Solpugida of the Nevada Test Site

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SOLPUGIDA OF THE NEVADA TEST SITE

by

Martin H. Muma

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SOLPUGIDA OF THE NEVADA TEST SITE

Martin H. Muma
University of Florida, Citrus Experiment Station, Lake Alfred, Florida

This paper is based on nearly 1,000 specimens of solpugids that were collected from 1960 through 1962 in a relatively small study area at Mercury, Nevada. I would like to thank Dr. D. M. Allred and Dr. D. Elden Beck of Brigham Young University, Provo, Utah, and Dr. Willis J. Gertsch of the American Museum of Natural History, New York City, New York, for the opportunity to identify and study this material.

The collection contained 395 adult specimens. Although this number would not be considered large for most orders of arthropods, it is more than half the total number of adults that were available for study at the time of my 1951 review of the order in the United States. In this light the Mercury material must be considered the most extensive single collection of these curious arachnids ever taken in the United States. Altogether 28 species, 9 undescribed, were represented by the specimens. As only 112 species are known from the entire country, the collection represents one-fourth of the described species and must also be considered the most intensive ever taken in the United States. The value of such a collection can hardly be overemphasized.

Taxonomically the discovery of 9 new species, 1 described by Muma, 1962, and 8 described below, and the collection of hundreds of new records greatly increase our knowledge of the occurrence, distribution and variation of these rare animals. Biologically, the collection provides for the first time, information on the life cycle, longevity, sex ratio and ecological association of solpugids in this country.

Recorded Species and Specimens

The following list of species is systematically arranged in the order used in Muma, 1951. The total number of adult males and females collected during the study are cited for each species.

Family Eremobatidae Roewer, 1934.

Genus Eremorhax Roewer, 1934.
1. Eremorhax pulcher new species—6♂ s, 21 ♀ s
2. Eremorhax titania Muma, 1951—1♂ , 1 ♀

Genus Eremobates Banks, 1900.
3. Eremobates zinni Muma, 1951—11 ♀ s
4. Eremobates similis Muma, 1951—1♂
5. Eremobates ctenidiculus Muma, 1951—3 ♀ s
6. Eremobates scopulatus Muma, 1951—3♂ s, 11 ♀ s
7. Eremobates mormonus (Roewer), 1934—17♂ s, 7 ♀ s
8. Eremobates vicinus new species—1♂

9. Horribates sp.—1 juvenile and 1 young ♀

Genus Therobates Muma, 1951.
10. Therobates branchi Muma, 1951—1♂
11. Therobates cameronensis Muma, 1951—15♂ s, 53 ♀ s
12. Therobates plicatus Muma, 1962—5♂ s, 11 ♀ s
13. Therobates flexicus new species—2♂ s
14. Therobates bidepressus (Muma), 1951—4♂ s, 8 ♀ s
15. Therobates nudus new species—1♂
16. Therobates attritus new species—2♀ s
17. Therobates arcus Muma, 1962—1♂

Genus Chanbria Muma, 1951.
18. Chanbria sp.—3 juveniles

Genus Hemerotrecha Banks, 1903.
19. Hemerotrecha denticulata Muma, 1951—5♂ s, 7 ♀ s
20. Hemerotrecha proxima new species—3♂ s, 6 ♀ s

1This study is part of the federal ecological study at the Nevada Test Site, sponsored jointly by the Brigham Young University Department of Zoology and Entomology and the United States Atomic Energy Commission, under AEC Research Grant AT(11-1)786.
2Florida Agricultural Experiment Stations Journal Series No. 1680
Family Ammotrechidae Roewer, 1934.

Genus Ammotrecha Roewer, 1934.
25. Ammotrechula dolabra new species—2♂
26. Ammotrechula lacuna new species—1♂, 1♀
27. Ammotrechula pilosa Muma, 1951—2♀s

Genus Branchia Muma, 1951.
28. Branchia potens Muma, 1951—9♂s, 12♀s

NEW SPECIES

The following new species were described from specimens preserved in 70 to 95 per cent ethyl alcohol. Total length measurements include the chelicerae and were gross, made without the use of magnification, under 95 per cent alcohol, over a plastic millimeter rule and adjusted to the nearest half-millimeter. Leg and palpal measurements exclude the coxae and were made in the same manner. Cheliceral and propeltidial measurements, coloration evaluations and morphological descriptions were made at 6X to 30X magnification. Measurements, comparisons, proportions and ratios were established with the same procedures as used by Muma (1951).

All primary types are deposited in the American Museum of Natural History, New York City, New York.

Eremorhax pulcher new species
Figures 1 to 3

Diagnosis: This species is most easily distinguished from Eremorhax magnus Hancock by its smaller size and purplish coloration of the terminal segments of the palpi, medial segments of legs 3 and 4, and anterior margin of the propeltidium. Males have a distinctive cheliceral profile and females have specifically different opercula.

Males: Total length 20.0 to 26.0 mm.

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<thead>
<tr>
<th></th>
<th>Length</th>
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<tbody>
<tr>
<td>Chelicerae</td>
<td>5.6-6.6</td>
<td>2.5-2.9</td>
</tr>
<tr>
<td>Propeltidium</td>
<td>2.6-3.1</td>
<td>4.2-4.4</td>
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<tr>
<td>Palpi</td>
<td>17.0-21.0</td>
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<td>First legs</td>
<td>14.0-16.0</td>
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<td>Fourth legs</td>
<td>23.0-28.0</td>
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Holotype larger measurements.

Color pale to straw yellow with purplish markings as follows: eye tubercle dark; anterior half of propeltidium, excluding the exterior lobes, faintly dusky; mesopeltidium and metapeltidium unmarked; abdominal tergites, dusky; tarsus, metatarsus, tibia and apical half of femur of palpus dusky with metatarsus somewhat darker than other segments; legs 1 and 2 dusky at the union of the femora and tibiae; legs 3 and 4 dusky on femora and all but the apical fourth of the tibiae. Malleoli pale.

Dentition of chelicerae somewhat variable but maintaining general pattern of Figures 1 and 2. Movable finger with principal tooth large, intermediate tooth tiny or missing, anterior tooth aborted to a small spur on a low ridge and mesal tooth large and visible behind principal tooth. Fixed finger essentially straight but distinctly narrowed in apical third and lightly curved downward. Fondal teeth graded in size I, III, II, IV. Fondal notch U-shaped, narrower than the base of the fixed finger and containing 1 to 3 denticules.

Mesal groove of fixed finger an indistinct hollow that extends along the lower margin of the finger to the area below the tip of the flagellar setal articulation area. Flagellum essentially composed of simple tubular bristles. Mesal setae of movable finger simple on apical half of articulation area, plumose on basal half of area.

Eye tubercle, eyes, propeltidial ratio and palpal setation as in E. magnus.

There are no ctenidia on the posterior margin of the first post-spiracular abdominal sternite.

Females: Total length 20.5 to 31.0 mm.

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<tbody>
<tr>
<td>Chelicerae</td>
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<td>2.5-3.1</td>
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<tr>
<td>Propeltidium</td>
<td>2.2-2.8</td>
<td>4.0-4.7</td>
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<tr>
<td>Palpi</td>
<td>10.5-10.0</td>
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<tr>
<td>First legs</td>
<td>9.0-11.0</td>
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<tr>
<td>Fourth legs</td>
<td>19.0-20.0</td>
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</table>

Allotype larger measurements.

Coloration similar to that of male.
Dentition and other structure as in *E. magnus*. Specific differences are found in the opercula of the genital segment of the abdomen, Figure 3.

**Type Locality:** Male holotype from 11 miles N of Mercury, Nevada, 2/10 mile E of Mercury Highway, S of well 5B road on June 10, 1961 (5AL10C). Male paratype from 35 miles N of Mercury, Nevada, 3/10 mile W of Groom Lake road on June 15, 1962 (10SH111C). Male paratype from same locality as holotype on June 6, 1961 (5AL4C). Female allotype from 28 miles N of Mercury, Nevada, 3 miles W of Mercury Highway on July 12, 1961 (1BF15C). Female paratype from same locality as female allotype on July 17, 1961 (1FA9C). Female paratype from near Mercury, Nevada (specific location unknown), on July 24, 1961. Holotype and allotype are deposited in the American Museum of Natural History, New York City, New York. Paratypes are in the author's collection and the collection at Brigham Young University, Provo, Utah.

*Eremobates vicinus* new species

Figs. 4 to 6

**Diagnosis:** This species is closely related to *Eremobates scopulatiss* Muma, *E. purpussi* Roeower and *E. tuberculatus* (Kraepelin). It differs from *scopulatus* in cheliceral profile, number of palpal papillae and number of abdominal ctenidia. The cheliceral profile and number of palpal papillae distinguish it from *purpussi*. The coloration, cheliceral profile and palpal papillae are the same as on *tuberculatus* but it has 8 (and one spurious) instead of 6 abdominal ctenidia.

**Male Holotype:** Total length 25.0 mm.

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<tbody>
<tr>
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<td>2.1 mm.</td>
</tr>
<tr>
<td>Propeltidium</td>
<td>2.2</td>
<td>3.9</td>
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<tr>
<td>Palpi</td>
<td>21.0</td>
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<tr>
<td>First legs</td>
<td>17.0</td>
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<td>Fourth legs</td>
<td>28.0</td>
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Coloration and markings identical with those of *E. tuberculatus* (Kraepelin).

Cheliceral structure nearly identical with *tuberculatus*. The palpal scopula has about 60 distinct papillae and there are 9 linear ctenidia on the first post-spiracular abdominal sternite, one ctenidium appears to be spurious. The cheliceral profile is shown in Figure 4, the palpal scopula in Figure 5 and the abdominal ctenidia in Figure 6.

Propeltidium wider than long by a ratio of 1 to 1.8. Metatarsus of palpus 3.9 times as long as tarsus.

**Type Locality:** Male holotype from 11 miles N of Mercury, Nevada, 2/10 mile E of Mercury Highway, S of Well 5B road on May 19, 1961 (5AA5C), in the American Museum of Natural History, New York City, New York.

*Therobates flexacus* new species

Figs. 7 to 9

**Diagnosis:** This species is readily distinguished from other species of the *arcus* group by the presence of a scopula of fine papillae on the tibia as well as the metatarsus. Other diagnostic characters include the slender, tubular, S-shaped fixed finger of the chelicerae, the narrow slot-like mesoventral groove of the fixed finger and the single pair of linear abdominal ctenidia.

**Males:** Total length 20.0 to 21.0 mm.

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<td>Chelicerae</td>
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<td>First legs</td>
<td>14.0-15.0</td>
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<tr>
<td>Fourth legs</td>
<td>25.0-25.0</td>
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Holotype smaller specimen.

Coloration and markings almost identical to those of *T. arcus* Muma except the dusky area on the leg femora covers the apical two-thirds of the segment.

Dentition of the same general type as that of *arcus* except the fixed finger is slender, needle-like and strongly S-shaped; the movable finger is provided with a strong principal tooth, two tiny intermediate teeth and an aborted anterior tooth but no mesal tooth; the fomedal notch is shallow, bears no denticules and is three times the width of the fixed finger at the base (Figure 7).

The mesoventral groove of the fixed finger is a narrow slot that extends nearly to the base of the finger where it expands into a cup-like hollow. Flagellum complex with basal, dorsal tubular bristles arched, apical, dorsal tubular bristles slightly S-shaped and pmnose bristles strongly S-shaped covering basal half of mesoventral groove.

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1This is a typical code number for all specimens collected as part of the AEI-BYU faunistic studies at the Nevada Test Site. A complete list of codification letters and numbers is given in the publication "Nevada Test Site Study Areas and Specimen Depositories" (Allred et al., 1964). Use of the code enables the location of a collection within a few feet of the place of capture.
Structure similar to that of *T. arcus*, except that the propeltidium is wider than long by a ratio of 1 to 1.4, the palpal scopula is composed of about 50 papillae on the tibia and 15 on the metatarsus (Figure 9), and there are only two slender ctenidia on the first post-spiracular abdominal sternite (Figure 8).

**Type Locality:** Male holotype from 10 miles N of Mercury, Nevada, 1 mile E of Mercury Highway on March 2, 1961 (5EL4C). Male paratype from Cane Springs 12 miles NNW of Mercury, Nevada on February 26, 1962 (CBA8C). Both types in the American Museum of Natural History, New York City, New York.

*Therobates nudus* new species

**Figure 10**

**Diagnosis:** The cheliceral profile and fondal tooth formula indicate a close relationship with *Therobates arcus*. It differs in its smaller size and in the lack of a palpal scopula and abdominal ctenidia.

**Male Holotype:** Total length 13.5 mm.

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<tr>
<td>Propeltidium</td>
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<td>2.7</td>
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<td>Palpi</td>
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<tr>
<td>First legs</td>
<td>10.0</td>
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<td>Fourth legs</td>
<td>17.0</td>
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</table>

Coloration, dentition and structure of this species are very similar to that of *T. arcus*. The dentition of this species differs in a more massive fixed finger, a fondal notch that is deeper than it is wide but narrower than the base of the fixed finger and a minute intermediate tooth in addition to one at the base of the principal tooth (Figure 10). Differences in structure include the lack of a palpal scopula and the lack of abdominal ctenidia.

**Type Locality:** Male holotype from 28 miles N of Mercury, Nevada, 3 miles W of Mercury Highway on April 20, 1961 (1BH20C), in the American Museum of Natural History, New York City, New York.

*Therobates attractus* new species

**Figures 11 and 12**

**Diagnosis:** Only the female of this species is known. The posterior lobes of the distinctive opercula are hooked laterally and truncate. This exact condition is not found in any other solpu-

**Females:** Total length 19.5 to 20.0 mm.

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<thead>
<tr>
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<tr>
<td>Propeltidium</td>
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<td>3.1-3.2</td>
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<tr>
<td>Palpi</td>
<td>12.0-12.0</td>
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<tr>
<td>First legs</td>
<td>9.0-9.0</td>
<td></td>
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<tr>
<td>Fourth legs</td>
<td>16.0-17.0</td>
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</tbody>
</table>

Holotype larger measurements.

Coloration somewhat faded by preservation but color and markings very similar, if not identical, to that of *T. arcus*.

Dentition worn as shown in Figure 11, similar to that of *T. arcus* but differing by having only two intermediate teeth on the movable finger and only one intermediate tooth between the medial and anterior tooth on the fixed finger.

There are no papillae on the metatarsus of the palpus and no ctenidia on the first post-spiracular abdominal sternite.

Opercula of genital segment as shown in Figure 12.

**Type Locality:** Female holotype from 28 miles N of Mercury, Nevada, 3 miles W of Mercury Highway on April 27, 1961 (1BB1C), and one female paratype from same locality as holotype on May 15, 1961 (1BH125C), both in the American Museum of Natural History, New York City, New York.

*Hemerotrecha proxima* new species

**Figures 13 to 17**

**Diagnosis:** Males are distinguished from *H. denticulata* Muma by their much smaller size, line-like palpal scopula of 5 to 15 papillae, and the presence of only two elongate ctenidia on the first post-spiracular abdominal sternite. Females have opercula that are distinctive in having knife-like, straight-edged posterior lobes.

**Males:** Total length 9.5 to 12.0 mm.

<table>
<thead>
<tr>
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<tr>
<td>Chelicerae</td>
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<td>0.7-0.9 mm.</td>
</tr>
<tr>
<td>Propeltidium</td>
<td>0.9-1.2</td>
<td>1.2-1.6</td>
</tr>
<tr>
<td>Palpi</td>
<td>11.5-14.5</td>
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<tr>
<td>First legs</td>
<td>8.5-11.0</td>
<td></td>
</tr>
<tr>
<td>Fourth legs</td>
<td>13.5-18.5</td>
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</table>
Holotype larger measurements.

Color and markings almost identical with those of *H. denticulata*, the 4 dusky abdominal stripes are faint on the 3 males seen.

Dentition as shown in Figure 13, very similar to that of *H. denticulata* except the fingers are more slender and elongate and the anterior and intermediate teeth of the movable finger are greatly reduced.

Flagellum complex and other cheliceral setae identical with those of *H. denticulata*. Propeltidial length to width ratio 1 to 1.3. Metatarsal scopula of palpus narrow and line-like, composed of only 5 to 15 small papillae, Figure 16. First post-spiracular abdominal sternite with 2 elongate ctenidia, Figure 14.

**Females:** Total length 13.5 to 17.0 mm.

<table>
<thead>
<tr>
<th>Length</th>
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<tbody>
<tr>
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<td>3.4-4.1 mm</td>
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<tr>
<td>Propeltidium</td>
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<td>Palpi</td>
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<td>First legs</td>
<td>10.0-11.0</td>
</tr>
<tr>
<td>Fourth legs</td>
<td>18.5-19.0</td>
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</tbody>
</table>

Allotype smaller measurements.

Color and markings same as on male except the posterior abdominal tergites are pale.

Dentition of chelicerae as shown in Figure 17, nearly identical with that of *H. denticulata*. Supernumerary teeth and loss of teeth are common.

Structure similar to that of male except there is no palpal scopula and no or only 2 trace ctenidia on the first post-spiracular abdominal sternite.

Opectura of genital segment of abdomen as shown in Figure 15.

**Type Locality:** Male holotype from 28 miles N of Mercury, Nevada, 3 miles W of Mercury Highway on October 10, 1961 (1B1130C). Male paratype from 30 miles N of Mercury, Nevada, 1 mile W of Rainier Mesa road on October 10, 1960 (4AL14C). Male paratype same locality as holotype on October 10, 1961 (1B1111C). Female allotype from 19 miles N of Mercury, Nevada, 3.4 miles W of Mercury Highway on November 20, 1961 (6FJC). Female paratype from same locality as holotype on October 26, 1961 (1B1115C). Holotype, allotype and male paratype in American Museum of Natural History, New York City, New York. Male and female paratype in collection at Brigham Young University, Provo, Utah.

**Ammotrechula dolabra** new species

Figures 18 and 19

**Diagnosis:** This species is distinguished by the robust untoothed fixed finger of the chelicerae and the lack of serially arranged spines on the tibia and metatarsus of the palpus.

**Males:** Total length 10.5 to 11.0 mm. Chelicerae 0.7 to 0.8 mm. wide and 2.3 to 2.7 mm. long. Propeltidium 1.9 to 2.0 mm. wide and 1.7 to 1.9 mm. long. Holotype larger measurement.

Color light yellow with purplish-brown markings as follows: chelicerae with one dorsal and one etal diffuse dusky stripe; propeltidum dark except for a narrow median stripe and the bases of the spines; mesopeltidium, metapeltidium and abdominal tergites pale on anterior third and dusky for the remainder of their length, palpi and legs dusky except on coxae, trochanters, and distal portion of tarsi; venter pale; eye tubercle dark; malleoli pale.

Dentition as shown in Figures 18 and 19. Fixed finger and fond with only an indication of the normal teeth. Dental group of movable finger occupies less than one-third of the length of the finger, principal tooth slightly larger than anterior tooth, single intermediate tooth closer to anterior tooth. Flagellum as on *A. nutlataki* Muma except the lower curled margin is fringed, attachment disc over area normally occupied by the first fondal tooth of the mesal row.

Palpi with usual clothing of long hairs, short hairs and cylinder bristles but no distinguishable series of spines on femora, tibiae or metatarsi.

Chelicerae slightly more than 3 times as long as wide. Propeltidium wider than long by a ratio of 1 to 1.1. Eyes separated by less than a diameter.

**Type Locality:** Male holotype from Cane Springs, 12 miles NNW of Mercury, Nevada on June 8, 1961 (CBA10C) and male paratype from 9.3 miles W of Mercury, Nevada on May 18, 1962 (JAA1C) in the American Museum of Natural History, New York City, New York.

**Ammotrechula lacuna** new species

Figures 20 to 23

**Diagnosis:** This species resembles *A. wasbaueri* Muma in the male cheliceral profile but has the metatarsus and tarsus of the female palpus pale and lacks serially arranged spines on the palpal tibia and metatarsus.
Male Holotype: Total length 9.0 mm. Chelicerae 0.7 mm. wide and 2.3 mm. long. Propeltidium 0.9 mm. wide and 0.7 mm. long.

Color pale yellow with dusky purplish-brown markings as follows: chelicerae with two distinct dorsal and one diffuse lateral stripes that are united behind flagellum and fond; propeltidium dark except for a narrow median stripe that is surrounded by a diffuse ovate area and the bases of the spines; mesopeltidium, metapeltidium, and abdominal tergites faintly dusky on lateral margins; palpi missing; legs dusky on lateral surfaces on the femora, tibiae and metatarsi; eye tubercle dark; male pale.

Dentition of chelicerae very similar to that of A. wasbaueri Muma except the fixed finger is slightly sinuate as shown in Figures 20 and 21. Flagellum spatulate with mesal curling of lateral margins covering much of mesal surface, lower margin fringed and anterior half with abrupt slope to tip.

Palpi missing, clothing unknown, but males and females usually have similar clothing so male palpi probably lack serially arranged spines.

Chelicerae 3.5 times longer than wide. Propeltidium wider than long by a ratio of 1 to 1.3.

Female Allotype: Total length 10.0 mm. Chelicerae 0.7 mm. wide and 2.5 mm. long. Propeltidium 1.8 mm. wide and 1.6 mm. long.

Color and markings same as on male except more extensive on legs extending onto dorsal surfaces of marked segments, palpi dusky on femora, tibiae and basal margin of metatarsi and abdominal markings are more distinct.

Dentition typical of Ammotrechinae as shown in Figure 22, with dorsal carina attaining a peak over first fonadal tooth of ectal row.

Palpi with the usual clothing of long and short hairs, but with few cylinder bristles and no series of paired tubular spines on the femora, tibiae or metatarsi.

Chelicerae 3.5 times longer than wide. Propeltidium wider than long by a ratio of 1 to 1.1. Genital plate wider than long by a ratio of 1 to 1.3, Figure 23.

Type Locality: Male holotype from 34.5 miles N of Mercury, Nevada, 1/2 mile E of Groom Lake road on June 26, 1961 (10DL1C), and female allotype from Cane Springs, 12 miles NNW of Mercury, Nevada on June 20, 1961 (CBA2C), both in American Museum of Natural History, New York City, New York.

New Synonymies

The systematic year-round trapping of solpugids at Mercury has resulted in the collection of numerous specimens of species originally described from limited material. These additional specimens have indicated errors in the association of sexes involving 3 previously described species. The valid names and synonyms are listed below.


Biological Notes

All of the solpugids collected during the study were taken in can traps in a 900 square mile area as described by Allred et al. (1963). It may be assumed that such a collecting method and procedure should result in an adequate sampling of a population of cursorial predatory arachnids such as solpugids. On the basis of such an assumption the number of sexually mature adults of 12 common species were arranged in Table 1 according to sex and month of collection.

From the results obtained it is possible to deduce several general facts concerning the biology of common solpugids in the Mercury area.

First, the unimodal peak abundance of adults in a two- to four-month period of time for most species indicates an annual life cycle. If development from egg to adult required less than one year or two or more years, there would be an overlapping of generations which would result in more than one peak abundance of adults during a year or the collection of adults during most months. Second, the adults of most species have a limited longevity. This is indicated by the fact that they mature, mate, lay eggs, and disappear in a 60- to 240-day period of time. Third, for most species, copulation takes place as soon as the females mature. This is indicated by the earlier appearance, peak abund-

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Specimens Collected</th>
</tr>
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<tbody>
<tr>
<td>Hemerotrecha denticulata Muma</td>
<td>1</td>
</tr>
<tr>
<td>Eremobates mormonar (Roewer)</td>
<td>1</td>
</tr>
<tr>
<td>Therobates bidpressus (Muma)</td>
<td>4</td>
</tr>
<tr>
<td>Hemerotrecha californica (Banks)</td>
<td>1</td>
</tr>
<tr>
<td>Eremobates scopulatus Muma</td>
<td>3</td>
</tr>
<tr>
<td>Therobates cameronensis Muma</td>
<td>2</td>
</tr>
<tr>
<td>Therobates plicatus Muma</td>
<td>1</td>
</tr>
<tr>
<td>Eremorhax pulcher Muma</td>
<td>4</td>
</tr>
<tr>
<td>Branchia potens Muma</td>
<td>5</td>
</tr>
<tr>
<td>Hemerotrecha serrata Muma</td>
<td>1</td>
</tr>
<tr>
<td>Eremobates zinni Muma</td>
<td></td>
</tr>
<tr>
<td>Hemerotrecha proxima Muma</td>
<td></td>
</tr>
</tbody>
</table>
ance and disappearance of males. Fourth, most species pass the winter as sub-adults and complete development in the spring or early summer. Adults are collected mainly in the spring and summer.

Because the calculated ratio of males per female varied widely within the 12 species, no generality can be expressed. Many factors inherent in the biology of arthropods result in differences in the ratio of the sexes. The best known of these are specifically different fertilization requirements, the production of males from unfertilized eggs, the production of females from unfertilized eggs, the overproduction of males in widely dispersed species, and the underproduction of males in colonial species. Further, it is realized that a trap and removal method of population sampling may result in the disproportionate or even exclusive collection of one sex owing to differences in the biological requirements of the two sexes. Solpugids are, however, predominately nocturnal, cursorial predators, a condition in which a sexual dispersion and equal prey searching activity of the sexes may be inferred. Males of trap building, nest building or ambush arthropods are generally more liable to trap collection than females owing to mate-searching activity. In solpugids, however, the earlier maturity of males would seem to contraindicate a specific mating period. All of these facts are considered in the discussions of the biological implications of the sex ratios of common Mercury solpugids.

Specific biological information may also be gleaned from Table 1. This, along with ecological data kindly furnished by Dr. Allred and Dr. Beck, is presented and discussed in the following paragraphs dealing with the 12 most common species in the Mercury area.

Solpugids were trapped in all 6 of the specific plant communities and the mixed communities recognized by Allred et al. (1963). They were, however, common only in the Desert Scrub Type, Larrea-Fraseria, Gragia-Lycium, Atriplex-Kochia, Coleogyne, and Salsola, and Mixed communities.

Among the 12 species of solpugids rated as common in this paper by far the greater number of individuals and all but one species were taken in the Gragia-Lycium community. Larrea-Fraseria and Salsola communities were second and third respectively in number of individuals and species. Within these communities a preponderant number of solpugids were trapped in association with the specific plant, Salsola kali. This plant, commonly known as Russian thistle, is a well-known invader of waste areas and at the Nevada Test Site is common at and around ground zero of old bomb sites. Such an association of predators with a specific plant type may be either direct or indirect. Solpugids may congregate in wastelands to prey upon the arthropods therein or they may congregate around Russian thistle for the thistle-associated animals.

*Eremorhax pulcher* Muma: This species matures in June and July with the peak abundance of adults occurring in June. It apparently passes the winter in a half-grown condition and completes development in the spring. The short period of adult collection suggests an adult longevity of less than 60 days. A sex ratio of 1 male to 3 females indicates a single fertilization requirement for the species with males capable of copulation with several females or the production of males from unfertilized eggs.

Although commonly taken in Larrea-Fraseria, Salsola and Gragia-Lycium communities, this species is most frequently associated with Russian thistle.

*Eremobates zimi* Muma: Although the collection of 11 females in July and August indicates late summer maturity of a parthenogenetic species, males are known, and it is probable that the females require only one fertilization or females are produced from unfertilized eggs. The species apparently overwinters as partly-grown nymphs. A short adult longevity is suggested by the two-month collection period.

This species is associated almost exclusively with Russian thistle in the Gragia-Lycium community.

*Eremobates scopulatus* Muma: The 14 collected adults of this species were taken in May, June, and July with the only males and largest number of females being trapped in May. The adults probably live less than three months with males shorter lived than females. Late spring or early summer maturity indicates that the species overwinters in a late nymphal stage. The low ratio of 1 male to 3 females suggests a single fertilization requirement or the production of males from unfertilized eggs.

This species is commonly associated with Russian thistle in Gragia-Lycium communities.

*Eremobates mounouns* (Roewer): This species matures in March, April, May, and June with the peak abundance of adults occurring in April and May. The two-month adult abun-
dance period suggests an adult longevity of 60 days or less. The species apparently passes the winter in a late or penultimate instar. A preponderance of more than 2 males to every female may indicate a multiple copulation requirement for egg fertilization although it is possible that the females are more sedentary and less liable to being trapped.

Sixty-five percent of the collected specimens of this species were taken in the Atriplex-Kochia community.

Therobates cecuroniensis Muma: Although adults of this species were taken in May, June, July, and August, 50 of the 68 specimens were trapped in July and August, which suggests late summer maturity. For this reason the majority of individuals probably pass the winter in a half-grown condition. Adults probably do not live longer than 90 days. The ratio of 3 females per male indicates a single copulation requirement for egg fertilization or the production of males from unfertilized eggs.

The collections of this species do not indicate an association with any specific plant community or type. Over 85 percent of the specimens were taken in the flats.

Therobates plicatus Muma: Adults of this species were taken in May, June, July, and August, but 11 of 16 specimens were collected in July. This midsummer maturity indicates that the species passes the winter in a half-grown condition. The short period of peak abundance also suggests an adult longevity of less than 30 days. A sex ratio of 2 females per male infers a limited copulation requirement or the production of males from unfertilized eggs.

Collections of this species indicate a strong association with Russian thistle in Gnygia-Lycium communities.

Therobates bidimplatus (Muma): This species matures in April and May, which makes it probable that it overwinters in a late, possibly penultimate instar. A short adult longevity is suggested by the two-month maturity period. A sex-ratio of 2 females per male probably indicates a limited copulation requirement for egg fertilization.

Although 55 percent of the collections of this species were from a Gnygia-Lycium community, there was no strong association with any specific plant type.

Hemerotrecha denticulata Muma: In the limited number of adults taken, this species exhibited no peak adult abundance. The collection of adults from October through May does, however, demonstrate that the species overwinters in the adult form, which is probably especially long-lived for solpugids. The nearly equal ratio of the sexes either indicates a multiple copulation requirement for egg fertilization or possibly is a biological buffer against winter mortality of the early maturing males.

Ninety percent of the specimens of this species were taken in association with Russian thistle in Salsola or Gnygia-Lycium communities.

Hemerotrecha proxima Muma: All 9 of the collected specimens of this species were taken in October and November with the peak abundance occurring in October. It is possible that the species passes the winter as an adult, but the lack of spring-collected adults indicates a short lived adult and an overwintering egg or early instar. A 1 to 3 ratio of males to females indicates a single fertilization requirement.

Six of 9 specimens, 66 percent, of this species were taken in Gnygia-Lycium plant communities with no specific plant association.

Hemerotrecha californica (Banks): Adults of this, the prevalent species, were taken from April through August but nearly 70 percent of the specimens were collected during June. Early summer maturity indicates that the species passes the winter in the mid to late instars. The short period of peak adult abundance indicates that adults may not live longer than 30 days. A sex ratio of nearly 2 males per female may indicate a multiple copulation requirement for egg fertilization, but the species is known to be diurnal and arboreal, which may have resulted in stratal escape of females from the can-traps used to sample cursorial populations.

Collections of this species indicate no specific plant type or community association.

Hemerotrecha serrata Muma: This species matures in June, July, August, and September with the peak adult abundance occurring in July and August. The late summer maturity indicates that the species passes the winter in the early instars. The two-month period of adult abundance infers a longevity of up to 60 days. A sex ratio of more than one male to every female suggests a multiple copulation requirement.

Collections of this species were divided among several communities and plant types.
Branchia potens Muma: Although adults of this species were collected in June, July, and August, 20 of 21 specimens were taken in June and July. This short period of adult abundance indicates a longevity of less than 60 days. Mid-summer maturity probably means that the species passes the winter in a half-grown condition. The nearly equal ratio of males and females suggests a multiple copulation requirement for egg fertilization.

This species is not associated with any specific plant community or type.

Summary

Study of nearly 1,000 specimens of solpugids collected in 1960, 1961, and 1962 from Mercury, Nevada, resulted in the identification and placement of 395 adults in 28 species. Eight new species are described and figured. Two new synonymies, resulting from proper association of males and females, are cited. Study of the seasonal distribution and relative abundance of the sexes of 12 common species has prompted general and specific deductions concerning the essentially unknown biology of North American solpugids. Systematic collection data furnished ecological information concerning the 12 common species.

Literature Cited


Figure 9. Therobates flexacus, new species, mesoventral view male palpus.

Figure 10. Therobates nudus, new species, ectal view right male chelicera.


Figure 24. Map of Southern Nevada