by two fused, squarish spots (spots 10 and 11) and large, fused squarish spots (spots 12 and 13), and V-shaped phantom spot pointing inwardly (spot 14, in most specimens); spot 11 inward of spots 10, 12, and 13; marginal border broad, light yellow, with diffuse black scaling basad, and thin black scaling along veins (in some specimens); fringes white to very light yellow.

Under surface of primaries: black; outer margin heavily overscaled with white; all spots of upper surface reappearing; spots 2, 3 and 4 white; spot 5 concave outwardly, very light yellow; spot 6 slightly smaller than on upper surface, very light yellow; spots 7, 8 and 9 same size and shape as on upper surface, light yellow; white portion of checkered fringe with thin line of black scales connecting vein tips in most specimens.

Under surface of secondaries: black, with costal margin grey and crossed by fine black lines; outer margin heavily overscaled with white in most specimens; two white spots in costal area, inner one triangular, outer one crescentic; bold discal band indicated by whitish overscaling; spot 10 reappearing as small, white prominent spot.

Male. Head: vertex grey. Palpus: white, with some black-tipped scales. Antenna: shaft white distad, ringed with black basad; club black. Thorax: very light grey dorsally with long light yellowish hairs caudad, brownish ventrally.

Upper surface of primaries: dark, greyish-black, with heavy amount of light yellowish hairs at base of wing; heavy line of white to yellowish-white overscaling just inside fringe along outer margin, from apex to inner margin and extending inwardly to spots 5 and 6; spot 1 (cell spot) very light yellow, somewhat triangular, with prominent white to light yellow spot distad on costal margin; spots 2, 3 and 4 (subapical spots) white, spot 2 nearly three times as wide as high, spot 3 two-thirds width of spot 2 and twice as wide as spot 4; spots 5 and 6 broad, pale yellow, sharply toothed (concave) outwardly; spot 6 angled inwardly and extending along vein M3 to inner edge of spot 7 in most specimens; spots 7, 8 and 9 broad, very light yellow; spot 7 rectangular, convex inwardly, extending well under and almost to outer edge of spot 6; spot 8 same shape and size as spot 7, both spots with outer edge in straight line; spot 9 sharply toothed inwardly and projecting slightly beyond spot 8, outer edge angled inwardly; fringes white to yellowish-white with vein tips thinly black, indistinctly checkered.

Upper surface of secondaries: black, with medium amount of light yellowish hairs at base of wing; marginal border broad, very light yellow, usually no black scaling along veins Cu^1 Cu^2 and 2A; fringes very light yellow.

Under surface of primaries: black; outer margin very heavily overscaled with white just inside fringe from apex to inner margin and extending inwardly to outer edges of spots 2 through 9; all spots of upper surface reappearing; spots 2, 3 and 4 white; spots 5 and 6 same shape as on upper surface, smaller, very light yellow (almost white); spots 7, 8 and 9 same size and shape as on upper surface, light yellow; inner edge of fringe a continuous black line with yellowish-white portion exhibiting thin line of black scales connecting vein tips in most specimens.

Under surface of secondaries: grey, with costal margin very light grey and

crossed by fine black lines; outer margin very heavily overscaled with white, creating whitish effect in most specimens; two white spots in costal area, inner one triangular, outer one crescentic; discal band indicated faintly by whitish overscaling contrasting with grey ground; spot 10 reappearing as minute white or black spot in some specimens; fringes very light yellow (almost white) with vein tips black.

Holotype female, 24 IV 1973, and allotype male, 29 I 1973: Wahweap Campground, Glen Canyon National Recreation Area, 5 miles northwest of Glen Canyon Dam, 3700' elevation, Coconino County, Arizona. Described from 20 specimens (12 males and 8 females) all reared from ova and larvae (except holotype female from pupa) collected by Ronald S. and Dale Wielgus in 1972 and 1973. The preserved larvae, larval skins and pupal cases are hereby made a part of the type series. The type locality is unique in that the majority of ova and larvae were found in a *Yucca* colony destined to be inundated by the rising waters of Lake Powell (Figs. **1** and **36**). Of eleven larvae collected from the locality in June 1972, five died during a difficult rearing process (one, of parasitism, in February 1973).

Foodplant: Yucca baileyi Wooton and Standley.

Larval parasite: Apanteles megathymi Riley (determined by Dr. Paul M. Marsh, Systematic Entomology Laboratory, U.S.D.A., Washington, D.C.).

COMPARISON

Tables **1** and **2** give detailed keys furnishing distinguishing characteristics whereby *albasuffusa* adults may be readily separated from the other subspecies considered in this study. The following general comparisons supplement the tables.

Males of *albasuffusa* are distinguishable from those of *navajo, arizonae, reubeni, coloradensis* and *browni* by having a heavy white overscaling on the dorsal surface of the thorax and along the margin of the upper surface of the primaries. from apex to outer angle, and in the limbal area of the lower surface of secondaries, from anal angle to outer angle, creating a pale, whitish effect in those areas.

Females of *albasuffusa* are distinguishable from those of *navajo, arizonae, reubeni, coloradensis* and *browni* in the following respects:

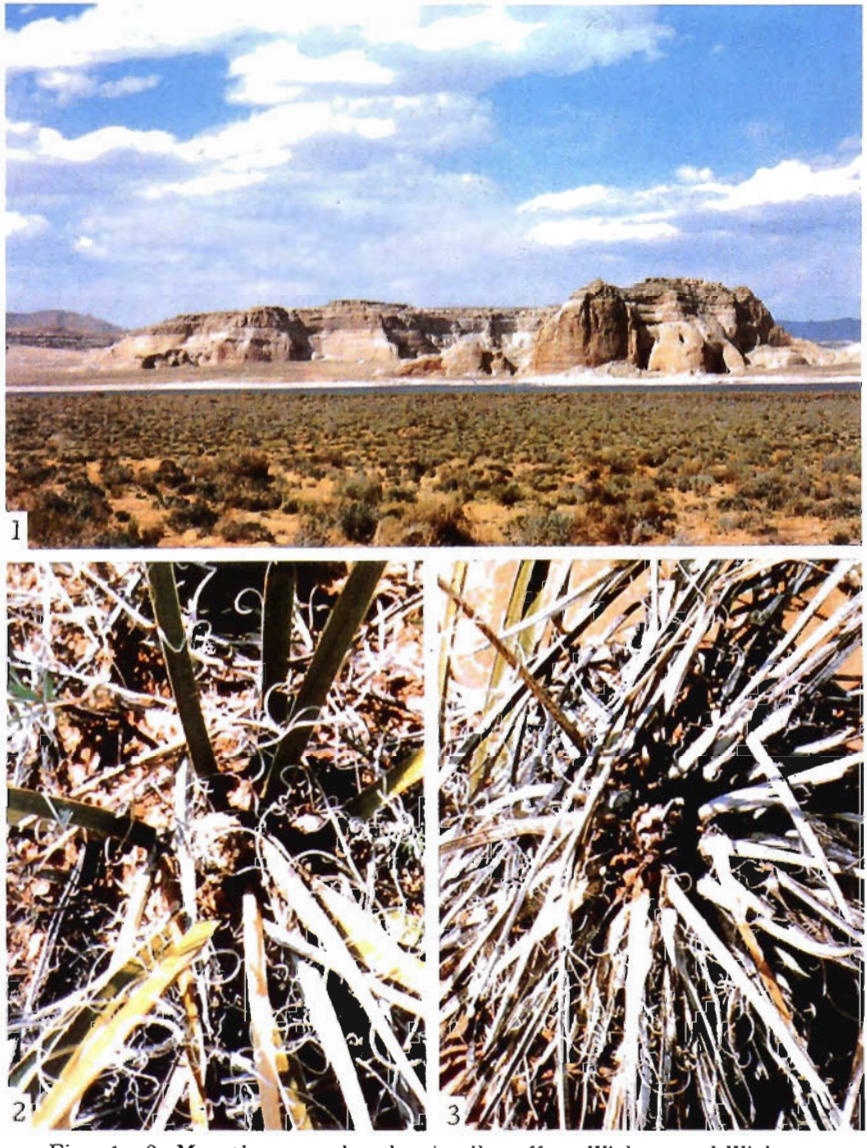
1. From *navajo,* by having the discal spots of the upper surface of the primaries broader, deeper yellow, a heavy suffusion of yellowish hairs at bases of forewings dorsad, and the marginal border of the upper surface of the secondaries broader.
2. From *arizonae* and *reubeni,* by having the upper surface of the primaries and secondaries blacker, the discal spots deeper yellow, and the marginal border of the upper surface of the secondaries yellower.
3. From *coloradensis,* by having the upper surface of the primaries and secondaries blacker, thorax lighter, and marginal border of the upper surface of the secondaries broader, with a heavy suffusion of black scales along inner edge.
4. From *browni,* by having the upper surface of the primaries and secondaries blacker, the discal spots of the primaries broader and spot 9 not prolonged basad, a heavy suffusion of yellowish-brown hairs at bases of wings, and the marginal border of the upper surface of the secondaries broader, yellower.

Adults of both sexes of *albasuffusa* are smaller than those of *navajo, arizonae* and *reubeni.*

LARVAL MORPHOLOGY

Our observations on the larvae of *albasuffusa* have established as many as six larval stadia. Evidence also indicates that the larvae of *Megathymus ursus ursus* Poling and *Megathymus ursus deserti* Wielgus, Wielgus & Wielgus undergo as many as six stadia. It is difficult to ascertain positively the moment of ecdysis

in *Megathymus* larvae due to their burrowing habits. However, cessation of feeding for a period of several consecutive days is a good indicator (Wielgus *et al.*, 1972), and we were able to confirm ecdysis to within an hour in some cases. This was done either by dilating the tent openings and observing the larvae with the aid of a flashlight, or by retrieving the cast skins.



Figs. 1 - 3. *Megathymus coloradensis albasuffusa* Wielgus and Wielgus, new subspecies. 1. Habitat, type locality, 13 April 1973. The larval foodplant, *Yucca baileyi* Wooton & Standley, grows abundantly in the foreground area. 2. & 3. *In situ* larval tents, type locality, 13 April 1973.

We did not attempt to make measurements of the larvae and limited our observations to changes in coloration, relative increases in size and feeding habits. It may have been possible to make direct measurements of the larvae during the transfer process but we ruled this out as the larvae proved to be irascible when handled. If provoked, the larvae would expell a foul-smelling brownish fluid from their mouths, defecate heavily and withdraw their heads under their prothoracic shields.

First and Second Instar: Head intense reddish-orange; trunk reddish-orange; prothoracic shield and suranal plate dark reddish-brown.

Third Instar: Head intense reddish-orange; trunk creamy-white; prothoracic shield and suranal plate shiny blackish-brown.

Fourth Instar: Head intense reddish-orange; trunk buff-cream, with intersegmental areas grey; prothoracic shield shiny (piceous) black, well-defined, continuous, no mid-break dorsally; suranal plate shiny blackish-brown (Fig. **34**).

Fifth Instar: Head deep reddish-brown, midcranial inflection and laterofacial sutures creamy-white; trunk buff-cream, intersegmental areas grey; prothoracic shield shiny (piceous) black, discontinuous, with mid-break dorsally; suranal plate brownish.

Sixth Instar (1972 rearing only): Head dark reddish-brown, becoming dark brown in fully-mature larvae, midcranial inflection and laterofacial sutures creamy-white and appearing trident-form; trunk warm buff-cream with pinkish overtones, intersegmental areas grey; prothoracic shield dark brown or blackish, light brown in some individuals, discontinuous, with mid-break dorsally; suranal plate brownish to light brownish.

Fully mature larvae of *albasuffusa* appear to differ from those of *navajo* and *arizonae* in the following respects: head of *albasuffusa* narrower, somewhat heart-shaped in some individuals, not as blocky or squarish; trunk longer, more slender, not as heavy and massive as in *navajo* and *arizonae*.

LARVAL BEHAVIOR

During our June 1972 search for the ova of *streckeri,* we found still attached to *Yucca* leaves many eggshells which we presumed to be those of *streckeri.* It was not unusual to find three or more eggshells attached to a single plant and sometimes two were affixed to a single leaf. In no case, however, did we find more than one larva inhabiting a *Yucca* plant. As a matter of fact, about one-half of the plants exhibiting more than one eggshell failed to yield a single larva, even after a careful search during which the plant was literally torn apart. In light of our experience with the behavior of first instar larvae of *streckeri,* this would not be unusual (Wielgus & Stallings, ms. in prep.). However, it is extremely difficult to discriminate between the eggshells of *streckeri* and *albasuffusa* in the field; thus, we could draw no conclusions. We did find evidence (intact, desiccated remains) of first and second instar larvae which indicated high early-stage mortality and which could be referable to *albasuffusa* by their particular positions on the plants.

The first instar larva of *albasuffusa,* in the field, feeds first upon the leaf, constructing on the blade a silken shelter which may be at any point from the tip to the middle portion. It may move to another leaf and construct a similar shelter in which it feeds until, in late second instar, it finally migrates to the center of the leaf rosette. It then proceeds to feed upon the base of the central growing portion, or heart, into which it slowly burrows and constructs the first tangible evidence of the tent so characteristic of most members of the genus. Plants selected for oviposition by the females ranged from extremely small offshoots to medium-sized individuals. In fact, we found living larvae boring in foot-long caudices hardly 3/16 inch in diameter! We concluded that, in these cases, the larvae must ultimately work their way downward into the central rhizomatous systems to continue their development. Our laboratory rearings appear to support this conclusion.

All of the larvae collected in 1972 (as well as those of 1973) were reared indoors at temperatures varying from 24.4 to 27.4 degrees C. Except for two larvae maturing earlier, the 1972 larvae remained indoors until the first week of October 1972, a time span of approximately four months. The larvae were then placed outdoors, in shade, to complete their development. Several of the larvae matured during the latter part of October but two continued to feed until the third week of November. On 16 December 1972, after four weeks duration outdoors during which time temperatures at night dropped to around -4 degrees C., the larvae were brought back indoors. Prior to that date, a slight daytime warming trend outdoors appeared to have provided the necessary stimulus for termination of diapause and we felt that no harm would result from the introduction of higher indoor temperatures. Within four hours after being brought indoors, the larvae began to open the tent closures. However, heavy powdering up and pupation of the first larva did not occur until January 1973.

A most unusual aspect of the 1972 and 1973 rearings was the acceleration of several larvae to maturity, pupation and eclosion of adults in the same year in which they hatched from ova. It is tantalizing to speculate on the possibility of a discrete brood maturing within the same year of hatching from ova but, laboratory conditions appear to have provided the stimulus responsible for this facet of behavior.

A return trip to the type locality on 13 April 1973 indicated that the flight period was already in progress. Ten newly-deposited ova were found on *Y. baileyi* leaves. We also found five empty pupal cases with waste fluids still inside and one uneclosed pupa.

The ova, when first found (Fig. **32**), were an apple green color turning to various shades of reddish-pink twenty-four hours later. Darkening of the chorion was noted to occur daily. The color changes were similar to those noted for *Agathymus* ova by Roever (1964) but there was no pronounced marbling. All of the ova were maintained indoors at a room temperature of approximately 24.4 degrees C.

The first two larvae hatched on the morning of the 25th of April and the remaining eight during the succeeding three days. Each newly-hatched larva immediately proceeded to a leaf axil in the center of the plant. There it constructed a miniature tent and began feeding on the leaf tissues. This behavior was in marked contrast to that of field-inspected larvae.

After three weeks, an inspection of the laboratory larvae revealed that each had already burrowed well into the central growing portion of the plant. Curiously, however, one larva vacated its burrow on 11 May 1973 in favor of feeding on the middle portion of one of the leaves. It subsequently returned to the center of the rosette on 13 May 1973.

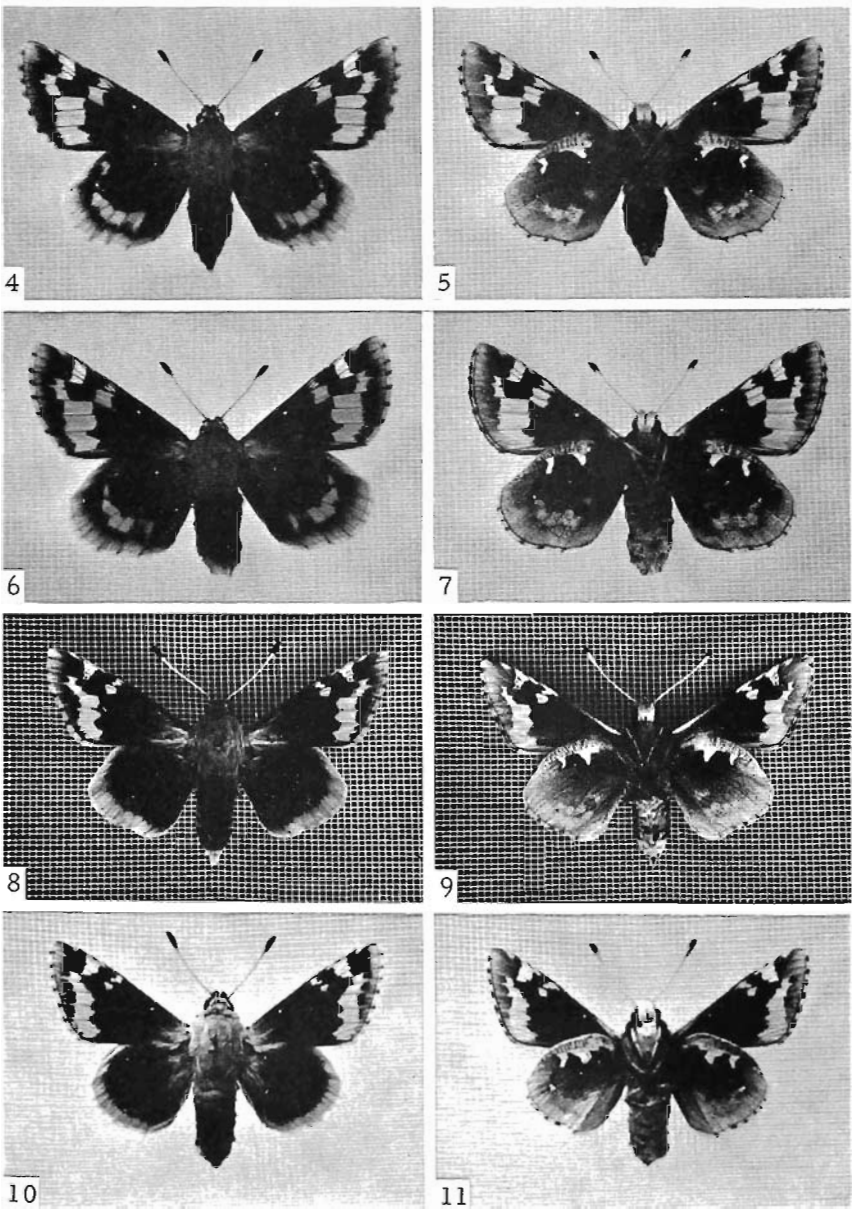
An additional fifteen larvae were collected at the type locality on 8 and 9 June 1973. On the morning of 9 June, at approximately 0935 hours, we witnessed burrow abandonment by one larva in the field. It simply crawled out of the burrow entrance and proceeded to the base of the plant, whereupon it was collected. Its actions were similar to those noted on the one laboratory larval burrow abandonment.

Again, as in 1972, we found indications of high, early-stage field mortality. Predation by other arthropods, especially ants, is strongly suspected but evidence

Figs. 4 - 11. *Megathymus coloradensis albasuffusa* Wielgus and Wielgus, new subspecies. 4. Holotype, female, ex pupa fnd. in *Yucca baileyi* at Wahweap Campground, Glen Canyon Nat. Rec. Area, 5 mi. N. W. Glen Canyon Dam, 3700' El., Coconino Co., Arizona. Found on 13 IV 1973. Emerged on 24 IV 1973. R. Wielgus, Collector. Pupa #6-73Wp., upperside. 5. Same as 4., underside. 6. Paratype, female, ex larva, same locality as 4., 9 II 1973, Wp#3-73, upperside. 7. Same as 6., underside. 8. Allotype, male, ex larva r. f. *Yucca baileyi,* same locality as 4., 29 I 1973, Wp#1-73, upperside. 9. Same as 8., underside. 10. Paratype, male, ex larva, same locality as 4., 25 IX 1972, Wp#2-72, upperside. 11. Same as 10., underside.

here is circumstantial. Certainly, a habit of burrow abandonment would not favor larval survival in a hostile desert environment.

In 1972, the larvae of *albasuffusa* differed markedly in behavior from those of the 1973 rearing, as well as from those of *navajo* and *arizonae*. The most remarkable feature of their larval biology was that the larvae were continuous borers, i.e.,



they excavated burrows only of sufficient diameter to accommodate their bodies and had either bored out through the bottoms of the *Yucca* caudices or had bored in circuitous fashion within. This boring behavior became noticeable during the early instars and was maintained by the larvae throughout their development. Therefore, it was necessary to transfer the larvae to fresh sections of caudices on four separate occasions. The total estimated length of each larval burrow (combining each larva's four separate burrows end to end) *was in excess* of 122 centimeters! This may have been a result of certain laboratory conditions in 1972 or improper preservation of the *baileyi* caudices. Our subsequent 1973 rearing, however, in which whole plants were kept viable by encasement in native sand and polyethylene plastic, did not elicit such larval behavior; one plant was sufficient for each larva's total feeding requirements. Our rearing experience with the larvae of *navajo* and *arizonae* has shown that, utilizing *Yucca baccata* Torrey and *Yucca thornberi* McKelvey, respectively, sections of caudices 30 to 38 centimeters in length are sufficient for the larvae of these taxa.

On those occasions when we witnessed ecdysis but were unable to retrieve the larval skin, continued observations revealed that the larva will consume the exuvium on about the third day thereafter. Once the exuvium has been consumed, the larva resumes feeding on the caudex.

In the 1972 laboratory rearings, the tent structures of *albasuffusa* remained relatively puny in comparison to those produced in 1973 and also to those of *navajo* and *arizonae*. These may have been a consequence of the artificial conditions then prevailing. For the most part, the tents persisted as small nipple-like constructions over the burrow entrances and were significantly enlarged only at the time larval development neared completion. However, tents found *in situ* at the type locality (Figs. 2 and 3), as well as those laboratory-produced in 1973, differed little from those of *navajo* and *arizonae*.

The larvae began to powder up discretely several weeks in advance of maturation but in no case did this initiate until they had entered the last stadium. Those larvae producing adults in the summers of 1972 and 1973, and fall of 1973, powdered up in the usual fashion prior to pupation.

An interesting sidelight of our observations is that we witnessed larvae reversing themselves in their burrows many times; the amazing thing is that they were able to accomplish this feat within the narrow diameter of the burrow, bending themselves like hairpins in the process! When we examined empty burrows by sectioning the caudices, we were unable to find any evidence of a

KEY TO DISTINGUISHING CHARACTERISTICS: Table 1.

Males, upperside

Subspecies	Thorax	Upperside of Primaries & Secondaries, ground color	Cell Spot	Spots 2, 3 & 4	Spots 5 & 6
albasuffusa	very light grey with some light yellowish hairs above	dark, greyish-black	medium; very light yellow	white	broad; sharply toothed along veins; pale yellow
navajo	dark grey, with some brownish hairs above	deep black	small to medium; light yellow	white	narrow; concave outwardly; 5 whitish to pale yellow; 6 light yellow
arizonae	light grey, with some brownish hairs above	dark, brownish-black	small; very light yellow	white	medium; sharply toothed along veins; whitish to pale yellow
reubeni	light grey, with some light brownish hairs above	dark, brownish-black	small to medium; white	white	broad; sharply toothed along veins; white
coloradensis	medium grey, with some yellowish-brown hairs above	light, brownish-black	broadly squarish; dark yellow	white	medium; sharply toothed along veins; yellow
browni	dark, brownish-grey, with some brown hairs above	black to brownish-black	broadly squarish; light yellow	white	narrow; sharply toothed along veins; creamy-white

turn-around enlargement.

DISTRIBUTION

At the time that we were considering describing this new subspecies, we were also rearing six *Megathymus* larvae which had been collected in *Y. baileyi* (our determination) found 5 miles west of the Mexican Water turnoff. This locality is about 100 miles east of Wahweap. The larvae were indistinguishable from those of *albasuffusa* and larval behavior, in 1972, was virtually the same. However, when the Mexican Water adults emerged in late January and early February of 1973, it was immediately apparent that the two populations were not quite the same. A partial barrier between the two populations is suggested, beginning at the north end of Monument Valley and extending southwestward through Klethla Valley, in which *Y. baileyi* is either exceedingly sparse or absent over many miles.

Although the most favorable *Yucca* colony at the type locality is destined to perish, we found *albasuffusa* larvae in scattered plants occupying higher ground, especially near the airstrip. Throughout the immediate area *Y. baileyi* is distributed diffusely and the continued existence of *albasuffusa* seems assured. We expect to find *albasuffusa* in adjacent desert areas along the Arizona-Utah border, northward and westward, in similar habitats.

ACKNOWLEDGEMENTS

The authors are indebted to Mr. Don B. Stallings, Caldwell, Kansas, for suggesting certain localities for *Yucca baileyi* and for detailed information regarding the early stages of *Megathymus streckeri;* his valuable assistance in this regard made our task easier.

Dr. Frederick H. Rindge of The American Museum of Natural History kindly loaned specimens of *Megathymus* to us for comparative studies and we expressly wish to thank him for his assistance.

We would also like to thank Mr. Joe L. Kennedy, Acting Superintendent, Mr. William Atterholt and Mr. Norman Salisbury, Naturalist, of the Glen Canyon National Recreation Area, for the granting of a permit to collect *Yucca* plants and for all of the courtesies extended to us during our visits. We also thank Mr. R. A. Countryman, Chief, Division of Compliance, Arizona Commission of Agriculture and Horticulture, for the granting of a permit for the removal of Arizona's protected native plants. The *Yucca* species at the type locality was identified by Dr. N. Duane Atwood, Brigham Young University, Provo, Utah; however, positive determination of this *Yucca* as the larval foodplant of *albasuffusa* is solely our responsibility.

We are again grateful to Dr. Frank F. Hasbrouck, Associate Professor of Zoology and Curator of Insects, Arizona State University, Tempe, Arizona, for

KEY TO DISTINGUISHING CHARACTERISTICS: Table 1.

Males, upperside (continued)

Subspecies	Spots 7, 8 & 9	Marginal Border of Secondaries	Fringes of Primaries
albasuffusa	broad; very light yellow; spot 7 well under spot 6	broad; very light yellow; usually no black scaling along veins Cu1, Cu2 and 2A	vein tips thinly black; indistinctly checkered
navajo	narrow to medium; light yellow; spot 7 extending to spot 6	medium; creamy-yellow; black scaling along veins Cu1, Cu2 and 2A	vein tips heavily black; medium checkered
arizonae	medium; whitish-yellow; spot 7 half way under spot 6	broad; very light yellow; some black scaling along veins Cu1, Cu2 and 2A	vein tips heavily black; very lightly checkered
reubeni	broad; spots 7 & 8 white; spot 9 whitish-yellow	very broad; creamy-white; some to no black scaling along veins Cu1, Cu2 and 2A	vein tips thinly black; very lightly checkered
coloradensis	broad; yellow	broad; yellow; usually no black scaling along veins Cu1, Cu2 and 2A	vein tips heavily brownish-black; strongly checkered
browni	broad; yellow; spot 9 prolonged inwardly	narrow to medium; greyish-yellow; some black scaling along veins Cu1, Cu2 and 2A	vein tips heavily dark, brownish-black; medium checkered

critically reviewing the manuscript.

The continued generosity of Mr. Arthur C. Allyn and Dr. Lee D. Miller, of the Allyn Museum of Entomology, Sarasota, Florida, made the publication of this paper possible and to them we wish to express our deepest appreciation.

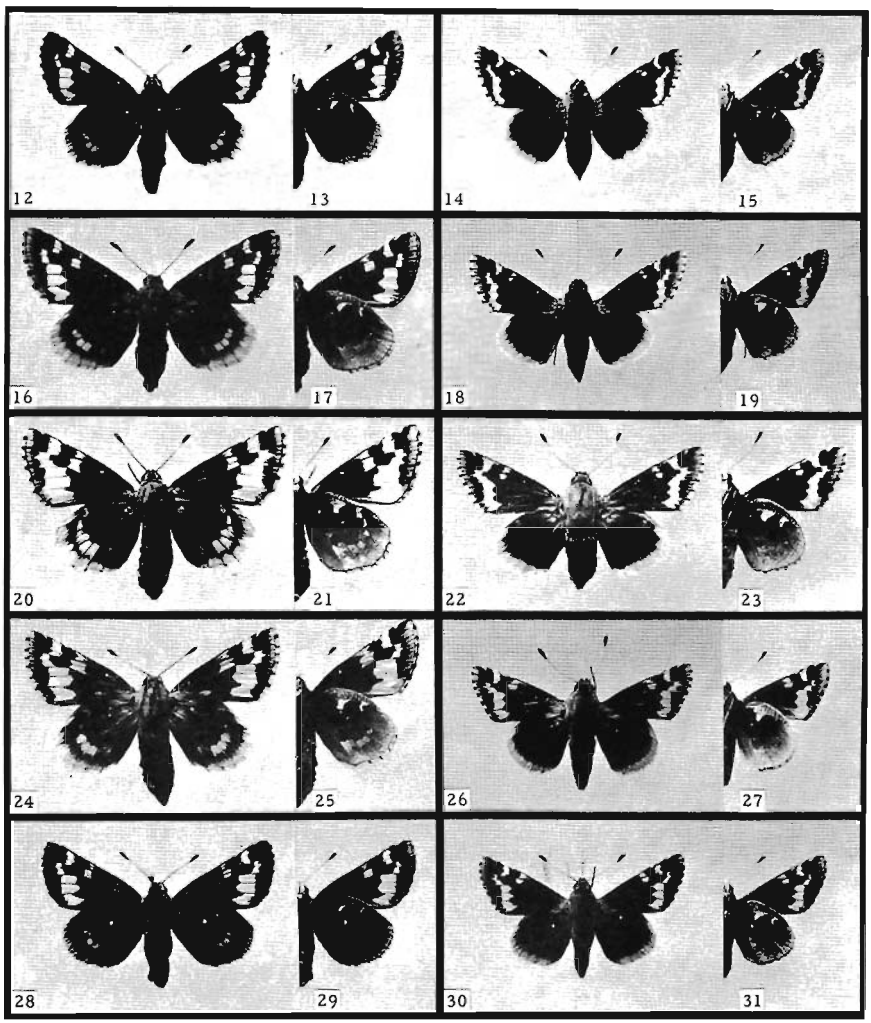
LITERATURE CITED

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

Emmel, T. C. and J. F. Emmel, 1969. A new subspecies in the *Cercyonis meadi* group (Satyridae). *J. Lepid. Soc.*, 23: 161-164, 10 figs.

——, 1971. An extraordinary new subspecies of *Cercyonis oetus* from central Nevada (Lepidoptera: Satyridae). *Pan-Pacific Entomol.*, 47: 155-157.

Emmel, Thomas C. and Sterling O. Mattoon, 1972. *Cercyonis pegala blanca*, a "missing type" in the evolution of the genus *Cercyonis* (Satyridae).



J. Lepid. Soc., 26(3): 140-149, 11 figs.
Freeman, H.A., 1969. Systematic review of the Megathymidae. *J. Lepid. Soc.*, 23, Supplement 1, 58 pp., 1 pl.
Riley, C. V., 1877. *Trans. Acad. Sci. St. Louis,* 3: 568.
Roever, K., 1964. Bionomics of *Agathymus* (Megathymidae). *J. Res. Lepid.*, 3(2): 103-120, 5 pls.
Skinner, H., 1911. *Ent. News,* 22: 300.
Stallings, D. B. and J. R. Turner, 1960. A new species of Agathymus and a new subspecies of Megathymus (Lepidoptera, Rhopalocera, Megathymidae). *J. Lepid. Soc.*, 71: 109-115, 2 pls.

KEY TO DISTINGUISHING CHARACTERISTICS:

Females, upperside

Subspecies	Thorax	Scales at tip of Abdomen	Upperside of Primaries & Secondaries, ground color	Cell Spot	Spots 2, 3 & 4	Spots 5 & 6
albasuffusa	light grey, with some greenish-brown hairs above	sordid yellow	black	large; deep yellow	nearly equal in size; white	medium; sharply toothed outwardly; light yellow
navajo	dark grey, with some brownish hairs above	dark grey	deep black	small to medium; yellow	white	narrow to medium; sharply toothed outwardly; light yellow
arizonae	medium brownish-grey with some greenish-brown hairs above	dark grey	deep, brownish-black	medium; light yellow	white	medium; sharply toothed outwardly; light yellow
reubeni	light grey, with some brownish hairs above	yellowish-brown	deep, brownish-black	large; creamy-yellow	wide; white	wide; sharply toothed outwardly; creamy-white
coloradensis	light grey, with some brownish hairs above	light brown	light, brownish-black	large; light yellow	wide; white	medium; sharply toothed outwardly; creamy-white
browni	dark, brownish-grey, with some dark brownish hairs above	light brown	dark, blackish-brown	medium; yellow	white	medium; slightly toothed outwardly; pale yellow

Figs. 12 - 31. Subspecies of *Megathymus coloradensis* considered in this study. 12. *Navajo* Skinner: Ex larva r. f. *Y. schidigera* fnd. 2-3 mi. S.E. Kingman on Hualapai Mtn. Rd., Mohave Co., Ariz. fnd. 30-31 XII 1971, pup. 18 I 1972, em. 8 II 1972, R. Wielgus, Coll., Larva #1, female, upperside. 13. Same as 12., underside. 14. *Navajo* Skinner: Same data as 12., Larva #3, male, upperside. 15. Same as 14., underside. 16. *Arizonae* Tinkham: Ex larva r. f. *Y. thornberi* fnd. S. Mountain View, Pima Co., Ariz., fnd. 16 I 1971, em. 24 II 1971, R. & D. Wielgus, Collectors, female, upperside. 17. Same as 16., underside. 18. *Arizonae* Tinkham: Same locality as 16., fnd. 16 I 1971, em. 11 II 1971, R. & D. Wielgus, Collectors, male, upperside. 19. Same as 18., underside. 20. *Reubeni* Stallings & Turner: Hueco Mts. Texas, Mar. 31, 1962, Viola Stallings, No. M 2008, female, upperside. 21. Same as 20., underside. 22. *Reubeni* Stallings & Turner: Hueco Mts. Texas, April 1, 1962, Viola Stallings, No. M 2010, male, upperside. 23. Same as 22., underside. 24. *Coloradensis* Riley: Springfield Colo(rado), 4-14 1956, El 4400, Stallings & Turner, female, upperside. 25. Same as 24., underside. 26. *Coloradensis* Riley: Springfield, Colo(rado), 4-2 1953, El 4400, Stallings & Turner, No. M 854, male, upperside. 27. Same as 26., underside. 28. *Browni* Stallings & Turner: Black Mesa, Colo.(rado), Near Black Canyon, June 7, 1951, El 7800 Ft., Specimen No. 82, Slide No. 182, Stallings & Turner, female, upperside. 29. Same as 28., underside. 30. *Browni* Stallings & Turner: Black Mesa, Colo.(rado), Near Black Canyon, June 8, 1951, El 7800 Ft., No. M 840, male, upperside. 31. Same as 30., underside.

KEY TO DISTINGUISHING CHARACTERISTICS: Table 2.

Females, upperside (continued)

Subspecies	Spots 7, 8 & 9	Marginal Border of Secondaries	Fringes of Primaries
albasuffusa	broad; deep yellow; spot 7 half way under spot 6 & extending almost to cell spot	broad; light yellow; diffuse black scaling basad; thin black scaling along veins	vein tips thinly black; lightly checkered
navajo	narrow to medium; light yellow; spot 7 extending to spot 6	medium; light yellow; heavy black scaling along veins	vein tips heavily black; strongly checkered
arizonae	broad; light yellow; spot 7 half way under spot 6	broad; very light, creamy-yellow; thin black scaling along veins	vein tips heavily black; lightly checkered
reubeni	very broad; creamy-yellow; spot 7 well under spot 6	very broad; creamy-white; thin black scaling along veins	vein tips heavily brownish-black; lightly checkered
coloradensis	very broad; light yellow; spot 7 well under spot 6	broad; yellow; thin black scaling along veins	vein tips thinly, dark-brownish; lightly checkered
browni	broad; yellow; spot 7 half way under spot 6; spot 9 prolonged inwardly	narrow; greyish-yellow; heavy black scaling along veins	vein tips heavily blackish; medium checkered

Stallings, D. B., J. R. Turner and V. N. Stallings, 1963. Two new species and one new subspecies of Megathymidae from Mexico and Texas. *J. Lepid. Soc.*, 17: 81-88, 3 pls.

Tinkham, E. R., 1954. The biology and description of a new giant skipper from Arizona. *Bull. So. Calif. Acad. Sci.*, 53: 75-87, 2 pls.

Wielgus, Ronald S., Joseph R. Wielgus and Dale Wielgus, 1970 (1971). Additional notes on the distribution and foodplant preferences of *Megathymus coloradensis navajo* Skinner. *J. Res. Lepid.*, 9(3): 169-174, 1 pl.

Wielgus, Ronald S. and Dale Wielgus 1972(1973). Some techniques for the rearing of Megathymus larvae. *J. Res. Lepid.*, 11(4): 245-250, 2 figs.

PUPAL MEASUREMENTS Table 3.

Megathymus coloradensis albasuffusa Ronald S. and Dale Wielgus, new subspecies.

Rearing Number	Sex	Length	Width	Remarks
Wp#1-72	Male	-	-	Not measured.
Wp#2-72	Male	-	-	Not measured.
Wp#1-73	Male	34 mm	8.0 mm	Ex larva; pupated 7 I 1973; emerged 29 I 1973.
Wp#2-73	Male	29 mm	7.0 mm	Ex larva; pupated 12 I 1973; emerged 1 II 1973.
Wp#3-73	Female	38 mm	8.5 mm	Ex larva; pupated 20 I 1973; emerged 9 II 1973.
Wp#4-73	Male	28 mm	6.0 mm	Ex larva; pupated 21 I 1973; emerged 15 II 1973.
Wp#5-73	?	-	-	Died as larva II 1973.
Wp#6-73	Female	35 mm	8.0 mm	Field-collected IV 1973.
Wp#7-73	Female	37 mm	8.0 mm	Ex ovum; pupated 1 VIII 1973; emerged 15 VIII 1973.
Wp#8-73	Female	42 mm	8.5 mm	Ex ovum; pupated 29 VIII 1973; emerged 12 IX 1973.
Wp#9-73	Female	40 mm	8.5 mm	Ex larva; pupated 7 IX 1973; emerged 23 IX 1973.
Wp#10-73	Male	39 mm	8.0 mm	Ex larva; pupated 11 IX 1973; emerged 26 IX 1973.
Wp#11-73	Male	41 mm	8.5 mm	Ex ovum; pupated 17 IX 1973; emerged 1 X 1973.
Wp#12-73	Female	45 mm	9.0 mm	Ex ovum; pupated 3 X 1973; emerged 21 X 1973.
Wp#13-73	Female	38 mm	7.5 mm	Ex larva; pupated 3 X 1973; emerged 19 X 1973.
Wp#14-73	Male	34 mm	7.0 mm	Ex larva; pupated 4 X 1973; emerged 19 X 1973.
Wp#15-73	Male	40 mm	8.0 mm	Ex ovum; pupated 15 X 1973; emerged 1 XI 1973.
Wp#16-73	Female	35 mm	8.0 mm	Ex ovum; pupated 16 X 1973; emerged 2 XI 1973.
Wp#17-73	Male	33 mm	6.8 mm	Ex larva; pupated 26 X 1973; emerged 13 XI 1973.
Wp#18-73	Male	40 mm	8.5 mm	Ex larva; pupated 6 XI 1973; emerged 26 XI 1973.
Wp#19-73	Male	42 mm	8.8 mm	Ex larva; pupated 12 XI 1973; emerged 3 XII 1973.
Wp#20-73	Male	35 mm	7.5 mm	Ex larva; pupated 21 XI 1973; emerged 11 XII 1973.
Wp#21-73	Male	36 mm	7.0 mm	Ex ovum; pupated 29 XII 1973; emerged 19 I 1974.
Wp#22-73	?	36 mm	7.0 mm	Ex larva; pupated 29 XII 1973; died 17 I 1974.

Figs. 32 - 35. *Megathymus coloradensis albasuffusa* Wielgus and Wielgus, new subspecies. 32. Ova on leaf of *Yucca baileyi*, type locality, 14 April 1973. 33. Second instar larval tent, with frass, in *Y. baileyi in situ* at type locality, 9 June 1973. 34. Fourth instar larva r. f. *Y. baileyi* in laboratory, June 1973. 35. Pupa, Wp#1-73. Scale graduation 1/16 inch.

WING MEASUREMENTS

Table 4.

Megathymus coloradensis albasuffusa Ronald S. and Dale Wielgus, new subspecies.

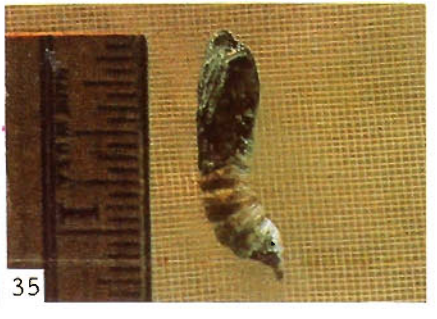
Rearing Number; Sex		Forewing			Hindwing	Expanse
		Apex to Base	Apex to Outer Angle	Outer Angle to Base	Base to End of Vein Cul	
Wp#1-72	Male	-	-	-	-	Misfit
Wp#2-72	Male	25 mm	16 mm	17 mm	15 mm	49.5 mm
Wp#1-73	Male	25 mm	16 mm	17 mm	15 mm	50.5 mm
Wp#2-73	Male	22 mm	14 mm	15 mm	14 mm	45.0 mm
Wp#3-73	Female	28 mm	18 mm	19 mm	20 mm	53.0 mm
Wp#4-73	Male	-	-	-	-	Misfit
Wp#5-73	?	Died as larva II 1973		-	-	-
Wp#6-73	Female	28 mm	18 mm	19 mm	19.5 mm	54.0 mm
Wp#7-73	Female	25 mm	16 mm	17 mm	17 mm	47.0 mm
Wp#8-73	Female	29 mm	18 mm	21 mm	20 mm	55.0 mm
Wp#9-73	Female	28 mm	18.5 mm	20 mm	19.5 mm	53.5 mm
Wp#10-73	Male	26 mm	17 mm	18.5 mm	15 mm	52.0 mm
Wp#11-73	Male	27 mm	17.5 mm	18.5 mm	16 mm	52.0 mm
Wp#12-73	Female	30 mm	21 mm	21 mm	22 mm	60.0 mm
Wp#13-73	Female	28.5 mm	19 mm	19 mm	20 mm	50.0 mm
Wp#14-73	Male	21 mm	13.5 mm	14 mm	13 mm	42.5 mm
Wp#15-73	Male	25 mm	16 mm	16 mm	14 mm	48.0 mm
Wp#16-73	Female	26.5 mm	17 mm	17 mm	19 mm	49.0 mm
Wp#17-73	Male	22 mm	14.5 mm	14 mm	15 mm	44.0 mm
Wp#18-73	Male	26 mm	17 mm	17 mm	15 mm	52.0 mm
Wp#19-73	Male	26 mm	17 mm	17 mm	16 mm	50.0 mm
Wp#20-73	Male	23 mm	15 mm	16 mm	15 mm	47.0 mm
Wp#21-73	Male	22 mm	14 mm	15 mm	14 mm	45.0 mm
Wp#22-73	?	Died as pupa 17 I 1974		-	-	-

Average Expanse: Male: 48.125 mm Female: 52.625 mm


32


33


34


35

DISPOSITION OF TYPE SERIES Table 5.

Megathymus coloradensis albasuffusa Ronald S. and Dale Wielgus, new subspecies.

Rearing Number	Sex	Where Deposited
Wp#2-73	Male	Allyn Museum of Entomology
Wp#1-73 (Allotype)	Male	Allyn Museum of Entomology
Wp#2-73	Male	Allyn Museum of Entomology
Wp#3-73	Female	Allyn Museum of Entomology
Wp#6-73 (Holotype)	Female	Allyn Museum of Entomology
Wp#7-73	Female	Allyn Museum of Entomology
Wp#8-73	Female	American Museum of Natural History
Wp#9-73	Female	American Museum of Natural History
Wp#10-73	Male	American Museum of Natural History
Wp#11-73	Male	American Museum of Natural History
Wp#12-73	Female	Los Angeles County Museum of Natural History
Wp#13-73	Female	Los Angeles County Museum of Natural History
Wp#14-73	Male	Los Angeles County Museum of Natural History
Wp#15-73	Male	Los Angeles County Museum of Natural History
Wp#16-73	Female	United States National Museum
Wp#17-73	Male	United States National Museum
Wp#18-73	Male	United States National Museum
Wp#19-73	Male	Allyn Museum of Entomology
Wp#20-73	Male	Don B. Stallings
Wp#21-73	Male	Arizona State University

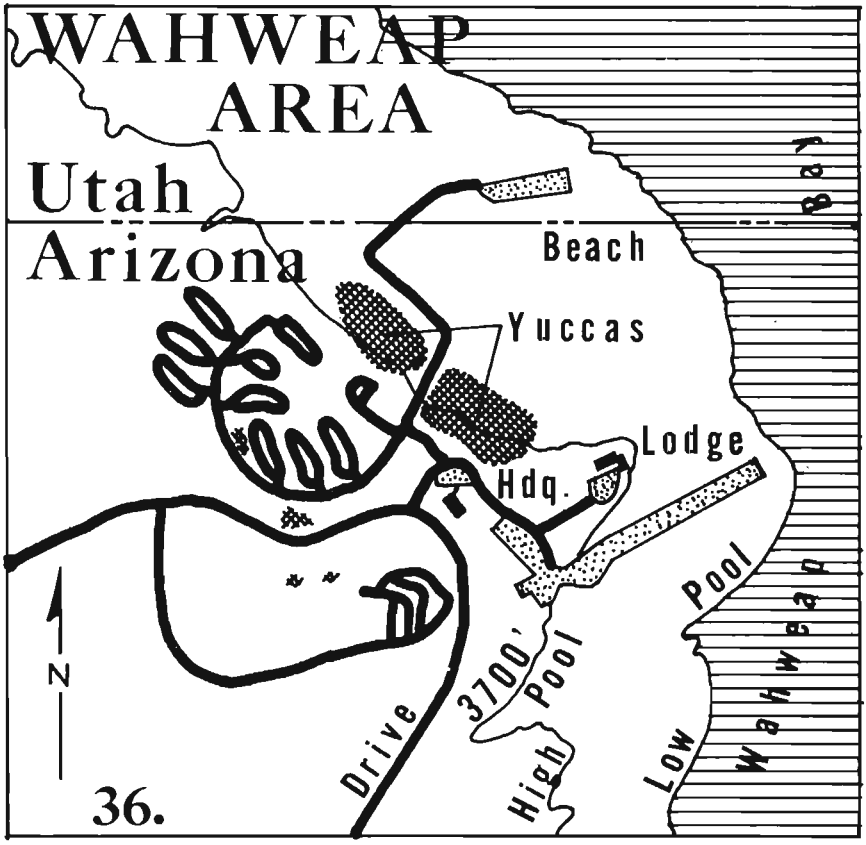
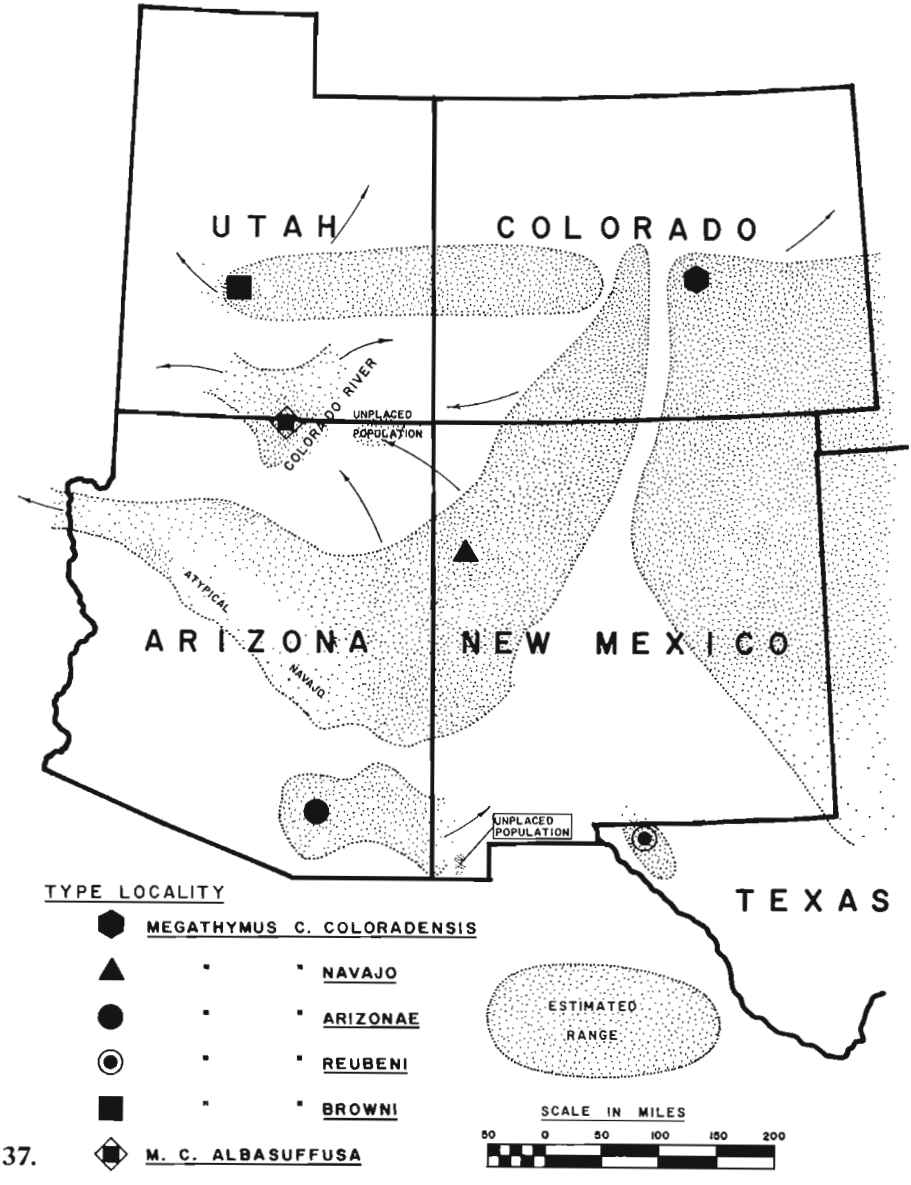


Fig. 36. Locality Map: Wahweap Area.



37.

Fig. 37. Distribution Map.