

NOTES ON *MEGATHYMUS NEUMÆGENI*, WITH DESCRIPTION
OF A NEW SPECIES (MEGATHYIMIDÆ)

by DON B. STALLINGS and J. R. TURNER

During the winter of 1951 D. L. BAUER sent us a number of specimens of *Megathymus* that he had collected in central Arizona. Among them were three individuals of a species new to us. The three specimens were collected in the fall during the last part of September and the first part of October of 1951 on the eastern slope of Mingus Mountain at an elevation of 6500 feet. This location is just above the town of Jerome, Arizona, and is about 30 miles northeast of Prescott, Arizona.

The most startling character in this species was that the spots and bands on the upper surfaces were orange-red, similar to FREEMAN's newly described *Megathymus chisosensis*. All other species of the Agave feeders that we had seen from Arizona had the spots yellow-brown to orange-brown.

At about the same time that we received these specimens we also received from WILLIAM D. FIELD of the U. S. National Museum photographs of the three specimens before EDWARDS when he described *M. neumægeni*. It was immediately evident that BAUER's specimens were true *M. neumægeni*. It was also evident that the three specimens before EDWARDS consisted of two males and one female and not one male and two females as he reported.

This one male which was (and is) marked a female evidently is the thing that has caused all the confusion since *M. neumægeni* was described—for it appears that since EDWARDS' description the name has been consistently applied to another species in which the female does have a marked resemblance to the male of *M. neumægeni*.

As a result the literature concerning *M. neumægeni* and its related species is full of errors. Probably the best way to bring the situation into proper focus is to make a chronological listing of the most important events as follows:

1. 1882 — EDWARDS described *M. neumægeni* - *Papilio* 2: p. 27.
2. 1905 — DYAR described *M. aryxna* - *Journ. N.Y. Ent. Soc.* 13: p. 141.
3. 1911 — SKINNER described *M. drucei* - *Trans. Amer. Ent. Soc.* 28: p. 207.
4. 1912 — BARNES and MCDUNNOUGH published DYAR's restriction to the application of the name *aryxna* - *Contrib. Nat. Hist. Lepid. N. Amer.* 1, No. 3: p. 23.
5. 1924 — SKINNER and WILLIAMS designated the type of *M. aryxna* - *Trans. Amer. Ent. Soc.* 50: p. 205.
6. 1950 — FREEMAN described *M. evansi* - *Field & Lab.* 18: p. 144.

EDWARDS, in his description of *M. neumægeni*, refers to a fourth "female" caught, but it is evident that this specimen was not before him when he made his description, and it is our opinion that this fourth specimen should not be considered a part of the type series. We understand that this fourth specimen is in the Strecker Collection at Chicago. EDWARDS' three specimens were caught near Prescott, Arizona.

DYAR described *M. aryxna* from ten specimens before him and referred to Figs. 3 & 4, Plate 69, *Biologia Cent. - Am. Lep. Het.*, Vol. III. The two figures (3 & 4) are hand drawings of actual specimens still in the British Museum. DYAR had before him six specimens of one species and four specimens of another species. As a matter of convenience we shall refer to the species represented by the six specimens before him as Species No. 1 and the other four as Species No. 2. All ten specimens were males, as are the two in the British Museum. The genitalia of all twelve specimens have been examined, and none are *M. neumægeni*.

In 1911 SKINNER took the position that Fig. 3 in the *Biologia* was a different species than Fig. 4 and gave it the name of *M. drucei*. Brig. W. H. EVANS of the British Museum has examined the genitalia of both specimens (Figs. 3 & 4) and states that they are both "*M. neumægeni*" - meaning Species No. 1, for this is a fairly common species and has been called *M. neumægeni* by nearly everyone - and is to this day. Practically all publications and plates prior to the present date refer to Species No. 1 as *M. neumægeni*.

Sometime after DYAR described his *M. aryxna*, BARNES and McDUNNOUGH suggested to him that Species No. 1 was *M. neumægeni* and that he should restrict his name to Species No. 2. This he did in 1910 to the extent of making a label as follows and attaching it to one specimen of Species No. 2:-

Megathymus
aryxna
Cotype Dyar
(Sensu Restr) (1910)

He never published this restriction. In 1912 BARNES and McDUNNOUGH did.

We are satisfied that Fig. 4 in the *Biologia* is the same thing as Species No. 1. The spots in the specimen shown in Fig. 3 are somewhat reduced; while this is not an unusual situation for individuals of Species No. 1, the fact is that there is a species in Mexico that is distinct from Species No. 1 but does resemble Fig. 3. At this time we do not know that Fig. 3 represents this Mexican species, but point out that there is a species that has a resemblance to Fig. 3.

In 1924 SKINNER and WILLIAMS challenged the restriction and designated Fig. 4 of the *Biologia* as the type of *M. aryxna*. They, along with most subsequent authorities, took the position that DYAR described Species No. 1. Frankly, we are unable to determine which of the two species he was describing. His description merely separates his *M. aryxna* from *M. neumægeni* by saying that "It differs from *neumægeni* in having the fulvous

markings considerably reduced, the outer band being broken into spots." This is true of both species before him. The first sentence in his description does refer to Fig. 3 & 4 in the *Biologia*. This sentence is probably what has caused so many to assume that he was describing Species No. 1. Actually, if we stop to think about it, we realize that he was describing the entire lot as one species and probably was treating the 4 specimens of Species No. 2 as females; nearly all authorities at that time were confusing the sex in *Megathymus*.

In 1950 FREEMAN, following the general view that the name *M. aryxna* had to be applied to Species No. 1, described Species No. 2 as *M. evansi*.

We have found three distinct schools of thought as to what comprised the type series of *M. aryxna*. Some said they were the two specimens in the *Biologia* others said they were the ten specimens before DYAR, and still others said they were all twelve specimens.

We find that there is a great difference of opinion as to the validity of DYAR's restriction. In view of the action of the International Commission last August at the Copenhagen Congress with reference to the Principle of the First Reviser it would appear that the synonymy should be as follows:

A. *Megathymus neumægeni* Edwards

B. *Megathymus aryxna* Dyar
syn. *evansi* Freeman

C. *Megathymus drucei* Skinner
syn. *neumægeni* auctt.

This arrangement is based on the assumption that both Figs. 3 & 4 of the *Biologia* are Species No. 1. If the name *M. drucei* is found to apply to a species other than Species No. 1, then Species No. 1 will have to be described as a new species. We come to the foregoing conclusion rather reluctantly as it would seem more practical to apply the name *M. aryxna* to Species No. 1 and the name *M. evansi* to Species No. 2, leaving the name *M. drucei* to apply to the Mexican species should it be found to so apply.

We designate the male specimen in EDWARDS' type series (now in the National Museum at Washington, D.C.), which is labeled a female, as the LECTOTYPE of *Megathymus neumægeni*. The female in the type series is a normal specimen and not aberrant as some would believe. The type locality is Prescott, Arizona. The life history follows the usual pattern of the Agave feeders. The food plant is *Agave conesii* Engelm.

The label on the specimen pictured at Fig. 4 in the *Biologia* indicates that it was caught in Mexico. The type of *M. drucei* was caught by MORRISON and is labeled N. Sonora, Mexico.

Among the specimens that BAUER sent us were a series of what we first considered to be a subspecies of *M. drucei*. It was not until August of 1953, after considerable study and many dissections, that we came to the conclusion that in fact this was a separate species. Its description follows.

Megathymus baueri new species

MALE. Upper surface of primaries: Deep black, with the base of wing orange-fulvous, extending outward along inner margin of the wing to a point just to the edge of the lowest spot in the discal band. There is an elongated spot-like suffusion of orange-fulvous scales extending from near the base to almost half way to the discal band. Spot 1 (Cell spot) is orange-fulvous, more linear than round and rather small. Spots 2, 3, and 4 (subapical spots) are of the same color and slightly linear. Spots 5 & 6 (submarginal spots) out of line from the subapical and discal spots and small. These two spots are the same color as those above. The discal band is composed of spots 7, 8, and 9. These three spots are rather small and separated from each other by more than the width of the veins. These three spots form a straight line, the top one of which is toothed inward, the middle one round and the bottom one broader at its bottom than at the top. All three spots are deep orange-fulvous. Fringes alternately checkered black and light orange.

Upper surface of secondaries: Deep black, basal half covered with orange hairs. Spots 10, 11, 12, and 13 (basic spots of the discal band) are in a straight line. There is one spot above spot 10, and outside of spot 13 there is an elongated spot which curves downward toward the anal angle. All spots are deep orange-fulvous. Fringes alternately checkered black and light orange.

Under surface of primaries: Dull black over all but the area from the discal spots to the apex, which is sparsely overscaled with gray. All spots reappear and are lighter in color. The cell, subapical, and submarginal spots are reduced in size.

Under surface of secondaries: Black, heavily overscaled with orange-gray. The discal band above appears on this surface only as a somewhat lighter gray area. There are one to two small white spots below the costal area.

Abdomen: Orange-fulvous at the cephalic end shading off into gray posteriorly above, beneath light grey. Thorax: Dark orange-fulvous above, gray beneath. Palpi: Gray. Antennæ: The base of the club gray; the remaining portion of the antennæ is black above, lighter beneath, showing faint rings.

Expanse of forewing from 26 to 28 mm.; average 27.5 mm. Wing measurements of the HOLOTYPE: Forewing, apex to base 27.5 mm., apex to outer angle 15 mm., outer angle to base 20 mm.; hindwing, base to end of vein Cu_1 , 19 mm.

FEMALE. Upper surface of primaries: Deep black with the same general overscaling as in the males except that it is a little lighter in coloration and somewhat more extensive. All spots are present and only slightly lighter in coloration. Spot 7 (top spot of discal band) is elongated inwardly and terminates just below and slightly beyond the outer edge of the cell spot. Spot 9 (bottom one) is more narrow and toothed on the inner side in about the center. On the outer edge of these three spots a near straight line is formed, curving slightly outward at the top and bottom. Fringes alternately checkered black and light orange.

Upper surface of secondaries: Deep black, heavily overscaled with fulvous hairs especially over the basal half of the wing. The spots appear in the same manner as in the males except they are about twice as large. Fringes alternately checkered black and light orange.

Under surfaces of primaries: Same as in the males except the spots are wider.

Under surfaces of secondaries: Dark grayish-black, heavily overscaled with orange gray. There are three white spots present, two small circular ones below the costal area and another circular one near the upper part of the discal area. The discal band of spots above shows through as a well defined grayish area and in some instances can be recognized as spots.

Abdomen: Fulvous at the cephalic end above, becoming grayish-black posteriorly, while on the lower side it is dark grayish-black. Thorax: Fulvous above, grayish beneath. Palpi: Gray. Antennæ: Same as in the males.

Expanse of forewing varies from 28 to 30 mm.; average 29 mm. Wing measurements of the ALLOTYPE: forewing, apex to base 29 mm., apex to outer angle 17 mm., outer angle to base, 20 mm.; hindwing, base to end of vein Cu_1 21 mm.

Described from 78 specimens (55 males and 23 females) collected near Verde Hot Springs, Yavapai County, Arizona, and other localities in Yavapai County during October 1950, 1952, and 1953 by DAVID BAUER, DON B. & VIOLA N. STALLINGS, and Dr. & Mrs. R. C. TURNER.

HOLOTYPE, Male, Oct. 25, 1952, Verde Hot Springs, Arizona, elevation 4,000 ft. (STALLINGS); ALLOTYPE, female, Oct. 4, 1953, Verde Hot Springs, Arizona, elevation 4,000 ft. (TURNER), are in the collection of the authors. There are 19 male and 6 female paratypes in the collection of BAUER. One male and one female paratype is being deposited in each of the following collections, with others to be determined later: U. S. National Museum, American Museum of Natural History, and H. A. FREEMAN.

We take pleasure in naming this new species for Mr. D. L. BAUER who has done some very fine collecting and life-history work in Arizona.

Superficially *M. baueri* is closer to *M. drucei* than to any of the other described species of *Megathymus*. However there are several ways by which the two can be readily separated: 1) the fringes of *M. baueri* are light orange and black instead of white and black like *M. drucei*; 2) the ground color is of a darker shade of black and the spots are smaller than in *M. drucei*; 3) the discal spots are located a little farther basad than the same spots in *M. drucei*; 4) the discal band on the upper surface of the secondaries forms a straighter line in *M. baueri* than it does in *M. drucei*; 5) the white spots on the lower surface of the secondaries are much smaller in *M. baueri*; 6) the overscaling on the under surfaces is orange-gray rather than white-gray.

The food plant is *Agave parryi* Engelm., the dominant species of the area at low (4,000 ft.) elevations.

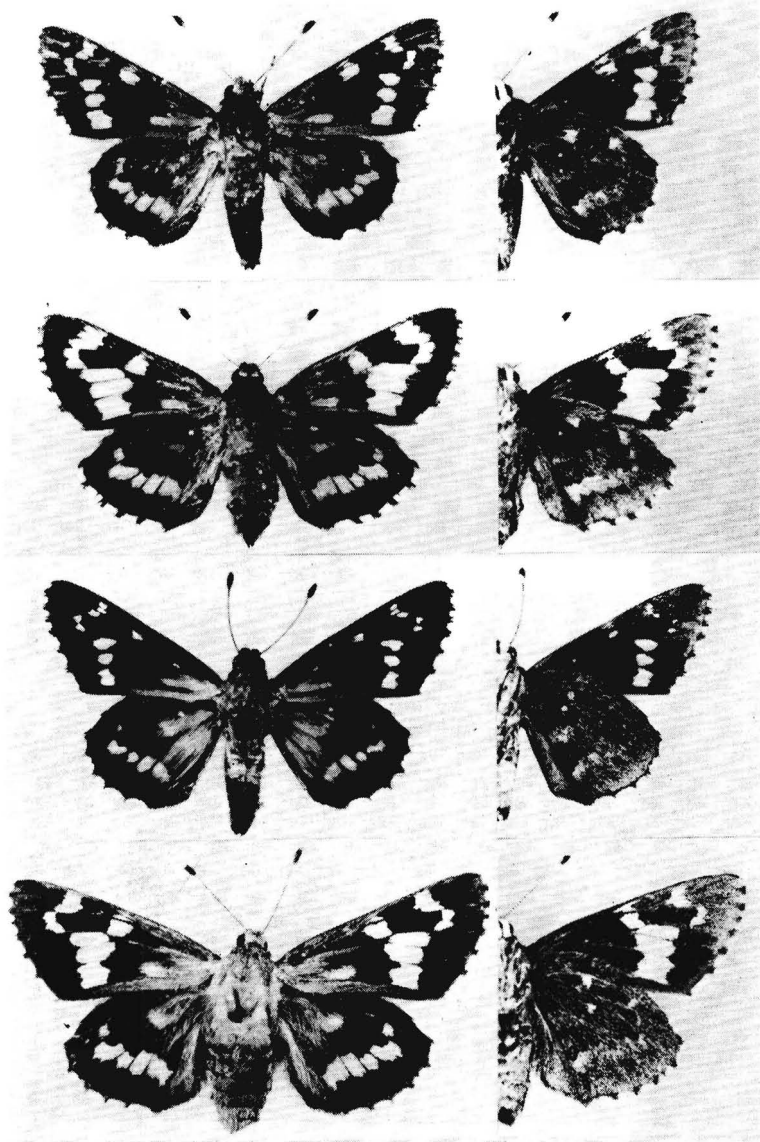
The life history follows the general pattern of the Agave feeders. The larvæ burrow only a short distance in one leaf. In view of this fact we suspect that this species and others of the Agave feeders feed on the fluid of the plant. The pulp removed by the burrowing larva is not in our opinion sufficient to support an insect of this size. In nearly all of the Agave feeders the opening to the burrow is placed low on the leaf, sometimes on the upper side, sometimes on the lower side, just at or above the area where the next leaf comes in contact with the leaf that has the burrow. Thus most openings are in the green area of the leaf. *M. baueri* differs from the others in this respect in that the opening is even lower, being adjacent to the white area of the leaf on the under side. The white area is caused by the next leaf fitting around the leaf above it so that the base does not receive sunlight and therefore remains white. When the adult emerges it must have a tight squeeze to get out of its hole and up between the close fitting leaves, for we never were able to pry the leaves apart sufficiently to locate the hole; we literally had to tear the plant apart to locate the pupæ. The opening in the leaf to the burrow is covered by a "trap-door". *M. baueri* always places the opening on the under side of the leaf.

The male genitalia are more similar to those of *M. neumœgeni* than to those of *M. drucei* or *M. aryxna*. In *M. baueri* and *M. neumœgeni* the lower clasp of the prong on the uncus is evenly curved. In *M. drucei* it curves abruptly, and in *M. aryxna* it is straight. The clasper is nearly as broad as in *M. aryxna*, and the chitinous fold, posteriorly situated from the prong, is fairly thick, while in *M. drucei* it is not as thick. The ædeagus is somewhat different.

The female genitalia show the specific difference perhaps better than in the male, for the general shape of the vaginal plate varies with the species. In *M. neumœgeni* and *M. aryxna* the upper flanges are not as sharply pointed as in *M. baueri* and *M. drucei*, and the chitinous fold that extends from the outer edge posteriorly bulges heavily near the bottom, while in *M. drucei* the bulge is not present and the fold tapers nearly to a point at the posterior end. *M. baueri* has the upper shape of *M. drucei* and the lower shape of *M. neumœgeni* and *M. aryxna*. The photographs here presented, of the adults of the various species involved, along with the photographs of the genitalia, should aid in the separation of *M. neumœgeni*, *M. aryxna*, *M. drucei*, and *M. baueri*. It should be pointed out that there is considerable variation in the male genitalia, and the photographs that we present represent average specimens. The photographs of *M. drucei* represent our present concept of this species.

We are deeply indebted to WM. D. FIELD of the U. S. National Museum for his assistance and information furnished from the material available in the Museum, to H. A. FREEMAN for his assistance in the dissections and study of the specific characters of the species involved, to Brig. W. H. EVANS of the British Museum for photographs of types and drawings of genitalia of the types, and to Dr. A. B. KLOTS for photographs of types made on his recent visit to Europe.

Caldwell, Kansas, U. S. A.



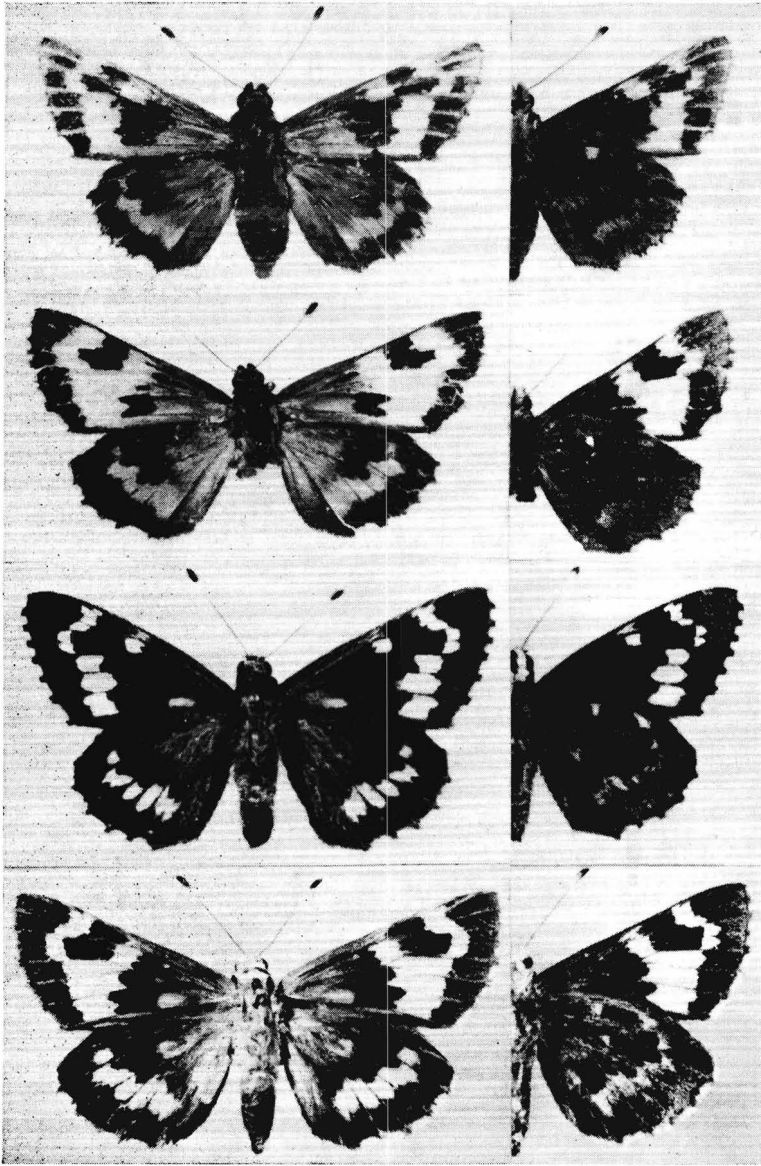
Top row: *M. drucei* ♂, Chiricahua Mts., Ariz., 9 Oct. 1951 (Specimen No. 111, S. & T. Coll.).

2nd row: *M. drucei* ♀, Chiricahua Mts., Ariz., 15 Oct. 1951 (No. 112, S. & T. Coll.).

3rd row: *M. baueri* HOLOTYPE ♂, Verde Hot Spgs., Ariz., 25 Oct. 1952 (S. & T. Coll.).

Lower row: *M. baueri* ALLOTYPE ♀, Verde Hot Spgs., Ariz., 4 Oct. 1953 (S. & T. Coll.).

[Uppersides at left; undersides at right]



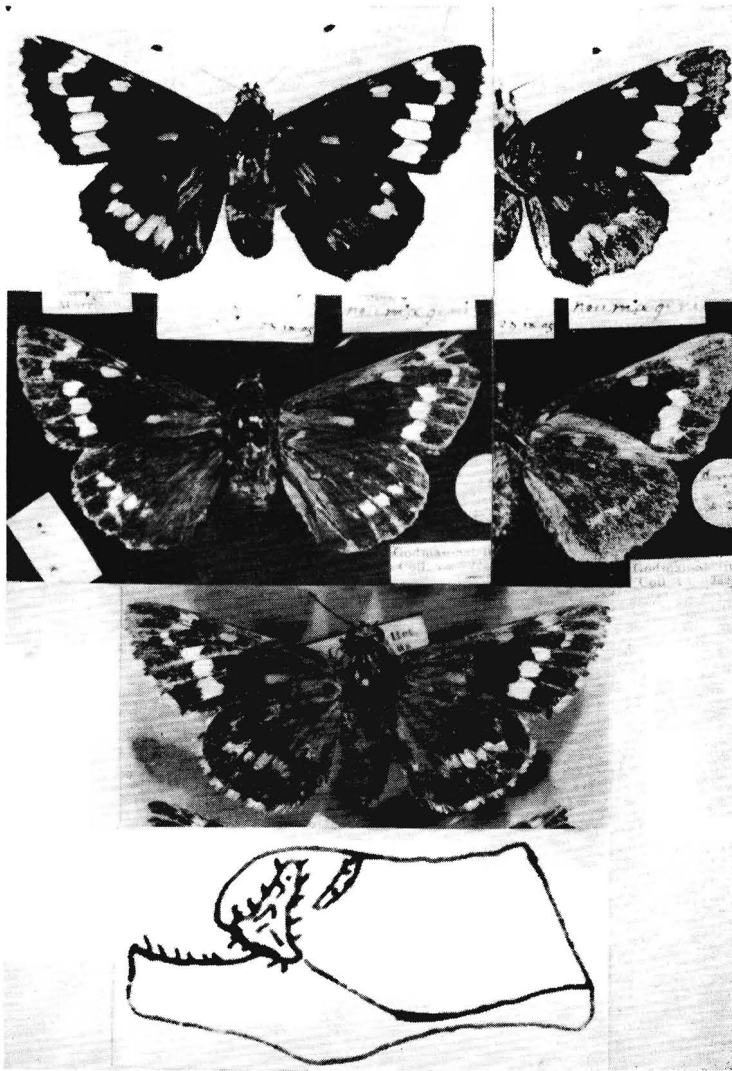
Top row: *M. neumægeni* LECTOTYPE ♂, Prescott, Ariz. (U.S.N.M.).

2nd row: *M. neumægeni*, the only ♀ in EDWARDS' type series, Prescott, Ariz. (U.S.N.M.).

3rd row: *M. evansi* HOLOTYPE.

Lower row: *M. evansi* ALLOTYPE.

[Uppersides at left; undersides at right]



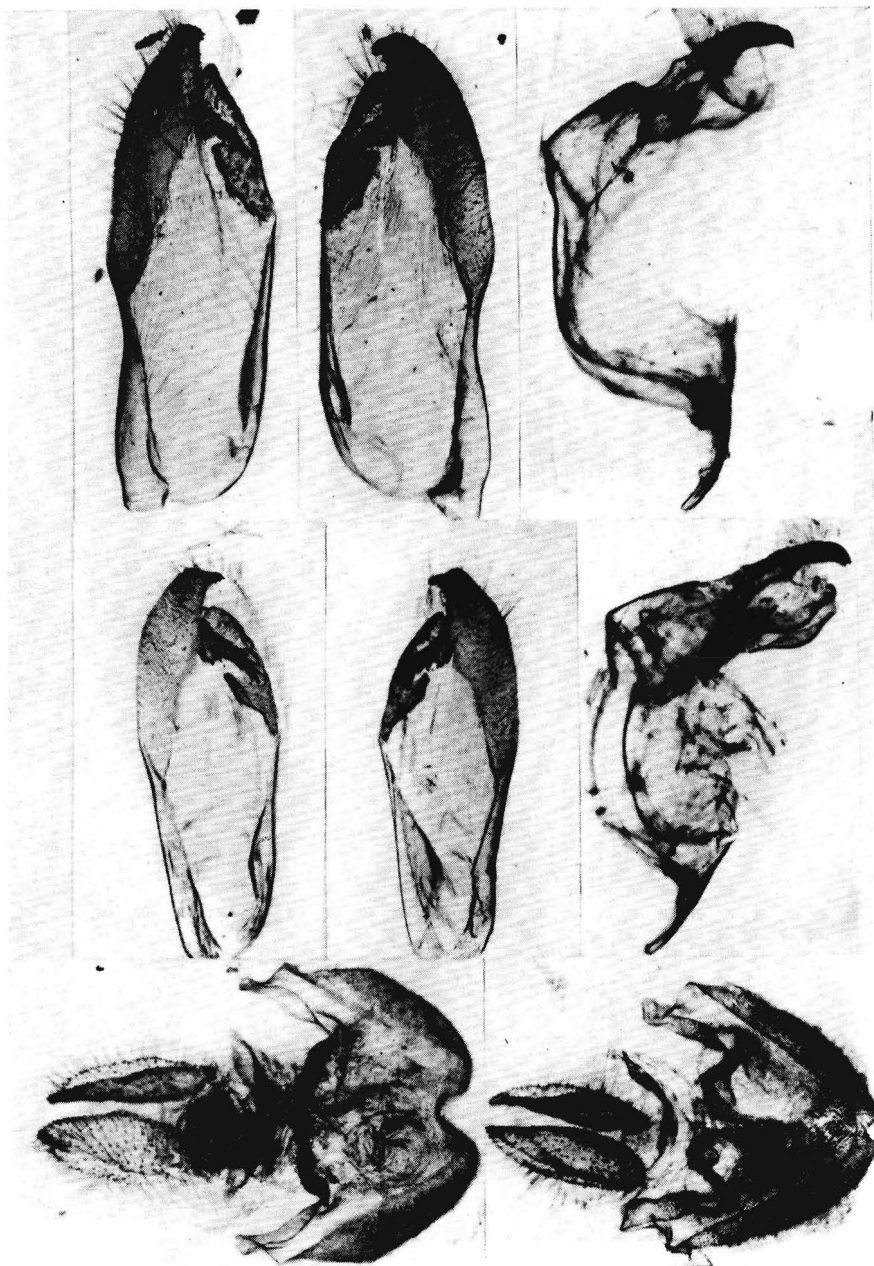
Top row: *M. aryxna* TYPE ♂, as restricted by DYAR.

2nd row: *M. drucei* TYPE ♂.

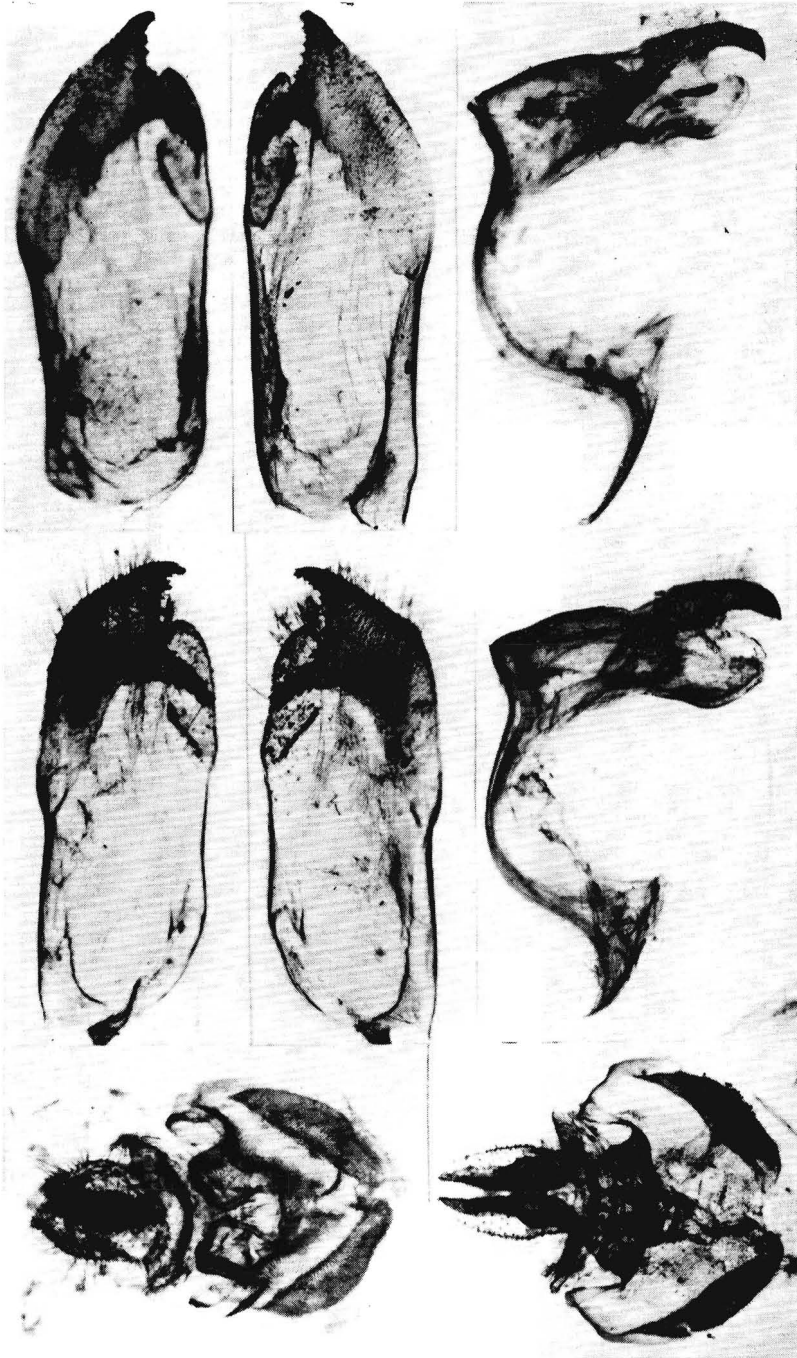
3rd row: Photograph of specimen in Brit. Mus. pictured in *Biologia*, Pl.69: fig.4.

Lower row: Drawing by Brig. EVANS of ♂ clasper of TYPE of *M. drucei*.

[Top rows with uppersides at left, undersides at right]



Top row: *M. drucei* ♂ genitalia, Paradise (Chiricahua Mts.), Ariz., 10 Sept. 1940 (No.91, S. & T. Coll.). 2nd row: *M. baueri* ♂ genitalia, Verde Hot Spgs., Ariz., 19 Oct. 1952 (No.105, S. & T. Coll.). Lower row, left: *M. baueri* ♀ genitalia, same locality, 10 Oct. 1950 (No.99, S. & T. Coll.). right: *M. drucei* ♀ genitalia, Chiricahua Mts., Ariz., 12 Oct. 1951 (No.93, S. & T. Coll.).



Top row: *M. neumægeni* ♂ genitalia, Jerome, Ariz., 25 Sept. 1949 (No.87, S. & T. Coll.). 2nd row: *M. aryxna* ♂ genitalia, Ramsey Canyon, Ariz., 12 Sept. 1950 (No.94, S. & T. Coll.). Lower row, left: *M. aryxna* ♀ genitalia, same locality, 1 Sept. 1950 (No. 96, S. & T. Coll.). right: *M. neumægeni* ♀ genitalia, Jerome, Ariz., 2 Oct. 1952 (No.89, S. & T. Coll.).