

NEW SPECIES AND RECORDS OF SOLPUGIDA (ARACHNIDA)

FROM THE UNITED STATES

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Abstract

New records, new species and new species groups of solpugids collected within the political boundaries of the United States are recorded herein. Altogether 25 new species and 3 new species groups are diagnosed and described. Keys (12) to subfamilies, genera, species groups and species of Eremobatidae and Ammotrechidae are updated to include the new species.

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Douglas Print Shop

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Since publication of The Arachnid Order Solpugida in the United States, Muma (1951), "Supplement 1", Muma (1962), and "A Synoptic Review of North American, Central American and West Indian Solpugida", Muma (1970), many new species and records of solpugids have been identified from the United States. This material was made available for study by the American Museum of Natural History, Brigham Young University, The California Academy of Sciences, The University of California at Davis, The Museum of Comparative Zoology at Harvard University, The Santa Barbara Museum of Natural History, The San Diego State Museum, and numerous arachnologists. I would like to thank the curators of the respective collections and my many helpful peers for this opportunity to record and describe this material.

Altogether 25 new species, several representing new species-groups, are described here. Numerous new records significantly extend our knowledge of the zoogeography of solpugids. Several new species and records were obtained during biological and ecological investigations and greatly extend our knowledge within these disciplines. Types of new species are deposited in the following institutions: American Museum of Natural History, New York, N.Y. Symbol=AMNH. Florida State Collection of Arthropods, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, Florida. Symbol=FSCA. California Academy of Sciences, San Francisco, California. Symbol=CAS. Collection of Brigham Young University, Provo, Utah. Symbol=BYU.

To facilitate comparisons and cross-references, systematic arrangement, diagnostic and descriptive form, and presentation style are the same as those utilized by Muma (1951, 1962, and 1970) and Brookhart and Muma (1981). The new diagnostic formula devised to express the mean length of solpugid appendages by Brookhart and Muma (1981) is utilized here. The A (appendage length)/CP (combined cheliceral and propeltidial length) is obtained by dividing the sum of the mean cheliceral and propeltidial (minimum and maximum) length into the sum of the mean appendage (minimum and maximum) of palpi, 1st legs and 4th legs lengths. A larger figure indicates longer legs. For example, the A/CP of 6.86 for male *Eremobates clarus* new species indicates shorter legs than *Eremobates actenidia* new species, which has an A/CP of 7.93 for males. The CP is the same as that

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delineated by Brookhart and Muma (1981) for a more stable comparative body length figure. The formulae CL/CW and PW/PL are simply a way of expressing the ratios of cheliceral length to width and propeltidial width to length respectively. These latter ratios were included in the text in Muma (1951, 1962, 1963, and 1970). The ECCS, (described by Muma (1985), have not as yet been validated, but are illustrated here for types, for future reference.

FAMILY EREMOBATIDAE ROEWER, 1934

Muma (1951) recognized Roewer's (1934) family, but on the basis of number of leg 1 tarsal claws, modified Roewer's subfamilies. Further, Muma (1951, 1962, 1963, and 1970) was unable to utilize Roewer's (1934) spine-like setal patterns on legs 2, 3, and 4 to identify genera, and established genera on the bases of form of the male cheliceral fixed finger, form of the modified setae in the male flagellum complex, and presence or absence and form of the male, cheliceral, fixed finger, mesal groove. Species groups within genera were recognized by minor differences in the above male characters, gross differences in the opercula of the female genital sternite, and proportionate sizes of the cheliceral fondal teeth of both sexes. Muma (1951) was also unable to utilize all of Roewer's (1934) specific diagnostic characters since some of them proved to be of generic and species group importance. However, number and form of abdominal ctenidia on the first post-stigmatic sternite, absence, presence, number, and position of papillae in the primarily, metatarsal scopula of the palpus, and slight differences in cheliceral dentition and opercula were used as specific criteria. Although he did not specifically state so, Muma also used size and color pattern differences as supporting characters for diagnosing species.

In his first review and supplement, Muma (1951 and 1962) worked primarily with solpugids from continental United States. However, Muma (1970, 1971, and 1986-87) and Muma and Nezaric (1971) expanded his studies into Mexico, Central America, and the West Indies. As a result, the 3 genera, 7 species groups and 34 species of Eremobatinae recognized in 1951 have been increased to 4 genera, 12 species groups and 78 species; the 3 genera, 9 species groups, and 29 species of Therobatinae recognized in 1951 have been increased to 3 genera, 13 species groups, and 59 species. This represents more than a 100 percent increase, not only in number of forms, but also in our knowledge of the family. For this reason subfamilies, genera, species groups, and species have been carefully reevaluated for errors of omission and commission in the selection of diagnostic characters and judgment.

Errors of both kinds have been discovered. In the following paragraphs dealing with subfamilies, genera, species groups, and species of eremobatids, an attempt is made to correct all

previous errors as well as to revise concepts and describe new forms.

The following keys to the subfamilies, genera, and species groups represent the first step in this process.

Key to Subfamilies and Genera of Eremobatidae

(Males Only)

1. Leg 1 with one claw; chelicerae about twice as long as wide; small to large species.....*Eremobatinae*..2
- 1'. Leg 1 with 2 claws; chelicerae 2.5 to 3 times longer than wide; tiny to moderate-sized species.....*Therobatinae*..6
2. Fixed cheliceral finger long, style-like or needle-like; mesoventral groove a crease, slot or cup-like structure; moderate-sized to large species.....3
- 2'. Fixed cheliceral finger short, sculptured and flanged; mesoventral groove a trough-like slot; moderate-sized species.....*Eremothera* Muma
3. Mesoventral groove an indistinct hollow or crease that does not extend to base of finger; movable finger dentition greatly reduced.....*Arenotherus* Brookhart and Muma
- 3'. Mesoventral groove a distinct crease, cup, or slot that may or may not extend to base of finger; movable finger dentition normal or increased.....4
4. Mesoventral groove short not extending to base of finger; apical striate or plumose setae of male flagellum complex not obviously modified or flattened.....5
- 4'. Mesoventral groove long, extending to base of fixed finger; apical plumose seta of male flagellum complex obviously enlarged and flattened covering part of mesoventral groove; some palpal setae enlarged and spine-like...*Eremobates* Banks
5. Palpal metatarsus, tibia and femur provided with enlarged spine-like setae, but they are not in ventral rows, especially robust, nor obviously movable....*Eremopus* Roewer
- 5'. Palpal metatarsus, tibia and femur provided with 2 ventral rows of enlarged, robust, spine-like, obviously movable setae.....*Horribates* Muma
6. Fixed cheliceral finger strongly recurved, sigmoid or S-shaped; mesoventral groove absent; both dorsal and ventral flagellum complex setae plumose; moderate-sized species.....
.....*Chanbria* Muma
- 6'. Fixed cheliceral finger style-like or needle-like and straight, curved or undulate but not S-shaped; mesoventral groove present or absent; dorsal flagellum complex setae striate, ventral setae striate or plumose.....7
7. Fixed cheliceral finger with a mesoventral groove that varies from one or more indistinct creases to an elongate hollow or cup; small to moderate-sized species.....
.....*Eremochelis* Roewer
- 7'. Fixed cheliceral finger without a mesoventral groove; tiny and small species.....*Hemerotrecha* Banks

Subfamily Eremobatinae Roewer

Males and females of this subfamily have one claw on the tarsus of leg 1. This claw is difficult to see on some species of *Eremopus* Roewer and *Horribates* Muma but can be observed from an end or tip view at high magnifications. With few exceptions, such as the small *Arenotherus mumai* (Brookhart), these species are moderate to large in size. Most have chelicerae that are nearly or slightly more than twice as long as wide. Again with a few exceptions, most species are predominately pale to dusty yellow in color with specifically variable purple to purplish brown markings. Except for the description of *Horribates* Muma (1962), the addition of new species groups in Muma (1970), and the present paper, this subfamily is essentially the same as it was in Muma (1951).

Arenotherus Brookhart and Muma

Arenotherus Brookhart and Muma, 1987, pp. 1-18.

These moderate to large Eremobatinae have been delineated and described as 10 species which are distributed from south Texas to California. New species were described in the above paper and are not included here.

Eremopus, Roewer, 1934

Eremopus Roewer, 1934, p. 501. (in part)

Eremocosta Roewer, 1934, p. 569. (in part)

Predominately large Eremobatinae. Fixed cheliceral finger of males with indistinct to distinct short mesal or mesoventral grooves that do not extend to the base of finger. Dorsal setae of flagellum complex striate but often weakly so, ventral setae plumose but often weakly so; apical setae of complex not obviously modified. Females have opercula alate and widely separated posteriorly.

Type: *Eremopus montezuma* Roewer, by designation, 1934.

Key to Species groups of *Eremopus* Roewer

1. Male cheliceral groove a short distinct ventral cup or slot; males with or without process distad to anterior tooth on movable cheliceral finger; female opercula alate with concave posterior notches, but without anterior pits
.....*striatus* group
1. Male cheliceral groove a short indistinct mesal crease; males without process distad of anterior tooth on movable finger; female opercula angulate with anterior pits.....
.....*montezuma* group

montezuma group

A new species of this recently established group (Muma, 1970)

is described in Muma (1986-1987). Diagnostic characters of the group include shallow, indistinct, longitudinal mesal groove of male fixed finger, *Eremobates*-like cheliceral dentition, *Eremopus*-like leg length, distinguishable abdominal ctenidia and angulate female opercula with anterior pits.

striatus group

A Mexican species described in Muma (1986-1987) does not alter the diagnostic characters cited by Muma (1951 and 1970) for this group. A new record extends the distribution of one known species.

Key to species of *striatus* group

(Males)

1. Movable cheliceral finger with a process distal of anterior teeth, a fixed finger that is greatly enlarged basally, and a mesoventral groove distinctly enlarged basally.....2
- 1.' Movable cheliceral finger without a process distal of anterior teeth, a fixed finger that is gradually enlarged basally, and an elliptical mesoventral, ventral, or ectoventral groove not distinctly enlarged basally.....4
2. Distal process of movable finger long, low, flat and tooth-like; palpi dusky at femoral tibial union, legs pale-----
.....*E. striatus* (Putnam)
- 2.' Distal process of movable finger, short, high, and not tooth-like; palpi and legs both pale or with dusky segmental unions.....3
3. Process quadrate and blade-like; legs and palpi pale.....
.....*E. gigas* Roewer
- 3.' Process rounded and serrate; palpi dusky on tarsi and union with metatarsi, and femoral tibial union, legs 3 and 4 dusky at femoral tibial union.....*E. gigasellus* (Muma)
4. Distinct groove of fixed cheliceral finger basal and ventral in position; all minor teeth on anterior margin of principal tooth of movable cheliceral finger.....
.....*E. formidabilis* (Simon)
- 4.' Distinct groove of fixed cheliceral finger distal in position; minor teeth of movable cheliceral finger not on anterior margin of principal tooth.....5
5. Anterior tooth of movable cheliceral finger aborted to at most a tiny tooth-like spur; palpi and legs pale or indistinctly dusky.....*E. bajaensis* (Muma)
- 5.' Anterior tooth of movable cheliceral finger normal; palpi and legs dusky at union of femora and tibia at least ventrally on palpi and leg 4.....6
6. Groove of fixed cheliceral finger ectoventral in position; duskiess on palpi and legs restricted to ventral surfaces of femoral tibial segments.....*E. titania* (Muma)

- 6.' Groove mesoventral in position; duskiness on palpi and legs restricted to femoral tibial unions..E. callexicensis (Muma)

Eremopus titania (Muma)

Eremohax titania Muma, (1951), p. 48; Muma, 1970, p. 9.

A female collected by B. J. Kaston at Upper Tecate, California on April 21, 1968 is presently the southernmost record of this species in the United States. It seems to be relatively common in southern Nevada, and southern California.

Genus *Eremobates* Banks, 1900.

Datames Simon, 1879, p. 113. (preoccupied)

Eremobates Banks, 1900, p. 426; Muma, 1951, p. 51; Muma, 1970, p.

10. (new name for *Datames* Simon)

Eremoperna Roewer, 1934, p. 557. (in part)

Eremognathus Roewer, 1934, p. 516. (in part)

Eremocosta Roewer, 1934, p. 571. (in part)

Mostly moderate-sized Eremobatinae. Fixed cheliceral finger of males with mesodorsal or mesoventral groove extending the length of finger. Dorsal setae of flagellum complex striate, ventral setae plumose; apical striate seta not obviously modified but apical plumose seta conspicuously flattened and covering part to nearly all of mesoventral groove. Most females have the opercula broadly triangular in shape but variable along mesal and posterior margins. Females of *palpisetulosus*, *aztecus*, and *vallis* groups have opercula pitted and alate laterally but variable in size and form. Fondal tooth formulae are no longer considered valid for genus or group separation; they are subject to wear, especially by females.

Key to species groups of *Eremobates* Banks

(Males)

1. Mesal groove of fixed cheliceral finger mesodorsal in position.....aztecus group
- 1.' Mesal groove of fixed cheliceral finger mesoventral in position.....2
2. Mesal groove broad both basally and apically, occupying most of finger widthvallis group
- 2.' Mesal groove narrow apically, occupying less than half of finger width.....3
3. Mesal groove not dilated basally.....angustus group
- 3.' Mesal groove distinctly dilated basally.....4
4. Fixed cheliceral finger in dorsal view with a wide notch or off-set.....scaber group
- 4.' Fixed cheliceral finger in dorsal view straight or at most slightly sinuate.....5
5. Fixed finger with an ectodorsal, ridge-like or tooth-like process near its base.....palpisetulosus group

- 5.' Fixed finger constricted near base but without an ectodorsal tooth-like process.....6
 6. Anterior tooth of movable cheliceral finger present and normal; small species.....*pallipes* group
 6.' Anterior tooth of movable cheliceral finger absent or abortive; large species.....*lapazi* group

(Females)

1. Opercula widely separated posteriorly and/or slightly to distinctly lobate at postero-ectal angles and with a pair of distinct pits about midway along ectal margins.....2
 1'. Opercula not or only moderately separated posteriorly; broadly triangular in shape and without distinct pits midway along ectal margins except for *E. mimbrenus* new species.....4
 2. Posteriomesal notch small and flat, occupying a minor portion of opercular area, pits shallow.....*vallis* group
 2'. Posteriomesal notch wide and long, occupying at least a third of opercular area, pits deep.....3
 3. Posteriomesal notch of opercula smoothly flared or arched mesally.....*palpisetulosus* group
 3'. Posteriomesal notch of opercula sinuate or weakly lobate mesally within the notch.....*azteca* group
 4. Mesal margins of opercula lobate, bilobate or sinuate at or just anterior to posteriomesal notch.....*scaber* group
 4'. Mesal margins of opercula straight or evenly curved to the posteriomesal notch.....5
 5. Mesal margins of opercula divergent both anteriorly and posteriorly.....*angustus* group
 5'. Mesal margins of opercula parallel anteriorly although variously notched posteriorly.....6
 6. Posterior mesal margins of opercula sinuate; posteriomesal notch narrow and slot-like.....*lapazi* group
 6'. Posterior mesal margins of opercula straight or evenly curved; posteriomesal notch variable in form...*pallipes* group

scaber group

Several new records of previously described species extend species ranges. Six new species are described below.

Key to species of *scaber* group

(Males)

1. Fondal notch deeper than wide or with depth and width equal; species generally with indistinct to distinct dusky markings (exception, pale to dark yellow *flavus*).....2
 1.' Fondal notch wider than deep; species generally very indistinctly dusky or pale (exceptions, dusky marked *mimbrenus* and *similis*).....8

2. Species with fondal notch distinctly deeper than wide and with no or only 2 ctenidia.....3
- 2.' Species with fondal notch equal in depth and width, or with depth only slightly greater than width, with 2-4 ctenidia...6
3. With no ctenidia and dusky apical ends of palpal metatarsi and all of tarsi.....*E. actenidia* n.sp.
- 3.' With 2 ctenidia and palpi marked differently than those cited above.....4
4. Palpi with no scopula and pale and unmarked; ctenidia short, flattened and widely spaced.....*E. ascopulatus* Muma
- 4.' Palpi with scopula and pale or dusky; ctenidia short and flat or short and sword-shaped.....5
5. Palpi pale and unmarked with a scopula of 80+ papillae; ctenidia sword-shaped.....*E. gladiolus* Muma
- 5.' Palpi dusky on all terminal segments and with a scopula of 40-60 papillae; ctenidia flat and straight.....
.....*E. septentrionis* Muma
6. Palpi with no scopula and dark tarsi and apical ends of metatarsi; 2-4 short slender to short flat ctenidia.*E. zinni* Muma
- 6'. Palpi with scopula but no distinct dark or dusky markings; only 2 short slender or short flat ctenidia.....7
7. Scopula with 20-30 papillae; ctenidia short and slender.....
.....*E. ctenidiellus* Muma
- 7.' Scopula of 40-80 papillae; ctenidia short and flat.....
.....*E. flavus* n. sp.
8. Species without a scopula.....9
- 8.' Species with a scopula of 40 or more papillae;.....10
9. Dusky well marked species with dusky legs and palpi; with 4-5 short slender ctenidia.....*E. similis* Muma
- 9.' Pale species with pale to faintly dusky legs and palpi; with no ctenidia.....*E. hodai* n. sp.
10. Palpi dusky at apical end of each segment from fe-ta; with 6 short slender ctenidia.....*E. mimbrenus* n. sp.
- 10.' Palpal segments all pale or faintly dusky; with 2-4 ctenidia.....11
11. Palpi with all terminal segments pale; 2 short, flat, widely spaced ctenidia.....*E. clarus* n. sp.
- 11.' Palpi with segments pale or faintly dusky; 2-4 slender ctenidia.....12
12. Ctenidia short, less than 1/2 width of adjacent segment; scopula relatively stable varying from 40-70+ papillae.....
.....*E. scaber* (Kraepelin)
- 12.' Ctenidia long, more than 1/2 width of adjacent segment; scopula highly variable, varying from 40-160 papillae.....
.....*E. mormonus* (Roewer)

Eremobates scaber (Kraepelin)

Datames scaber Kraepelin, 1899, p. 243.

Eremobates scaber (Kraepelin), Kraepelin, 1901, p.124; Muma, 1970, p.12.

Eremostata scabra (Kraepelin), Roewer, 1934, p. 573.

Four males from Utah with a wide, shallow fondal notch, 40-70+ papillae in scopula, 2 to 4 short, more or less tapered ctenidia and indistinct palpal and leg markings are temporarily assigned to this species. If the present evaluation proves to be correct, the species may eventually integrate with *E. mormonus* (Roewer).

Eremobates gladiolus Muma

Eremobates gladiolus Muma, 1951, p. 57; Muma, 1970, p. 11.

A female of this species collected at McCall, Idaho on August 4, 1968 extends the range of this species to that state. I also have seen several females from Nevada. It is now known from Idaho, Oregon, Utah, Nevada, and Washington.

Eremobates ascopulatus Muma

Eremobates ascopulatus Muma, 1951, p. 60; Muma, 1970, p. 10.

A male from Indian Springs area, Clark Co., Nevada collected by F. E. Russell extends the range of this species from Idaho through Nevada to Utah.

Eremobates similis Muma

The following California and New Mexico records extend the range of this species to 6 states, California, Arizona, New Mexico, Nevada, Utah, and Colorado: 1 male from 6 mi. NE of Santa Fe, Santa Fe Co., N.M. at 8000 ft. on July 3, 1964 by F., P., and M. Rindge; 1 male from 8.7 mi. W and 0.6 mi. S of White Rock, Los Alamos Co., N.M. at 7400 ft. on July 3, 1970 by R. Zweifel; 1 male under board on ground from San Jacinto, Riverside Co., Calif. on July 25, 1965 by William White; 4 males and 19 females from Winchester, Riverside Co., Calif. from July through August, 1968 by Wendell Icenogle.

The statement "Only the type is known." by Muma (1970) is an error. It should read "Only the type is known from Utah."

Eremobates actenidia new species

Figures 1 and 2

DIAGNOSIS: Lack of abdominal ctenidia distinguishes this species from all other members of group. It is separated from *E. ascopulatus* by a scopula of 70+ papillae. Pale legs and dusky palpal tips distinguish it from *E. septentrionis*. It is much smaller in size than most species which also serves to distinguish it from *E. gladiolus*.

MALE HOLOTYPE: Total length 18.0 mm.

	Length	Width
Chelicerae	4.0 mm.	2.3 mm.
Propeltidium	2.3	3.5
Palpus	17.0	CL/CW=1.74

	Length	Width
Leg 1	13.0	PW/PL=1.52
Leg 4	20.0	A/CP =7.94
		CP =6.3

Coloration and markings similar to those of *E. septentrionis* except dusky areas are fainter and less distinct. Only distinct markings on appendages are dusky palpal tarsi and apical ends of palpal metatarsi, figure 1.

Fondal notch deep, distinctly deeper than wide, no ctenidia on first post-spiracular sternite, and scopula of palpal metatarsus composed of 70 or more papillae. Otherwise, structure similar to that of other species of group. Cheliceral dentition as shown in figure 2. ECCS at 140x under normal light, as shown in figure 2; also at least 2 setae located behind and below base of principal tooth of movable cheliceral finger.

TYPE LOCALITY: Male holotype from Gouldings Trading Post, Monument Valley, San Juan Co., Utah on June 2, 1953 by R.E. Ryckman, R.D. Lee, C.T. Ames, C.C. Lindt, and C.T. Christianson in AMNH.

Eremobates clarus new species

DIAGNOSIS: Species distinguished from closely related *E. scaber* and *E. mormonus* by 2 short, flat abdominal ctenidia and entirely pale legs and palpi. Three species of group are known to have a wide, shallow fondal notch. They are mostly easily separated by number and form of abdominal ctenidia, presence or absence of palpal scopula and coloration of legs and palpi.

MALE HOLOTYPE: Total length 19.0 mm.

	Length	Width
Chelicerae	4.7 mm.	2.33 mm.
Propeltidium	2.3	3.4
Palpus	16.0	CL/CW=2.04
Leg 1	12.0	PW/PL=1.47
Leg 4	20.0	A/CP =6.86
		CP =7.0

Coloration and markings very pale and indistinct. Chelicerae pale, propeltidium dusky with purple only on margins, abdominal tergites lightly dusky, and legs and palpi pale and apparently without markings.

Structure similar to *E. scaber* and other species with a wide, shallow fondal notch, except for 2 short, flat, widely spaced abdominal ctenidia on first post-stigmatic sternite, figure 3. Cheliceral dentition shown in figure 4, which also shows ECCS at 140x normal light magnification.

TYPE LOCALITY: Male holotype from pitfall trap at 7900 ft. elevation on the Saratoga Stratton Exp. Watershed, Cargon Co., Wyoming between July 17 and 21, 1973 by John Schmid, in AMNH.

Eremobates consors new species
 Figures 5 and 6

DIAGNOSIS: Species distinguished by typical structure but unusual conformation of opercula. It is similar to *scaber*, *ascopulatus*, and *clarus* n. sp. in the pale coloration of the palpi and legs. Strikingly different opercula separate it from *scaber* but it may be the female of either of the latter two species.

FEMALE HOLOTYPE: Total length 21.0 mm.

	Length	Width
Chelicerae	6.5 mm.	2.5 mm.
Propeltidium	2.0	5.0
Palpus	15.0	CL/CW=2.6
Leg 1	12.0	PW/PL=2.5
Leg 4	21.0	A/CP =5.65 CP =8.5

Species is nearly identical in coloration and markings with *scaber*, *ascopulatus*, and *clarus*; the propeltidium and abdominal tergites are dark, dusky purple as on most species of the group.

Structure similar to other species, except for opercula, figure 5. Cheliceral dentition, figure 6, illustrates ECCS and is also similar to other females of species group.

TYPE LOCALITY: Female holotype from Minden, Douglas Co., Nevada, on VII-II-83 by D. A. Ball, Code No. 83H30-2, in FSCA.

Eremobates flavus new species
 Figures 7 to 9

DIAGNOSIS: Males of species distinguished from other species of group by 2 flat ctenidia, separated by less than their length, pale legs and palpi, a scopula of 40 or more papillae, and fondal notch deeper than wide or equal in depth and width. Females have opercula quite similar to *septentrionis* but have pale legs and palpi. To date, they have been found only in central to northwestern, Nevada.

MALES: Total length 20.0 to 24.0 mm. Holotype - smaller measurement.

	Length	Width
Chelicerae	5.5-6.0 mm.	2.5-3.0 mm.
Propeltidium	2.5-3.0	4.0-4.5
Palpus	16.0-18.0	CL/CW=2.09
Leg 1	14.0-16.0	PW/PL=1.54
Leg 4	19.5-24.0	A/CP =6.31 CP =8.0-9.0

Coloration and markings very similar if not identical with those of *E. septentrionis* except that leg and palpal markings are either very indistinct or missing.

Structure of species very similar to *E. septentrionis* except fondal notch of this species more closely approaches equal length and width, and two flattened ctenidia are 1/2 width of segment they cover, figure 7.

FEMALES: Total length 20.0 to 21.0 mm. Allotype larger measurements.

	Length	Width
Chelicerae	5.8-7.0 mm.	2.5-3.0 mm.
Propeltidium	2.5-2.5	4.0-5.0
Palpus	13.0-16.0	CL/CW=2.3-2.3
Leg 1	10.5-13.5	PW/PL=1.6-2.0
Leg 4	17.5-23.5	A/CP =4.93 CP =8.3-9.5

Coloration and markings of female similar to males and *E. septentrionis* except that markings are less extensive on chelicerae, peltidia, and abdominal tergites, and very indistinct or missing on palpi and legs.

Structure of females very similar to *E. septentrionis*. Figure 8 shows chelicerae nearly identical, except possibly for ECCS. Opercula also nearly identical, figure 9.

TYPE LOCALITY: Male holotype collected in Reno, Washoe Co., Nevada, VII-7-72 by W.F. Hendrick and female allotype in Jungo, Humboldt Co., Nevada, VI-6-79 by L. L. Stitt in FSCA. Paratypes are in other institutions.

DISTRIBUTION: Recent records of this species are mostly from counties north of Reno in northern Nevada.

REMARKS: Muma's (1951) records of *septentrionis* should be carefully checked for either misidentifications or possible synonymy with this species.

mormonus
Eremobates mimbrenus new species
Figures 10 to 13

DIAGNOSIS: This species is closely related to *E. scaber*, *E. mormonus* and *E. similis*, and may also be related to *E. consors* n. sp. and *E. hodai* n. sp. It is distinguished by 6 short, slender ctenidia, distinctive opercula, and mountain top distribution in southern New Mexico.

MALE HOLOTYPE: Total length 23 mm.

	Length	Width
Chelicerae	6.0 mm.	3.0 mm.
Propeltidium	3.2	4.2
Palpus	17.0	CL/CW=2.0
Leg 1	14.0	PW/PL=1.3
Leg 4	23.0	A/CP =6.94 CP =9.2

Coloration and markings similar to those of *mormonus* and *similis* but dark and distinct as in the latter. The palpus is illustrated in figure 10.

This species is also very similar in structure to *mormonus* and *similis* except that it has a scopula of 60 plus or minus papillae, 6 slender ctenidia equal to about 1/2 the length of the succeeding abdominal sternite, figure 11, and distinct palpal and leg markings.

FEMALES: Total length 21 to 24 mm. Allotype 23 mm.

	Length	Width
Chelicerae	5.7-6.5 mm.	2.5-2.75 mm.
Propeltidium	2.5-2.75	4.0-5.0
Palpus	12.5-14.25	CL/CW=2.2-2.4
Leg 1	11.0-11.5	PW/PL=1.6-1.8
Leg 4	16.5-18.5	A/CP =4.9-4.6 CP =8.2-9.3

Females are colored and marked similarly to male, except not as darkly or extensively.

Except for sexual differences, females are structured similarly to males. They are also structurally similar to females of *scaber* and *mormonus*. Cheliceral profile and ECCS as in figure 12. Opercula as in figure 13.

TYPE LOCALITY: Male holotype collected in a cantrap on Signal Peak in Gila National Forest, Grant Co., N.M., at 8000 ft. in an Alpine meadow on 6/17/76 by M. H. Muma. Female allotype also taken in a cantrap in the same Alpine meadow on 7/1/76 by M. H. Muma. Both in FSCA.

Eremobates hodai new species
Figure 14

DIAGNOSIS: Species most closely related to *E. mormonus* (Roewer). Readily distinguished by lack of scopula and ctenidia. Pale coloration also indicates a relationship with *E. scaber*.

MALE HOLOTYPE: Total length 21.0 mm.

	Length	Width
Chelicerae	6.5 mm.	3.3 mm.
Propeltidium	3.5	4.0
Palpus	20.0	CL/CW=1.7
Leg 1	17.5	PW/PL=1.1
Leg 4	26.0	A/CP = 6.35 CP =10.0

Coloration and markings similar to *mormonus* and *scaber*. Markings seem to be confined to margins of propeltidium and abdominal tergites.

Structure as in *mormonus* but lacking scopula and ctenidia. Figure 14 of cheliceral profile also illustrates ECCS under normal light at 140x magnification.

TYPE LOCALITY: Male holotype from College of Idaho with no other collection data.

vallis group

Males of group have basal constriction but no distinct notch and dorsal flare but no ectodorsal tooth-like process on fixed cheliceral finger. Mesoventral groove of finger broad from apex to base, not distinctly dilated. No anterior tooth on movable cheliceral finger. Females have opercula broadly lobate at posteroectal angles, adjacent mesally for most of length and with a small but wide and flat opercular notch.

Eremobates vallis new species

Figures 15 to 19

DIAGNOSIS: This species not closely related to any other species or group of genus. Males readily distinguished by much broader fixed cheliceral fingers, lack of palpal scopula and 2 short flattened ctenidia on first post-stigmatic abdominal sternite. Females are distinguished by a small, flattened opercular notch and a pair of shallow hollows near the margins of opercula. Cheliceral patterns also distinctive.

MALE HOLOTYPE: Total length 22.0 mm.

	Length	Width
Chelicerae	4.7 mm.	2.3 mm.
Propeltidium	2.6	3.9
Palpus	21.0	CL/CW=2.04
Leg 1	16.0	PW/PL=1.50
Leg 4	26.0	A/CP =8.63 CP =7.3

Coloration in alcohol rusty yellow with dusky purplish markings as follows: chelicerae unmarked; propeltidium lightly dusky with narrow pale median stripe; mesopeltidium, metapeltidium, and abdominal tergites lightly dusky, especially marginally; abdominal pleura pale; palpi lightly dusky on apical ends of femora and gradually becoming more extensive darkened on tibiae, metatarsi, and tarsi to distinctly dusky on tarsi, figure 15; all legs lightly dusky to dusky on apical ends of femora and tibiae; all sternites pale yellow; malleoli white.

Structure typical of other species of genus and quite similar to the *palpisetulosus* species group. Apical plumose bristle of flagellum complex short, strongly flattened, and broad. Cheliceral dentition and other structures shown in figure 16. Abdominal ctenidia in figure 17. Usual pair of rows of long spine-like setae on palpal tibia and metatarsus short and indistinct. Leg 1 tarsi seem to have only one small claw as in other Eremobatinae, but paratype female has 2 such claws, indicating variations of character.

FEMALES: Total length 27.0 to 27.5 mm.

	Length	Width
Chelicerae	5.7-6.0 mm.	2.6-2.9 mm.
Propeltidium	2.9-3.0	4.4-4.7
Palpus	16.0-17.0	CL/CW=2.11
Leg 1	14.0-15.0	PW/PL=1.53
Leg 4	24.0-25.0	A/CP =2.08 CP =8.6-9.0

Allotype smaller measurements.

Coloration in alcohol almost identical with male except pale, median, propeltidial stripe indistinct.

Structure similar to other females of the genus. Chelicerae of paratype shown in figure 18, chelicerae of allotype badly worn. Opercula shown in figure 19. Two, tiny trace ctenidia on first post-stigmatic abdominal sternite. Leg 1 tarsi seem to have

only one small claw, but see male description above.

TYPE LOCALITY: Male holotype and female allotype collected from can traps in Rock Valley near Mercury, Nevada on June 20-25, 1965 by Martin H. Muma in FSCA. Female paratype collected in can-trap at Mercury, Nevada on July 20, 1965 by J. Hopkins in author's collection.

REMARKS: ECCS shown for both male and female types. Setal evaluations made under normal light conditions at 140x magnification.

Variation in leg 1 tarsal claw number disturbing but may not prove to be inconsistent when additional specimens have been examined. Or perhaps species is a link between Eremobatinae and Therobatinae.

Genus *Eremothera* Muma, 1951

Eremothera Muma, 1951, p. 82; Muma, 1970, p. 29.

Moderate-sized Eremobatinae. Fixed cheliceral finger of males sculptured and with short, weak mesal groove that does not extend length of finger. Dorsal setae of flagellum complex striate; ventral setae plumose; apical striate, and apical plumose setae both flattened and spatulate. Females have opercula broadly triangular in form.

Eremothera sculpturata Muma

Eremothera sculpturata Muma, 1951, p. 82; Muma, 1970, p. 29.

Following record extends range of species in the United States into northern Arizona. One male collected 6 mi. N of Wickenburg, Arizona, August 13, 1976 indoors by T. Kingsley.

Genus *Horribates* Muma, 1962

Horribates Muma, 1962, p. 7; Muma, 1970, p. 29. Females only.

Collection of additional specimens of type species and 2 undescribed species has greatly increased our knowledge of this genus.

Key to species of genus *Horribates*

(Females)

1. Species with movable, spine-like setae on palpal tarsi; females 20 mm. or more in length; opercular pits directed ventrally and medially located.....*H. spinigerus* Muma
- 1.' Species with no movable, spine-like setae on palpal tarsi; females 15 mm. or less in length; opercular pits not directed ventrally and not located medially.....2
2. Females with 5 pairs of movable, spine-like setae on palpal femora; opercular pits relatively large, located laterally and directed laterally.....*H. bantai* n. sp.

- 2.' Females with 3 pairs of movable, spine-like setae on palpal femora; opercular pits small, located laterally and directed ventrolaterally.....*H. minimus* n. sp.

Horribates spinigerus Muma

Horribates spinigerus Muma, 1962, p. 7; Muma (1970), p. 29.

Muma (1963 and 1970) recorded two immatures of genus from Mercury, Nevada. These specimens are believed to represent the type species which has 48 or more robust, movable, spine-like palpal setae.

Horribates minimus new species
Figures 20 to 22

DIAGNOSIS: Species distinguished by reduced number (26-30) of robust, movable, spine-like, palpal setae, small size of these setae, distinctive genital opercula and extensively dusky legs and palpi.

FEMALE HOLOTYPE: Total length 15.0 mm.

	Length	Width
Chelicerae	4.3 mm.	1.6 mm.
Propeltidium	1.6	2.9
Palpus	10.5	CL/CW=2.68
Leg 1	9.0	PW/PL=1.81
Leg 4	15.0	A/CP = 5.85 CP =5.9

Coloration in alcohol pale yellow marked with dusky purple as follows: chelicerae unmarked; eye tubercle dark; propeltidium dusky along lateral and posterior margins and faintly dusky behind each eye; mesopeltidium, metapeltidium, and abdominal tergites densely reticulate dusky; pleura dusky; abdominal sternites dusky along lateral margins; venter otherwise pale; malleoli white; palpi and legs dusky on tarsi, metatarsi, tibiae, and on apical ends of femora; legs also dusky to faintly dusky on dorsal surfaces of trochanters.

Dentition shown in figure 20, note also ECCS. Mesal tooth missing; fondal tooth formula I, III, II, IV for both rows; mesal setae of movable finger plumose on basal half of articulation area, simple apically. This species has a greater than usual number of strong, sclerotized setae ectally just behind fond and dentition of fixed cheliceral finger.

Structure otherwise very similar to *H. spinigerus* except robust, movable, spine-like, palpal setae greatly reduced in number to 26-30 and are much shorter, shown in figure 21. There are two widely separated trace ctenidia on first post-stigmatic abdominal sternite. Genital opercula in figure 22.

TYPE LOCALITY: Female holotype collected in house, Lytle Creek Canyon, San Bernardino Co., California, 1 September, 1970 by David E. Bixler in FSCA.

Horribates bantai new species
Figures 23 to 25

DIAGNOSIS: Species distinguished by reduced number (30-32) robust movable, spine-like, palpal setae, greater length of these setae, distinctive genital opercula and dusky palpal tarsus, metatarsus and tibia.

FEMALE HOLOTYPE: Total length 15.0 mm.

	Length	Width
Chelicerae	4.2 mm.	1.5 mm.
Propeltidium	1.6	2.9
Palpus	12.5	CL/CW=2.80
Leg 1	9.5	PW/PL=1.81
Leg 4	16.0	A/CP =6.55 CP =5.8

Color in alcohol faded (specimen apparently has dried out at one time), but apparently as follows: chelicerae, peltidia, palpi, and legs pale yellow except for tarsus and metatarsus of palpus which are dusky purple; eye tubercle dark; malleoli white; abdominal coloration impossible to determine.

Structure very similar to *H. spinigerus*. Cheliceral dentition and ECCS shown in figure 23. Mesal tooth missing; fondal tooth formula of mesal row I, III, II, IV; ectal row of right chelicerae II, I, III, IV, ectal row of left chelicera III, I, IV, II; mesal setae of movable finger plumose on basal two-thirds of articulation area, simple distally. Robust, movable, spine-like, palpal setae reduced in number to about 30-32 but elongate as shown in figure 24. Abdominal ctenidia not observable.

Genital opercula shown in figure 25.

TYPE LOCALITY: Female holotype from Saline Valley-Station 18, Inyo Co., California on 8, June 1959 by B. Banta in CAS.

Subfamily Therobatinae Muma, 1951

Males and females of subfamily have 2 claws on tarsus of leg 1. Two exceptions are *Eremochelis plicatus* Muma which apparently has none, and *Eremobates vallis* new species, described above, which sometimes also has 2 claws. These claws are very difficult to see on small dark species where they are sometimes easier to view in profile. Except for species of *Chanbria* Muma and *Eremochelis simplex* group, these species are small to moderate in size and frequently well marked with dusky to dark coloration. Most species also have chelicerae 2.5 to 3 times as long as wide.

Fewer specimens of this subfamily are available for study than of the subfamily Eremobatinae. This may be the result of their lesser abundance, smaller size, or perhaps cryptic habits. Because of this scarcity of material, many species have been described on the basis of a single sex and have been placed in the wrong genus or species group. Recent material has prompted study and reorganization of species, species groups, and genera.

*♀ abd. setae 1.5-2.0
How many specimens?*

As a result many specimens and species have been relocated. These are listed and discussed within the relevant paragraphs. The key to subfamilies and genera of Eremobatidae (page 3) will distinguish genera of Therobatinae.

Genus *Chanbria* Muma, 1951

Chanbria Muma, 1951, p. 96; Muma, 1962, p. 27; Muma, 1970, p. 36.

This unique sand inhabiting genus is presently under revision so two new forms from the United States are not included here. *Two new species?*

Genus *Eremochelis* Roewer

Eremochelis Roewer, 1934, p. 570; Muma, 1970, p. 30.

Therobates Muma, 1951, p. 85; Muma, 1962, p. 9.

Small to large Therobatinae. Male fixed cheliceral finger with dorsomesal, mesal, or mesoventral groove. Dorsal setae of flagellum complex weakly to strongly striate, ventral setae weakly to strongly plumose. Plumose setae partially to completely cover mesal, mesoventral, or dorsomesal groove. Apical striate and apical plumose setae not especially modified on most species groups. However, in the *branchi* group the apical plumose seta is distinctly flattened. In the *andreasana* group both apical setae are strong and striate. The *bilobatus* species has both dorsal and ventral setae of complex plumose. Males, in addition to usual palpal clothing, often have femora, tibiae, and metatarsi provided below with one or two unequal rows of elongate spine-like setae. Female opercula extremely variable within genus but relatively consistent within species groups.

Key to species groups of *Eremochelis* Roewer

(Males)

1. Fixed cheliceral finger with a distinct, elongate, mesoventral or dorsomesal cavity or slot occupying at least half of finger length.....2
- 1.' Fixed cheliceral finger with short mesal creases, hollows, grooves or very short apical cups.....4
2. Apical plumose seta of flagellum complex distinctly to conspicuously flattened and widened.....3
- 2.' Apical plumose seta of flagellum complex obscurely or not widened and flattened.....*bilobatus* group
3. Fixed cheliceral finger without dorsal flange and with groove mesoventral in position.....*branchi* group
- 3.' Fixed finger with dorsal flange and with groove dorsomesal in position.....*striodorsalis* group
4. Fixed finger straight or evenly curved ventrally; mesal groove one or more creases; flagellum complex apically with striate and plumose setae; movable finger with an apical cup or hollow.....*imperialis* group

- 4.' Fixed finger undulate or notched ventrally; mesal groove a distinct to indistinct cup-like hollow; flagellum complex apically with only striate setae; movable finger with or without a flange.....*andreasana* group

(Females)

1. Opercula provided posteriorly with a distinct mesal notch...2
 1.' Opercula flared but not distinctly notched posteriorly.....3
 2. Opercula commonly provided with anteriolateral pits and often with adjacent distinct mesal lobes at the anterior end of the notch.....*bilobatus* group
 2.' Opercula not usually provided with anteriolateral pits but often strongly constricted laterally and with small, triangular elevations near the posterior end of the notch.....
*branchi* group
 3. Lateral pits of opercula indistinct, often hidden behind the lateral wings.....*andreasana* group
 3.' Lateral pits of opercula distinct, often invading lateral wings.....*imperialis* group
 Females of *striodorsalis* group unknown.

branchi group

Several new species described below do not significantly alter group characters cited in Muma (1951) and key to species groups above. Distribution ranges of 2 previously described species are extended by new records.

Five species of group are known from males and females. They are *E. branchi* Muma, *E. iviei* (Muma), *E. fuscella* new species, *E. insignitis* Roewer, and *E. bidepressus* (Muma). *E. medialis* (Muma) and *E. bechteli* new species are known only from males. *E. gertschi* (Muma), *E. malkini* (Muma), *E. coloradensis* (Muma), *E. saltoni* new species, *E. tanneri* new species and *E. flavus* new species are known only from females. Some of the latter will unquestionably be moved to other genera or species groups when males have been collected.

Key to species of *branchi* group

(Males)

1. Medium sized species, 18-28 mm., with a low, rounded process anterior to teeth on movable cheliceral finger.....2
 1.' Small sized species, 9-14 mm., without a process anterior to teeth on movable cheliceral finger.....6
 2. Palpi dusky on tarsi and apical ends of metatarsi; with 4 or 6 long ctenidia.....3
 2.' Palpi pale or dusky on tarsi and metatarsi; with 6 long or short ctenidia.....5
 3. Palpi with scopula of 30-50 papillae; mesoventral groove extends basally into fondal notch.....4

- 3.' Palpi without scopula; mesoventral groove extends basally to but not into fondal notch, 4 long ctenidia.....*E. medialis* (Muma)
4. Six very long ctenidia, extending beyond posterior margin of adjacent abdominal sternite; anterior process of movable finger low but well sclerotized; palpal scopula with 30-40 papillae.....*E. fuscillus* n.sp.
- 4.' Four shorter ctenidia, not extending beyond posterior margin of adjacent abdominal sternite; anterior process high and distinct; palpal scopula with 40-50 papillae.....*E. branchi* (Muma)
5. Palpi dusky on tarsi and metatarsi with a scopula of 20-30 papillae; ctenidia nearly as long as adjacent sternite; movable finger process long and flattened....*E. iviei* (Muma)
- 5.' Palpi pale on all segments, with scopula of 20 papillae; ctenidia very short; movable finger process high and rounded.....*E. bechteli* (Muma)
6. Fondal notch shallow and obscure; mesal groove of fixed finger wide and distinct; anterior and intermediate teeth of movable cheliceral finger small but distinct.....*E. insignitis* Roewer
- 6.' Fondal notch deep, rounded and distinct; mesal groove of fixed cheliceral finger wide but shallow and indistinct; anterior and intermediate teeth of movable finger absent or obscure.....*E. bidepressus* (Muma)

(Females)

1. Medium sized species, 18-28 mm.; most species have the palpi lightly to distinctly dusky from tarsi through apical end of femora.....2
- 1.' Small sized species, 9-16 mm., most species have the palpi distinctly dusky to dark from tarsi through femora.....9
2. Primary teeth on fixed cheliceral finger separated by 2 intermediate teeth; posteriormesal opercular notch with a pair of conical elevations.....3
- 2.' Primary teeth (at least one pair) separated by more or less than 2 intermediate teeth; posterior opercular notch not provided with conical elevations.....8
3. Opercular lateral margins concave and hollowed; anterior lobes thickened and/or swollen.....4
- 3.' Opercular lateral margins concave but not hollowed; anterior lobes slender and/or tapered.....6
4. Lateral opercular hollows circular or ovate; palpi dusky from tarsi through apical ends of femora.....*E. gertschi* (Muma)
- 4.' Lateral opercular hollows elongate ellipses; palpi dusky on tarsi and distal ends of metatarsi.....5
5. Anterior lobes swollen and lobate; lateral hollows occupy more than half of opercular length.....*E. branchi* (Muma)
- 5.' Anterior lobes thickened but not lobate; lateral hollows occupy less than half of opercular length.....*E. fuscillus* n. sp.

6. Vulvular opening within opercular notch; anterior lobes slender anteriorly, broad posteriorly; palpi mostly pale.....
.....*E. saltoni* n. sp.
- 6.' Vulvular opening behind opercular notch; anterior lobes slender medially, broader at both ends.....7
7. Opercula nearly twice as wide as long; opercular notch with concave margins; a dusky species.....*E. malkini* (Muma)
- 7.' Opercula only slightly wider than long; opercular notch triangular; a pale to lightly dusky species...*E. iviei* n. sp.
8. Opercular notch elongate and tapered anteriorly; anterior lobes of opercula uniformly slender anteriorly.....
.....*E. coloradensis* (Muma)
- 8.' Opercular notch short and wide posteriorly; anterior lobes acutely capitate anteriorly.....*E. tanneri* n.sp.
9. Primary teeth on fixed cheliceral finger separated by 2 intermediate teeth; anterior lobes of opercula short and broad.....*E. flavus* n. sp.
- 9.' Primary teeth on fixed cheliceral finger separated by a variable number of intermediate teeth; anterior lobes of opercula long and slender or tapered anteriorly.....10
10. Anterior lobes of opercula long and slender, posterior lobes wide and ovate.....*E. insignitis* Roewer
- 10.' Anterior lobes of opercula long and tapered anteriorly, posterior lobes wide, quadrate, and pitted.....
.....*E. bidepressus* (Muma)

Eremochelis iviei (Muma)

Figures 26 and 27

Therobates iviei Muma, 1951, p. 88.

Eremochelis iviei (Muma), Muma, 1970, p. 32.

Species known only from Arizona; female holotype collected from Colossal Cave Camp, Arizona on September 8, 1941 by Wilton Ivie in AMNH. Male allotype collected at black light trap, Colossal Cave, Pima Co., Arizona on August 25, 1970 by R. E. Woodruff, in FSCA.

MALE ALLOTYPE: Total length 28.5 mm.

	Length	Width
Chelicera	6.8 mm.	3.1 mm.
Propeltidium	2.9	4.7
Palpus	27.0	CL/CW=2.19
Leg 1	21.0	PW/PL=1.62
Leg 4	32.0	A/CP =8.25
		CP =9.7

Coloration in alcohol pale to rusty yellow lightly marked with purplish brown as follows: eye tubercle dark; propeltidium lightly dusky except for pale, ovate, median area; mesopeltidium, metapeltidium, and abdominal tergites indistinctly reticulate dusky; abdominal pleura, venter, and malleoli pale; chelicerae, palpi, and legs pale or indistinctly dusky except for palpal metatarsi and tarsi which are lightly dusky.

Structure similar to *branchi* and *medialis* with specific differences as shown in measurements and ratios, figure 26 of chelicerae, and figure 27 of abdominal ctenidia. Distinct mesal tooth on movable cheliceral finger, fondal teeth graded in size I, II, III, IV for both rows; three denticules in fondal notch and 6 mesoventral spine-like setae on palpal femora, 4 or 5 pairs on tibia but none on metatarsi. Palpal metatarsus has scopula of 20-30 papillae and is 3 times length of tarsus.

REMARKS: The association of the sexes of this species indicates that *branchi*, *gertschi*, *malkini*, *fuscellus*, *bechteli*, *saltoni*, *tanneri*, and this species are all closely related, and form a homogeneous group.

Eremochelis fuscellus new species
Figures 28 to 31

DIAGNOSIS: Species distinguished from *iviei* by a longer scopula on palpal metatarsus with a greater number of papillae (30-40 as opposed to 20-30), and only palpal tarsus and metatarsal tip dusky; distinguished from *medialis* by presence of scopula and 6 abdominal ctenidia and reduced dusky markings on palpal metatarsi.

MALES: (3 specimens) Total length 20.0 to 26.5 mm.

	Length	Width
Chelicerae	0.60-0.70 mm.	0.30-0.30 mm.
Propeltidium	0.30-0.40	0.40-0.50
Palpus	22.0-25.07	CL/CW= 2.0-2.3
Leg 1	18.0-19.0	PW/PL= 0.75-0.80
Leg 4	24.0-28.0	A/CP = 7.11-6.45 CP = 0.90-1.10

Holotype larger measurements.

Coloration in alcohol pale to dusty, and rusty yellow sparsely marked with purplish brown as follows: eye tubercle dark; propeltidium pale to dusty yellow throughout; mesopeltidium, metapeltidium, and abdominal tergites, pleurites, and sternites seemingly an unmarked combination of dusty and rusty yellow; chelicerae, palpi, and legs a pale to distinct rusty with only palpal tarsi and distal ends of metatarsi lightly dusky.

Structure similar to *iviei* and *medialis* with specific differences as shown in measurements and ratios, figure 28 of chelicerae, and figure 29 of abdominal ctenidia. No distinct mesal tooth on movable cheliceral finger, fondal teeth graded in size I, II, III, IV for both rows, and two denticules in fondal notch; ECCS shown at 140x. An elongate scopula of 30-40 papillae in palpal metatarsus which is 3 times length of tarsus.

FEMALE ALLOTYPE: Total length 24.0 mm.

	Length	Width
Chelicerae	0.70 mm.	0.20 mm.
Propeltidium	0.40	0.30
Palpus	19.0	CL/CW=3.5
Leg 1	14.0	PW/PL=0.75

	Length	Width
Leg 4	25.5	A/CP =5.31 CP =1.10

Coloration and markings of allotype very similar to holotype.

Structure similar to other species of group as shown by measurements and ratios, figure 30 of chelicerae, and figure 31 of opercula. Opercular structure is most similar to *iviei* and *malkini*.

TYPE LOCALITY: Male holotype, female allotype and male paratype from Newberry, San Bernardino Co., California, 7 August, 1971 by David E. Bixler in FSCA. A designated male paratype from 3 mi. S of Wickenburg, Arizona, collected 8-15-76 by T. Kingsley is retained in author's collection.

Eremochelis bechteli new species
Figures 32 and 33

DIAGNOSIS: Species closely related to *medialis* from which it differs by a longer mesosventral groove, 6 short sword-like ctenidia, scopula of about 20 ctenidia, and distinctive coloration.

MALE HOLOTYPE: Total length 18.0 mm.

	Length	Width
Chelicerae	5.5 mm.	2.2 mm.
Propeltidium	3.0	4.0
Palpus	20.1	CL/CW=2.50
Leg 1	16.0	PW/PL=1.33
Leg 4	24.5	A/CP =7.1 CP =8.5

Coloration in alcohol pale yellow with dusky purplish markings as follows: eye tubercle dark; propeltidium dusky on anterior third except for a pale, median, ovate area and a small, pale, ovate area on each side of eye tubercle; anterior arci each with a dark comma shaped mark; mesopeltidium and metapeltidium with similar comma shaped marks; abdominal tergites bordered with dark bars and spots; abdominal pleurites and sternites pale yellow to grey; palpi and legs essentially pale yellow except for a slight darkening at segmental unions; leg 4 dusky distally on femora, and dorsally and laterally on tibiae and metatarsi; venter pale; and malleoli pale.

Structure similar to other males of group as shown in measurements and ratios, figure 32 of chelicerae, figure 33 of ctenidia, and a narrow line-like palpal scopula of 15 to 20 papillae. Fossal teeth graded in size I, III, II, IV ectally and I, III, II, IV mesally. Mesal tooth of movable cheliceral finger indistinct. Spine-like setae occur on femora, tibiae, and metatarsi of palpi.

TYPE LOCALITY: Male holotype collected at Whiskey Flat, Mineral Co., Nevada, July 11, 1979 by R. D. Bechtel and R. L. Bradley, in FSCA.

REMARKS: Species appears to have one primary and two minor setae in ECCS under normal light at 140x magnification.

Eremochelis saltoni new species

DIAGNOSIS: Species closely related to *iviei* and *malkini*. Readily distinguished by pale coloration and differently proportioned opercula. All three species have 6 trace ctenidia on first post-spiracular sternite, the usual number for members of *branchi* group.

FEMALE HOLOTYPE: Total length 24.0 mm.

	Length	Width
Chelicerae	6.1 mm.	2.3 mm.
Propeltidium	2.6	3.9
Palpus	18.0	CL/CW=2.65
Leg 1	14.0	PW/PL=1.50
Leg 4	25.0	A/CP =6.55
		CP =8.7

Coloration in alcohol very pale yellow but similar to *branchi* and *iviei*.

Structure similar to *branchi*. There is a distinct mesal tooth on movable finger but no intermediate tooth behind principal tooth of fixed cheliceral finger. Cheliceral pattern shown in figure 34. Opercula in figure 35. Six widely spaced, tiny, trace ctenidia on first post-spiracular abdominal sternite.

TYPE LOCALITY: Female holotype from sand 10 mi. S of Salton City, Imperial Co., California on September 30, 1967 by J. Bigelow, S. Goradenski, and M. A. Cazier in CAS.

REMARKS: Species seems to have one primary, four minor, and one microseta in ECCS under normal light at 140x.

Eremochelis tanneri new species

Figures 36 and 37

DIAGNOSIS: Species seems to be most closely related in both size and opercular form to *iviei* and *malkini*. Differs from both by pale coloration and cheliceral dentition. Presence of two trace ctenidia distinguish it from *malkini* which has 6 and from *insignitis* which has 4.

FEMALE HOLOTYPE: Total length 20.0 mm.

	Length	Width
Chelicerae	5.2 mm.	2.1 mm.
Propeltidium	2.2	3.9
Palpus	15.0	CL/CW=2.48
Leg 1	12.0	PW/PL=1.77
Leg 4	20.0	A/CP =6.35
		CP =7.4

Coloration in alcohol pale yellow with dusky purplish markings as follows: eye tubercle dusky; propeltidium faintly dusky along posterior margin; palpus faintly dusky on apical end

of femur and all of tibia, metatarsus, and tarsus; other structures paler.

Structure similar to *branchi* as indicated by measurements and ratios, as shown in figure 36 of chelicerae and figure 37 of opercula. Dentition is greatly reduced and opercula distinctive. No mesal tooth on movable cheliceral finger and only 2 trace ctenidia on first post-stigmatic abdominal sternite. Otherwise setation similar to other females of group. Both rows of fondal teeth graded I, III, II, IV in size.

TYPE LOCALITY: Female holotype from the Tecoma Range, Copper Mts., Utah near Lucin, Utah in June, 1928 by Vasco M. Tanner in BYU.

REMARKS: Only one, broken off, primary seta and 3 minor setae could be found in ECCS under normal light at 140x magnification.

Eremochelis flavus new species
Figures 38 and 39

DIAGNOSIS: Small species and has shortest, most wide spread opercula of group. Lacks the posteriomedian elevations of *iviei* and *malkini*. Approaches *insignitis* in size but is much paler. When more specimens are available or sexes have been collected together, may prove to be female of *medialis*.

FEMALE HOLOTYPE: Total length 14.0 mm.

	Length	Width
Chelicerae	3.9 mm.	1.6 mm.
Propeltidium	1.8	3.0
Palpus	11.0	CL/CW=2.43
Leg 1	8.0	PW/PL=1.67
Leg 4	14.0	A/CP =5.79
		CP =5.7

Coloration in alcohol entirely pale yellow except for a slightly dusky eye tubercle.

Structure similar to other females of group as shown by measurements and ratios and figure 38 of cheliceral dentition. No mesal tooth and fondal teeth graded in size III, I, II, IV for both rows. Two widely spaced trace ctenidia on first post-spiracular abdominal sternite. Spine-like setae on palpi long but too slender to be counted accurately. Opercula shown in figure 39.

TYPE LOCALITY: Female holotype from 13 mi. W of Winterhaven, California on May 23, 1956 by V. Roth in AMNH.

REMARKS: Only one primary seta and 3 very slender minor setae could be found in ECCS of holotype, under normal light and 140x.

bilobatus group

As indicated in key to species groups, the several new species described below alter group diagnostic characters given in Muma (1951, 1962, and 1970). Mesoventral groove of male fixed cheliceral finger may or may not contain distinct carinae

and female opercula may or may not be lobate mesally within posterior notch, or have lateral pits.

The new species also indicate this group and arcus group cannot be maintained separately. They are combined here. Only *E. bilobatus* (Muma), *E. morrissi* (Muma), *E. plicatus* (Muma), *E. arcus* (Muma), *E. kerni* n. sp., and *E. cochiseae* and are known from males and females. *E. giboi* n. sp., *E. macswaini* (Muma), *E. cuyamacanus* (Muma), *E. nudus* (Muma), and *E. noonani* new species are known only from males and *E. acrilobatus* (Muma), *E. attritus* (Muma) and *E. truncus* Muma known only from females.

Key to species of *bilobatus* group

(Males)

1. Mesoventral groove of fixed cheliceral finger an elongate, ovate structure that is slightly narrowed anteriorly; fixed finger often curved or thickened but normal in appearance....2
- 1.' Mesoventral groove of fixed cheliceral finger a short, nearly normal, ovate structure or an attenuate structure that is expanded posteriorly and tube-like anteriorly; fixed finger often bent at tip or strongly sinuate.....10
2. Mesoventral groove obviously internally ridged.....3
- 2.' Mesoventral groove apparently internally smooth.....5
3. Without a palpal scopula; with 4 long (longer than 1/2 segment) slender abdominal ctenidia, the middle pair of which is thinner and shorter; movable cheliceral finger with 1 tooth anterior to principal tooth...*E. bilobatus* (Muma)
- 3.' With a palpal scopula; with two long (shorter than segment) thick, or 4 very long (longer than segment) slender abdominal ctenidia.....4
4. Scopula with plus or minus 40 papillae; palpi dusky to dark from tarsi through most of femora; movable cheliceral finger with 3 teeth anterior to principal tooth....*E. morrissi* (Muma)
- 4.' Scopula with plus or minus 50 papillae; palpi dusky from tarsi through femoral apex; movable cheliceral finger with 1 tooth anterior to principal tooth.....*E. giboi* n.sp.
5. Movable finger with 1 tooth anterior to principal tooth; 4 very long (longer than segment) flattened ctenidia.....6
- 5.' Movable finger with 3 teeth, 2 teeth, or 1 tooth plus rounded elevations anterior to principal tooth; with 4 very short or no ctenidia.....8
6. Palpal scopula with less than 40 papillae; fixed cheliceral finger essentially straightly but slightly undulate; medium sized (21 mm.) species.....*E. cuyamacanus* (Muma)
- 6.' Palpal scopula with more than 40 papillae; fixed finger arched or bowed dorsally.....7
7. Palpi dusky from tarsi through femoral apex; with 40-60 papillae in scopula; small (14 mm.) species....*E. arcus* (Muma)
- 7.' Palpi dusky from tarsi through most of femora; with 70-80

- papillae in scopula; medium sized (22 mm.)species.....
*E. noonani* (Muma)
8. Movable cheliceral finger with 2 teeth anterior to principal tooth; with no ctenidia and no scopula.....*E. nudus* (Muma)
- 8.' Movable cheliceral finger with 3 teeth or 1 tooth and 2 rounded elevations anterior to principal tooth; with 4 short ctenidia.....9
9. With no palpal scopula; with 4 short, thick ctenidia; with 3 teeth anterior to principal tooth of movable cheliceral finger.....*E. cochiseae* new species
- 9'. With 40-60 papillae in scopula; with 4 short, slender ctenidia; with 1 tooth and two rounded elevations anterior to principal tooth of movable cheliceral finger.....
*E. macswaini* (Muma)
10. Mesoventral groove of fixed cheliceral finger ovate but not greatly narrowed anteriorly; fixed finger bent downward at tip; fondal notch narrow.....11
- 10.' Mesoventral groove of fixed finger ovate posteriorly but greatly attenuated and narrow anteriorly; fixed finger strongly sinuate; fondal notch wide.....*E. flexacus* (Muma)
11. Fondal notch deep and bent dorsally; finger tip folded; with 2 tiny teeth anterior to principal tooth on movable cheliceral finger*E. plicatus* (Muma)
- 11.' Fondal notch shallow and enclosing 2 remnant teeth; finger tip bent; with 1 tooth and two rounded elevations anterior to principal tooth on movable cheliceral finger.....
*E. kerni* n.sp.

(Females)

1. Small to medium sized species; fixed cheliceral finger with 2 intermediate teeth between principal tooth and medial tooth, and 1 between medial tooth and anterior tooth; movable cheliceral finger with 2 intermediate teeth between principal tooth and anterior tooth; opercular scuta with anterior, mesal lobes within the posterior notch and laterally directed pits near ectal margins.....*E. bilobatus* (Muma)
- 1.' Small and medium sized species; primary teeth on both cheliceral fingers separated by 2 intermediate teeth; opercular scuta without mesal lobes, without pits or without both (exception-*E. kerni* new species).....2
2. Opercular notch with both mesal lobes, and lateral opercular pits; small to medium sized California species.....
*E. kerni* n. sp.
- 2.' Without either pits or lobes or both.....3
3. Without pits.....4
- 3.' Without lobes or both.....5
4. Opercula with rounded mesal lobes and an extreme lateral groove.....*E. morrissi* (Muma)
- 4.' Opercula with elongate pointed lobes, but no groove or pit.....*E. acrilobatus* (Muma)

5. With lateral pits that are outside of the opercular scuta....7
7
 5.' Without mesal lobes or lateral pits.....6
 6. Opercula nearly twice as wide as long with a short wide mesal notch.....*E. arcus* (Muma)
 6.' Opercula only slightly wider than long with long, narrow mesal notch.....*E. plicatus* (Muma)
 7. Palpi with short thick spine-like setae....*E. cochiseae* n.sp.
 7.' Palpi without short thick spine-like setae.....
*E. attritus* (Muma)

Eremochelis bilobatus (Muma)
 Figure 40

Datames pallipes (Say), Simon, 1879, p. 139 (not *pallipes* Say).
Eremobates pallipes (Say), Banks, 1900, p. 427; Kraepelin, 1901, p. 126; Roewer 1934, p. 555 (not *pallipes* Say).
Therobates bilobatus Muma, 1951, p. 92.
Eremochelis bilobatus (Muma), 1970, p. 33.

Muma (1951) in figure 173 failed to illustrate the characteristic opercular pits of species. His figure included a convex surface elevation; he did not see the ventro-laterally facing pits. The pits are shown here in figure 40 which is an exact copy of the 1951 figure (omitting most setae) replacing the erroneous elevations with pits.

This common, relatively widespread species is somewhat variable in size and coloration. Brookhart (1972) recorded longer ctenidia on Colorado specimens. Two additional atypical specimens are recorded here: a pale male collected at Rodeo, New Mexico on July 10, 1965 by the author has only one pair of distinguishable ctenidia; a large pale female collected 7 mi. NE of Miami, Texas on July 1, 1967 by Rose Carpenter has dusky purplish coloration only on palpi. Thirty years of collection have not greatly extended the range of this species.

Eremochelis giboi new species
 Figures 41 and 42

DIAGNOSIS: Small species seeming to be most closely related to *E. bilobatus* from which it differs by having a palpal scopula of about 50 tiny scopae. Distinguished from most species of group by longer mesoventral groove of fixed cheliceral finger. Four very long, slender ctenidia, long slender, spine-like, palpal setae, and reduced dentition of movable cheliceral finger separate it from sympatric *E. morrisi*.

MALE HOLOTYPE: Total length 14.0 mm.

	Length	Width
Chelicerae	4.7 mm.	1.8 mm.
Propeltidium	2.1	3.1
Palpus	17.0	CL/CW=2.61
Leg 1	13.0	PW/PL=1.48

	Length	Width
Leg 4	20.5	A/CP =7.43 CP =6.8

Coloration in alcohol questionable. Specimen was at one time dried out. Palpi seem to be dusky apically on femora and all of tibiae, metatarsi, and tarsi. All other structures are apparently pale.

Structure similar to other species of group as indicated in measurements and ratios, figure 41 of chelicerae, and figure 42 of ctenidia. No mesal tooth on movable cheliceral finger; mesoventral groove of fixed cheliceral finger does not extend basally into fondal notch; fondal tooth sizes are I, III, II, IV for ectal row and I, II, III, IV for mesal row. There are 14 or 15 long, slender, spine-like setae ventrally on femora and tibia of palpi; those on the metatarsi are indistinguishable. TYPE LOCALITY: Male holotype from NE El Paso Mts., Kerr Co., California in the spring of 1963 by D. Gibo in AMNH.

Eremochelis noonani new species
Figures 43 and 44

DIAGNOSIS: Only known species of group in which males have 4 long, flattened abdominal ctenidia and scopula of 70 to 80 widely separated, small, slender papillae on both tibia and metatarsus of palpus. Females are not known.

MALE HOLOTYPE: Total length 22.0.

	Length	Width
Chelicerae	5.0 mm.	2.3 mm.
Propeltidium	2.3	3.9
Palpus	18.0	CL/CW=2.17
Leg 1	14.0	PW/PL=1.70
Leg 4	24.0	A/CP =7.67 CP =7.3

Coloration in alcohol somewhat faded and overlaid with fine dust or dirt but apparently dusky yellow marked with purplish brown as follows: eye tubercle dark; propeltidium dark on anterior and lateral margins; mesopeltidium, metapeltidium, and abdominal tergites uniformly dusky; abdominal pleura slightly dusky; venter pale; chelicerae pale; palpi and legs slightly dusky on all segments except the coxae; malleoli pale.

Structure typical of other males of group but specifically different as indicated in measurements and ratios, figure 43 of chelicerae, and figure 44 of ctenidia. No distinct mesal tooth and both rows of fondal teeth graded I, III, II, IV. Palpal metatarsus 3.1 times length of tarsus.

TYPE LOCALITY: Male holotype taken in a bait trap in Miller Canyon, So. Drdo Co., California between May 10 and June 16, 1964 by G. R. Noonan in AMNH.

Eremochelis morrisoni (Muma)
Figure 45

Therobates morrisoni Muma, 1951, p. 90.

Eremochelis morrisoni Muma, 1970, p. 32.

Collection of two additional males and the female for first time permits further evaluation of species. Males vary from 13.0 to 14.0 mm. in length with a mean A/CP of 6.72. They are much shorter legged than other members of group and have palpal spine-like setae short, robust, and reduced in number. Although chelicerae are badly worn, female is described here as the allotype.

FEMALE ALLOTYPE: Total length 11.0 mm.

	Length	Width
Chelicerae	3.0 mm.	1.1 mm.
Propeltidium	1.3	2.2
Palpi	8.5	CL/CW=2.73
Leg 1	8.0	PW/PL=1.69
Leg 4	12.0	A/CP =6.63 CP =4.8

Coloration in alcohol similar to male. Propeltidium dark purplish brown except along anterior margin. Mesopeltidium, metapeltidium, abdominal tergites, and abdominal pleura also dark. Legs and palpi dusky on all segments above but paler laterally and ventrally; palpal metatarsus and tarsus somewhat darker than other segments. Chelicerae, venter, and malleoli pale.

Structure essentially that of other females of group. Cheliceral dentition too worn to determine or illustrate profile pattern and ECCS. Opercula shown in figure 45. Two distinguishable trace ctenidia on first post-stigmatic abdominal sternite. Opercula do not have lateral pits but do have an obscure groove that seems to run through lateral margin. Palpi have following series of stout, ventral, spine-like setae, 5 or 6 mesoventrally on femur, 3 or 4 pairs on tibia, and 3 or 4 pairs on metatarsus.

TYPE LOCALITY: Female allotype collected in building, Winchester, Riverside Co., California August 23, 1971 by W. Icenogle in FSCA.

REMARKS: Species now known from 3 males and 1 female collected in Los Angeles, Riverside, and San Bernardino counties, California.

There are 1 primary, 2 minor and 2 possible microsetae in male ECCS at 140x magnification, on a male from Winchester, California.

Eremochelis kerni new species
Figures 46 to 49

DIAGNOSIS: Species approaches *plicatus* and *flexacus* in size and color but otherwise significantly different. Female

opercula have small median lobes similar to but smaller than those of *E. bilobatus*.

MALE HOLOTYPE: Total length 18.0 mm.

	Length	Width
Chelicerae	4.9 mm.	2.2 mm.
Propeltidium	2.3	2.9
Palpus	19.0	CL/CW=2.23
Leg 1	14.0	PW/PL=1.26
Leg 4	24.0	A/CP =7.92
		CP =7.2

Coloration in alcohol pale to dark yellow with dusky purplish markings as follows: eye tubercle dark; propeltidium dusky on anterior 3/4 with median pale ovate area and a light ovate area on each side of eye tubercle; mesopeltidium, metapeltidium, and abdominal tergites dusky bordered forming two narrow lateral stripes; palpi dusky on dorsal and lateral surfaces of all segments except coxae; legs dusky on dorsal and lateral surfaces of all segments except coxae and tarsi; venter pale; malleoli pale.

Structure similar to other males of group as indicated by measurements and ratios, figure 46 of cheliceral profile, and figure 47 of ctenidia. Fossal tooth sizes are I, III, II, IV ectally and I, II, III, IV mesally. A ridge but no distinct mesal tooth on movable cheliceral finger. There are 15-20 slender papillae in slender palpal scopula, and 6-8 long, spine-like setae ventrally on palpal femora, 3 pairs on tibiae, and 4 or 5 almost not recognizable, on metatarsi. Metatarsus of palpus 3.5 times the length of tarsus.

FEMALES: Total length 19.5 to 21.0 mm. Allotype smaller measurements.

	Length	Width
Chelicerae	5.0-5.2 mm.	1.9-2.1 mm.
Propeltidium	2.1-2.3	3.1-3.9
Palpus	14.0-15.0	CL/CW=2.55
Leg 1	10.5-12.0	PW/PL=1.59
Leg 4	18.5-21.0	A/CP =6.25
		CP =7.1-7.5

Coloration of females in alcohol similar to male except considerably paler with dusky markings not as extensive.

Structure similar to other females of group as indicated by measurements and ratios, figure 48 of chelicerae, and figure 49 of opercula. No mesal tooth on movable cheliceral finger; four trace ctenidia on first post-stigmatic abdominal sternite, and palpi also armed ventrally with spine-like setae. TYPE LOCALITY: Male holotype from Roads End, Kern River, Tulare Co., California on July 3, 1956 by V. Roth and W. Gertsch in AMNH. Female allotype from Pearblossom, San Bernardino Co., California on April 26, 1974 by David E. Bixler in FSCA. Female paratype indoors in chaparral association, Alta Loma, San Bernardino Co., California, May 27, 1974 by David E. Bixler in author's collection.

Eremochelis cochiseae new species
Figures 50 to 53

DIAGNOSIS: Males of species readily distinguished from other group members by the curious, almost totally ventral, mesoventral groove, and the very short, broad-bladed, dagger-like abdominal ctenidia. Female opercula similar to other members of group except lateral opercular lobes truncate and lack median lobes on anterior margin of mesal notch.

MALES: Total length 13.0 to 13.5 mm. Allotype larger measurements.

	Length	Width
Chelicerae	3.1-3.2 mm.	1.0-1.1 mm.
Propeltidium	1.6-1.8	2.1-2.2
Palpus	14.0-14.5	CL/CW=2.90
Leg 1	9.0-10.0	PW/PL=1.29
Leg 4	16.0-17.0	A/CP =8.28 CP =4.7-5.0

Coloration in alcohol dusky yellow distinctively marked with dark to dusky purple as follows: eye tubercle dark; propeltidium reticulate dusky with narrow, pale median stripe, an indistinct, light ovate area on each side of eye tubercle, and narrow, pale band along ectal and posterior margin; mesopeltidium, metapeltidium, and abdomen tergites lightly dusky and somewhat darker on lateral margins resulting in two narrow dark dorsal stripes on abdomen; abdominal pleura pale; chelicerae with two dorsal and 1 lateral dark stripes; palpi and legs dark on all segments except basally on femora and all of coxae; venter pale; malleoli pale except for a thin, dark line along ectal margin.

Structure similar to other species of group as shown in measurements and ratios, figure 50 of chelicerae, and figure 51 of abdominal ctenidia. Palpal setae so slender they cannot be counted accurately. No scopula on palpus and fondal tooth size gradient III, II, IV, I ectally and I, III, II, IV mesally. Palpal metatarsus longer than tarsus by a ratio of 1 to 3.7.

FEMALES: Total length 15.0 to 18.0 mm.

	Length	Width
Chelicerae	3.9-4.4 mm.	1.8-1.6 mm.
Propeltidium	2.9-1.8	4.7-2.9
Palpus	11.0-12.0	CL/CW=2.80
Leg 1	8.0-9.5	PW/PL=1.58
Leg 4	15.0-17.0	A/CP =5.50 CP =6.8-6.2

Coloration in alcohol similar to males except females are somewhat paler.

Structure similar to other females of group with specific differences as indicated in measurements and ratios, figure 52 of chelicerae, and figure 53 of opercula. There are 4 trace ctenidia on first post-stigmatic abdominal sternite and palpi also have spine-like ventral setae.

TYPE LOCALITY: Male holotype, female allotype, and male and

female paratypes from Portal, Arizona, Cochise Co, on November 9, 1964 by V. Roth in FSCA.

RECORDS: New Mexico-one female, in can trap in pinyon-juniper life zone, Silver City, November 18, 1972 by M. H. Muma; one male in house, Lake Roberts, Grant Co., August 21, 1981 by Wanda Galloway. Arizona-one female on outside wall of house, Portal, Cochise Co. on October 26, 1986 by M. H. Muma.

REMARKS: This species seems to be closely related in the females to *attritus* (Muma) but is distinctive morphologically and ecologically.

andreasana group

An additional record of the typical species and the description of a new species of the group from Mexico, *E. sonora* Muma (1986-1987), greatly increase our knowledge of group, but do not alter diagnostic characters cited in key to species groups; Muma (1962) apparently failed to illustrate the obscure lateral pits above lateral extensions of female opercula on typical species. This group which also includes *E. rothi* (Muma) is further discussed under the *imperialis* group.

Eremochelis andreasana (Muma)

Therobates andreasana Muma, 1962, p. 16.

Eremochelis andreasana (Muma), Muma, 1970, p.35.

Two males and one young female collected in Organ Pipe Cactus National Monument, Pima Co., Arizona on July 10, 1966 by David Bixler extend range of species.

imperialis group

The new species described here does not significantly alter diagnostic characters of group as presented by Muma (1951, 1962, 1970). Rowland (1974) questioned the existence of fundamental differences between *E. imperialis* (Muma) and *E. andreasana* and he could well be right. However, most species seemingly related to *E. imperialis* have the apex of movable cheliceral finger modified into a more or less distinct cup whereas those apparently related to *E. andreasana* have movable cheliceral finger flanged at most. Further, *imperialis* group species have apical setae of flagellum complex enlarged, whereas *andreasana* group species have these setae serrate but not especially enlarged.

Key to species of the *imperialis* group

(Males and Females)

1. Male fixed cheliceral finger straight basally, lightly curved upward and then curved downward at acute tips; metatarsi of male palpi with elongate, spine-like setae, with no scopula and with dusky markings on tarsi, metatarsi, tibiae and

- femora. Female palpi similarly colored; opercula with anterior lobes and posterior lobes and associated pits.....2
1. Male fixed cheliceral fingers essentially straight and gradually tapered to blunt tips; metatarsi of male palpi with elongate, spine-like setae, scopula of plus or minus 45 papillae, and dusky brownish tarsi, metatarsi, tibiae and apical half of femora that result in lighter palpi than legs that are purplish brown. Female palpi similarly colored; opercula sub-triangular with no associated pits, lie anterior to distinct and elongate vulvular opening.....
.....*E. kastoni* Rowland
2. Movable cheliceral fingers with a slender principal tooth, a tiny anterior intermediate tooth and a slender, elongate cup-like structure that lies behind the upcurved tip; dusky reddish markings on palpi more distinct at unions of tarsi, metatarsi, tibiae and femora; 2 long, slender ctenidia are more than 1/2 length of segment. Females unknown.....
.....*E. undulus* n. sp.
2. Movable cheliceral finger, palpal markings, ctenidial and female characters all different than those cited for *undulus*.....3
3. Male movable cheliceral fingers with distinct apical, cup-like structure involving the up turned finger tip; male palpi dusky purplish on tarsi, metatarsi, tibiae, and apical 1/3 of femora that result in darker palpi than legs; 4 long, slender ctenidia that extend to or just beyond anterior margin of succeeding abdominal sternite. Female palpal coloration similar to male; opercula with slender, elongate anterior lobes, broad, ovate posterior lobes, distinct pits at the angle between the anterior and posterior lobes, and a distinct vulvular opening that lies behind the opercula.....*E. imperialis* (Muma)
3. Male movable cheliceral fingers with distinct, slender principal teeth, no anterior teeth, and a short but very distinct cup-like structure at distal end of lightly curved finger; male palpi dark dusky purplish on tarsi, metatarsi, tibiae, and femoral tips that results in dark palpi, and well marked legs; 4 very long slender ctenidia that extend well beyond the following sternite. Female palpi colored and marked similarly to male; opercula with slender anterior lobes, angular posterior lobes with mesal posterior projections, large pits at the angles between the anterior and posterior lobes and a distinct, elongate vulvular opening that lies posterior to the opercula.....
.....*E. larreae* (Muma)

Eremochelis undulus new species
Figures 54 and 55

DIAGNOSIS: This is an intermediate species of group. It appears to be somewhat related to *E. larreae*. Males have indistinct, apical cup-like structures on both fixed and movable fingers of chelicerae; striate bristles of flagellum complex enlarged but not flattened. There is one dorsally enlarged,

curved, striate seta and the apical plumose seta is slightly flattened. There are 2 elongate, flattened abdominal ctenidia but no palpal scopula. Eyes are separated by 1/2 a diameter.

MALE HOLOTYPE: Total length 12.0 mm.

	Length	Width
Chelicerae	3.1 mm.	1.3
Propeltidium	1.7	2.6
Palpus	12.0	CL/CW=2.38
Leg 1	8.5	PW/PL=1.53
Leg 4	14.0	A/CP =7.10 CP =4.8

Coloration in alcohol somewhat faded but apparently pale yellow with dark eye tubercle, reddish duskiness on tarsus, metatarsus, tibia, and apical end of femur of palpus and a reddish duskiness on femur and tibia of leg 4. All other structures pale or indistinctly dusky.

Structure not entirely typical but approaching that of group as indicated in diagnosis above. Measurements and ratios, figure 54 of chelicerae, and figure 55 of abdominal ctenidia further characterize the species. No anterior or mesal teeth on movable cheliceral finger, but there is one tiny denticule just distal of primary tooth. Both rows of fondal teeth are graded in size I, III, II, IV and there is an indistinct cup-like hollow apically on both of the cheliceral fingers. Palpal metatarsus 3 times the length of tarsus.

TYPE LOCALITY: Male holotype from pits along Sidewinder Road, 11 mi. W of Colorado River, California, April, 1973 in FSCA.

REMARKS: Although unusual characters of species indicate it is not a member of this species-group, the flagellar complex setae have prompted its placement here for the present. Its possible relationship to species of genus *Hemerotrecha* Banks cannot be ignored but strongly modified fingers of chelicerae seem to preclude it from that genus.

Genus *Hemerotrecha* Banks, 1903

Tiny to medium sized Therobatinae. Fixed cheliceral finger of males essentially straight, although it may be denticulate, undulate, or serrate, and completely lacks a mesal or mesoventral groove. Dorsal setae of flagellum complex weakly to strongly striate; ventral setae weakly to strongly plumose. Apical striate seta and sometimes sub-apical striate seta frequently strong, enlarged, flattened or hooked; apical plumose seta may or may not be modified. Female opercular form variable within genus but may be consistent within species groups.

Key to species groups of *Hemerotrecha* Banks

(Males)

1. Fixed cheliceral finger without teeth, denticules or indication of such on ventral surface.....2

- 1.' Fixed cheliceral finger with nearly normal dentition, modified dentition, or at least undulate lower margin indicating dentition.....4
2. Fixed cheliceral finger abruptly narrowed or truncated at apex; apical and sub-apical striate setae of flagellum complex broad, flat and spatulate.....*banksi* group
- 2.' Fixed cheliceral finger gradually tapered from base to tip; apical and sub-apical striate setae of flagellum complex strong but not modified.....3
3. Fixed cheliceral finger curved upward and serrate dorsally; apical striate setae of flagellum complex strongly curved and tubular.....*serrata* group
- 3.' Fixed cheliceral finger essentially straight and smooth dorsally; apical striate setae of flagellum complex distinctly to indistinctly striate.....*simplex* group
4. Apical and sub-apical striate setae and sometimes apical plumose seta strongly flattened, hooked, or flattened and hooked; fixed cheliceral finger provided with modified but recognizable teeth.....*branchi* group
- 4.' Apical and sub-apical striate and plumose setae not modified but sometimes weakly striate or plumose; fixed cheliceral finger undulate or dentate.....5
5. Fixed cheliceral finger undulate ventrally; mesal surface with an indistinct apical hollow.....*texana* group
- 5.' Fixed cheliceral finger provided with nearly normal or female-like dentition; mesal surface without a definable crease or hollow.....*denticulata* group

texana group

Muma (1951) stated that this group was probably heterogeneous but insufficient material was available at that time for further separation. The description of *H. proxima* Muma in 1963 and the description here of 3 new species, all obviously closely related to *H. denticulata* Muma indicate a natural grouping that requires the erection of a separate species group within the genus. This group is here designated to be the *denticulata* group and is characterized in the key above and the descriptions below. *H. simplex* Muma and related species are also segregated into a new species group, here designated the *simplex* group.

The only species left in the *texana* group is the typical species diagnosed in the key above and a presently undescribed species from southern Canada.

simplex group

This group is established for 5 previously described species. They are *H. simplex* Muma and *H. weneri* Muma known only from males, *H. jacintoana* Muma, *H. nevadensis* Muma and *H. steckleri* Muma known only from females, and *H. fruitana* Muma known from both males and females. The group as restricted is

much more homogeneous. The following new species also appears to belong here.

Key to species of the *simplex* group

(Males)

1. Metatarsus of palpus with scopula; abdominal ctenidia long, slender and 6 in number.....*H. simplex* (Muma)
- 1.' Metatarsus of palpus without scopula; abdominal ctenidia short or long and 4 or 8 in number.....2
2. Movable cheliceral finger with 2 intermediate teeth and a low, flat anterior tooth anterior to principal tooth; abdominal ctenidia long, slender, and 8 in number.....*H. weneri* (Muma)
- 2.' Movable cheliceral finger with 2 intermediate teeth (anterior one often missing) and a low, rounded ridge anterior to principal tooth; abdominal ctenidia short, slender and 4 in number.....*H. fruitana* (Muma)

Hemerotrecha maricopana new species
Figures 56 and 57

DIAGNOSIS: Species colored and marked similarly to *H. texana* except the markings are paler than *texana*. Opercula distinctive as are 4 trace ctenidia on first post-spiracular abdominal sternite.

FEMALE HOLOTYPE: Total length 24.0.

	Length	Width
Chelicerae	6.0 mm.	2.2 mm.
Propeltidium	2.6	3.6
Palpus	18.0	CL/CW=2.73
Leg 1	13.0	PW/PL=1.38
Leg 4	25.0	A/CP =6.51 CP =8.6

Coloration in alcohol pale yellow marked with dusky purple as follows: eye tubercle dark; propeltidium reticulate dusky except for a narrow median pale stripe and a narrow margin band; mesopeltidium, metapeltidium, and abdominal tergites distinctly to indistinctly dusky marginally; abdominal pleura, venters, malleoli, and chelicerae pale; palpi dusky on tarsi, metatarsi, tibiae, and most of femora; legs 1 to 4 dusky on femora and tibiae, leg 2 with least marking.

Structure similar to other females of group with specific differences as indicated in measurements and ratios, figure 56 of chelicerae, and figure 57 of opercula. A distinct mesal tooth on movable finger of chelicerae, both rows of fondal teeth graded in size I, III, II, IV, V, palpi have 5 mesoventral spine-like setae on femora and 3 pairs ventrally on tibiae. There are 4 trace ctenidia on first post-spiracular abdominal sternite. Palpal metatarsi 3.5 times length of tarsi.

TYPE LOCALITY: Female holotype taken in pitfall trap on South Mountain, Phoenix, Maricopa Co., Arizona on September 10, 1966. by S. C. Williams in CAS.

denticulata group

Small to moderate sized species. Males with fixed cheliceral finger bearing aborted teeth and lacking a mesal or mesoventral groove. Striate bristles of flagellum complex indistinctly to distinctly striate or possibly smooth; apical plumose bristles also indistinctly to distinctly plumose. Eyes separated by about one diameter. Palpi armed ventrally with long, slender, spine-like setae and with or without a scopula. All known males also have 2, 4, or 6 post-stigmatic abdominal ctenidia. Female opercula strongly to slightly constricted laterally just anterior to posteriolateral lobes but otherwise variable.

All known males of this species group convey the impression they are in the penultimate instar prior to true maturity. Despite this, males of previously described species and those described here, possess characters such as ctenidia and scopula, found only on mature males of other families, genera, and species groups of solpugids. Further, several vials of the most common species, *H. denticulata*, recorded in Muma (1951) contained both males and females indicating maturity of males and association with females. Males of all other known species of Eremobatidae mature prior to females. In Muma (1963), *denticulata* males matured in early October, females in late October and November.

For these reasons, this species group is erected here and will be maintained until adequate data indicate that it is invalid.

Key to species of *denticulata* group

(Males)

1. Dusky, deep purplish markings on palpal tarsi, metatarsi, tibiae, and distal ends of femora.....2
- 1.'Faint, indistinct or distinct pale purplish markings on palpal tarsi, metatarsi, tibiae and distal ends of femora...4
2. Small-sized species (9-12 mm.) with 2 long, slender ctenidia; with a scopula of 5-15 small papillae; with movable finger, dental group basal.....*H. proxima* Muma
- 2.'Medium-sized species (10-18 mm.) with 4 ctenidia; with a scopula of 50-120 papillae.....3
3. Ctenidia long and slender; 120 papillae in scopula; movable finger dental group basal.....*H. denticulata* Muma
- 3.'Ctenidia short and slender; 50 papillae in scopula; movable finger dental group distal.....*H. neotena* n. sp.
4. Small-sized species (11 mm.) with 4 very long ctenidia, extending beyond posterior margin of succeeding sternite; with 40 papillae in scopula.....*H. parva* n.sp.
- 4.'Medium-sized species (16-18 mm.) with 6 ctenidia; with a scopula of 100-140 papillae.....5
5. Ctenidia very long and slender, extending beyond posterior of succeeding sternite; 100 papillae in scopula
-*H. carsonana* n. sp.
- 5.'Ctenidia long and slender, extending across sternite; 140 papillae in scopula.....*H. delicatula* n. sp.

Hemerotrecha denticulata Muma

Hemerotrecha denticulata Muma, 1951, p. 105; Muma, 1970, p. 39

Range of species was extended by Allred and Muma (1971) who recorded both sexes in May and June from the National Reactor Testing Station at Idaho Falls, Idaho. A male collected at 5900 ft. S of Callahan, Siskiyou Co., California on August 13, 1972 by Hugh B. Leech also extends range. Species now known from California, Idaho, Nevada, Utah, and Washington in and around the Great Basin.

Hemerotrecha parva new species

Figures 58 and 59

DIAGNOSIS: Species is size of *H. proxima* and has similar cheliceral profile but has a palpal scopula of 40 papillae, 4 slender ctenidia longer than the succeeding sternite and lacks the distinctive coloration of *proxima*. It is much smaller than *H. denticulata* and has a similar but different cheliceral pattern. Females are not known.

MALE HOLOTYPE: Total length 11.0 mm.

	Length	Width
Chelicerae	0.29 mm.	0.13 mm.
Propeltidium	0.10	0.18
Palpus	12.0	CL/CW=2.23
Leg 1	8.5	PW/PL=1.80
Leg 4	14.0	A/CP =8.85
		CP =0.39

Coloration in alcohol apparently entirely pale yellow except for palpal tarsus, metatarsus, tibia, and apical end of femur, and leg 4 apical end of femur and basal end of tibia which are faintly to indistinctly dusky.

Structure similar to other males of group but specifically different as indicated in measurements and ratios, figure 58 of chelicera, and figure 59 of abdominal ctenidia. No mesal tooth on movable cheliceral finger, fonal teeth graded in size I, III, II, IV, V, and ventral spine-like palpal setae much too slender for evaluation and counting. Setae occur on femora, tibiae. and metatarsi. Palpal metatarsus 3+ times as long as tarsus.

TYPE LOCALITY: Male holotype from Vernal, Utah, September 17, 1947 by O. Bryant in CAS.

Hemerotrecha delicatula new species

Figures 60 and 61

DIAGNOSIS: Species within size range of *H. denticulata* and has very similar cheliceral profile but has a palpal scopula of 140+ papillae, 6 long slender ctenidia, and a greatly reduced color pattern. Similar in color pattern to *H. parva* and *H. proxima* but is much larger and has a greater number of ctenidia and scopular papillae than either of these two species.

MALE HOLOTYPE: Total length 16.0 mm.

	Length	Width
Chelicerae	0.34 mm.	0.16 mm.
Propeltidium	0.18	0.24
Palpus	16.0	CL/CW=2.13
Leg 1	12.0	PW/PL=1.26
Leg 4	20.5	A/CP =9.32
		CP =0.52

Coloration in alcohol pale yellow marked with dusky purple as follows: eye tubercle dark; propeltidium reticulate dusky except for a narrow, pale, median stripe and a narrow, pale, marginal band; mesopeltidium, metapeltidium, and abdominal tergites apparently totally lacking dusky markings; abdominal pleura, venter, malleoli, and chelicerae pale; palpi dusky on tarsi, metatarsi, tibiae, and apical half of femora; legs dusky on apical end of femora and proximal end of tibiae, most extensive on leg 4 and least extensive on leg 2.

Structure similar to other males of group but specifically different as indicated in measurements and ratios, figure 60 of chelicerae, and figure 61 of abdominal ctenidia. No mesal tooth on movable finger of chelicerae, fondal teeth graded I, III, II, IV for both rows and ventral spine-like setae of palpus are too slender to evaluate and count. Palpal metatarsus 4 times the length of tarsus.

TYPE LOCALITY: Male holotype from 5400 ft. elevation at Nipple Bench, 6.5 Km. SE Tippet Spring, Kane Co., Utah on October 17, 1971 by Donald M. Allred in BYU.

REMARKS: Two males with 6 ctenidia identified by Muma (1962) as *H. denticulata* may well be this species.

Hemerotrecha carsonana new species
Figures 62 and 63

DIAGNOSIS: Species seems to be closely related to *delicatula* new species in size, number of ctenidia, and number of papillae in palpal scopula but it virtually lacks purple markings, has definitive spine-like setae on palpal femora, tibiae, and metatarsi. It also has a slightly different cheliceral profile.

MALE HOLOTYPE: Total length 17.25.

	Length	Width
Chelicerae	0.50 mm.	0.25 mm.
Propeltidium	0.30	0.35
Palpus	18.0	CL/CW=2.00
Leg 1	13.0	PW/PL=1.16
Leg 4	23.5	A/CP =6.87
		CP =0.80

Coloration in alcohol pale to dusty yellow except perhaps lightly dusky yellow apically on femora and all of tibiae, metatarsi, and tarsi of palpi. Fourth legs distinctly dusky to dark at union of femora and tibiae.

Structure similar to other males of group but specifically different as indicated in measurements and ratios, figure 62 of chelicerae, and figure 63 of ctenidia. No distinct mesal tooth on movable cheliceral finger and fondal teeth

graded in size I, III, II, IV, V for both rows. Spine-like setae on metatarsi (5-6), tibiae (2-3), and femora (3-4) of palpi. Palpal metatarsus 3+ times length of tarsi.
 TYPE LOCALITY: Male holotype collected X-5-79 at Carson City, Lyon Co, Nevada by E. L. Marshall (79J10-4) in FSCA.

Hemerotrecha neotena new species
 Figures 64 to 67

DIAGNOSIS: Most divergent species of group. Males readily identified by obviously modified but strongly developed cheliceral dentition, 4 short slender abdominal ctenidia, and apically located scopula of plus or minus 50 papillae on palpal metatarsus. Females have distinctive opercula for group and have a scopula of 5 to 10 widely spaced papillae on palpal metatarsus. Both sexes have only 1 claw on tarsus of leg 1.

MALE HOLOTYPE: Total length 18.0 mm.

	Length	Width
Chelicerae	4.2 mm.	2.0 mm.
Propeltidium	2.5	3.5
Palpus	13.0	CL/CW=2.1
Leg 1	11.5	PW/PL=1.5
Leg 4	18.5	A/CP =6.5
		CP =6.7

Coloration in alcohol dusky yellow with purplish brown markings as follows: chelicerae with a narrow lightly dusky dorsal stripe and a similar lateral stripe; eye tubercle dark; propeltidium distinctly dusky on anterior 2/3 except for a pale oval area on each side of eye tubercle, an elongate pale area extending from eye tubercle to posterior margin, and a narrow yellow stripe extending from posterior margin to eye tubercle; mesopeltidium, metapeltidium, and abdominal tergites faded but dusky from apical third of femora through tarsi; legs 1 and 2 pale; legs 3 and 4 dusky from apical third of femora to tarsi; malleoli discolored but apparently pale.

Structure similar to other males of group but distinctive as indicated in measurements and ratios, figure 64 of chelicerae, and figure 65 of ctenidia. A mesal tooth present on movable cheliceral finger but it is not very distinct. Fungal teeth graded in size III, I, IV, II, V. There are spine-like setae on palpal femora (4-5) and tibiae (4-5). Palpal metatarsus 3 times as long as tarsus.

FEMALE ALLOTYPE: Total length 23.0 mm.

	Length	Width
Chelicerae	6.0 mm.	2.5 mm.
Propeltidium	3.0	4.5
Palpus	15.0	CL/CW=2.4
Leg 1	13.0	PW/PL=1.5
Leg 4	20.0	A/CP =5.3
		CP =9.0

Coloration in alcohol apparently same as male but more distinct. Single female somewhat faded.

Structure similar to other females of group with specific

differences as indicated in measurements and ratios and figure 66 of opercula. Chelicerae much too worn to be of diagnostic value. Movable cheliceral finger mesal tooth very indistinct if present. Spine-like palpal setae same as male. There are four trace ctenidia on specimen, figure 67.

TYPE LOCALITY: Male holotype, female allotype, and male paratype taken in pitfall traps between August 24 and October 18, 1973 in Sitgreaves N. F., Coconino Co., Arizona on Chevelon Rd., Sec. 23, T13N, R13E at 7200 ft. elevation beneath an overstory of *Pinus ponderosa* by D. T. Jennings in FSCA.

REMARKS: This is the largest known species of group and to date has been collected farther south than any other species.

branchi group

Species described here demonstrate a need for a review and revision of diagnostic characters of group as presented by Muma (1951, 1962, and 1970). These species are tiny to small. Males have greatly reduced or modified teeth on ventral margin of fixed cheliceral finger. Striate bristles of flagellum complex may be either flattened basally or apically and with or without an apical hook, or tubular, hooked and blunt or truncate at tip. Females apparently have vulvular opening between half-round to semi-obovate opercula, longitudinal rather than transverse. Eyes separated by about 1 diameter.

Muma (1962) included *Datames carolinianus* Kraepelin, *Datames sulfureus* Simon, and *Eremocantha robusta* Roewer in this species group because of Roewer's (1934) illustrations of opercula. Muma (1970) found that these species were immature *Eremobates* and *Eremorhax*. Muma (1962) also described and referred here *H. elpasoensis* Muma. Opercula of this species so similar to *H. fruitana* Muma as figured by Brookhart (1965) that it is probable that *elpasoensis* is a synonym of *fruitana*.

Key to species of the *branchi* group

(Males and Females)

1. Palpi dusky and leg 1 faintly to distinctly dusky; palpal tarsus of both sexes less than 1 1/2 times as long as wide..2
- 1.' Palpi and legs either pale or faintly to distinctly dusky; palpal tarsus of both sexes 1 1/2 to 2 1/2 times as long as wide.....4
2. Movable finger of chelicerae with one intermediate tooth; females with an elongate open area between the opercula.....
.....*H. milsteadii* Muma
- 2.' Movable finger of chelicerae with two intermediate teeth; females previously unknown. (*H. marathoni*, known only from a female with a short open area between opercula, seems to be female of *H. minima*.....3
3. Males without a palpal scopula; abdominal ctenidia shorter than succeeding sternite; striate bristles of flagellum

- complex flattened apically.....*H. minima* Muma
- 3.' Males with palpal scopula; abdominal ctenidia longer than succeeding sternite; striate bristles of flagellum complex flattened basally.....*H. macra* Muma
4. Males without palpal scopula; females unknown....*H. xena* Muma
- 4.' Males with palpal scopula; females known for one species....5
5. Males with scopula of 30+ papillae and 3 apically hooked flagellar setae; females unknown.....*H. branchi* Muma
- 5.' Males with scopula of 60+ papillae and 1 apically hooked flagellar seta; females have opercula adjacent and hollowed mesally.....*H. bixleri* n. sp.

Hemerotrecha milsteadi Muma
Figures 68 and 69

Hemerotrecha milsteadi Muma, 1962, p. 35; Muma, 1970, p. 43.
(female)

A male of species collected at light 8.9 mi. N of Van Horn, Texas on July 11, 1974 by J. O. Brookhart and M. H. Muma is described here as allotype of species. Further, Muma (1974) recorded a female of species from New Mexico as *H. marathoni* Muma. Species is now known from Texas and New Mexico.

DIAGNOSIS: Males and females of species distinguished from all other species of group by possession of only one intermediate tooth on movable cheliceral finger and short, thick, dark palpi. Males have striate bristles of flagellum complex flattened basally, one apically hooked and flattened flagellar seta, a palpal scopula of 30-40 papillae, and two abdominal ctenidia that extend 3/4 length of succeeding sternite. Females distinguished by mesally separated opercula.

MALE ALLOTYPE: Total length 8.5 mm.

	Length	Width
Chelicerae	2.1 mm.	0.8 mm.
Propeltidium	1.1	1.7
Palpus	6.5	CL/CW=2.63
Leg 1	4.5	PW/PL=1.55
Leg 4	8.5	A/CP =6.00
		CP =3.2

Coloration in alcohol pale yellow with dusky purplish markings as follows: eye tubercle dark; propeltidium dusky around eye tubercle; chelicerae with 2 faint dusky stripes above; palpi dusky on tarsus, metatarsus, tibia, and apical end of femur; leg 4 dusky around union of femur and tibia.

Structure similar to other males of group but specifically different as indicated in measurements and ratios, figure 68 of chelicerae, and figure 69 of abdominal ctenidia. Metatarsus of palpus 3.5 times as long as tarsus which is only slightly longer than wide. No mesal tooth on movable cheliceral finger and fondal teeth are aborted to unmeasurable denticules.

TYPE LOCALITY: Female holotype from Sierra Vieja, 11 miles W of Valentine, Presidio, Texas by W. W. Milstead. Male allotype at light 8.9 miles N of Van Horn, Texas on July 11, 1974 by J. O.

Brookhart and M. H. Muma. Female holotype in AMNH, male allotype in FSCA.

REMARKS: Female from Van Horn, Texas on June 26, 1964 and a female from 10 miles north of Deming, New Mexico on June 30, 1973 have more coloration than holotype. Palpal duskiness extends onto femur, first leg faintly dusky on tarsus, metatarsus, tibia, and apical end of femur and fourth leg dusky around union of femur and tibia.

Hemerotrecha bixleri new species
Figures 70 to 73

DIAGNOSIS: Males and females of species have palpal tarsus between 1 1/2 and 2 times as long as wide. Males differ from similar species in having striate bristles of flagellum complex flattened basally, only 1 apically hooked flagellar seta, a palpal scopula of 60+ papillae, and 2 abdominal ctenidia that are only 2/3 as long as succeeding sternite. Females distinguished by having opercula adjacent for entire length and concave mesally.

MALES: Total length 10.5 to 13.0 mm. Holotype smaller measurements.

	Length	Width
Chelicerae	1.6-3.1 mm.	1.1-1.3 mm.
Propeltidium	1.6-1.8	2.3-2.6
Palpus	1.9-10.0	CL/CW=2.00
Leg 1	5.5-7.0	PW/PL=1.47
Leg 4	12.0-12.5	A/CP =6.83 CP =3.2-4.9

Coloration in alcohol pale to rusty yellow with dusky purplish red markings as follows: eye tubercle dark; propeltidium lightly dusky except for a pale obovate area that extends from eye tubercle nearly to posterior margin; mesopeltidium, metapeltidium, and abdominal tergites indistinctly reticulate dusky; abdominal pleura, venter, malleoli, and chelicerae pale; palpi and leg 1 dusky on tarsus, metatarsus, tibia, and distal end of femur; leg 4 dusky on apical end of femur, tibia, and metatarsus; legs 2 and 3 pale.

Structure similar to other males of group but specifically different as shown in diagnosis, measurements and ratios, figure 70 of chelicerae, and figure 71 of abdominal ctenidia. Fondal tooth formula III, II, I, IV ectally and I, III, II, IV mesally. Palpal metatarsus 3 times length of tarsus.

FEMALE ALLOTYPE: Total length 12.0 mm.

	Length	Width
Chelicerae	3.1 mm.	1.3 mm.
Propeltidium	1.6	2.3
Palpus	8.0	CL/CW=2.38
Leg 1	5.0	PW/PL=1.44
Leg 4	11.0	A/CP =5.21 CP =4.7

Coloration in alcohol similar to male but markings not quite as distinct.

Structure similar to male and other females of group but specifically different as shown in diagnosis, measurements and ratios, figure 72 of chelicerae, and figure 73 of opercula. No mesal tooth and both rows of fondal teeth graded in size I, III, II, IV.

TYPE LOCALITY: Male holotype, male paratype, and female allotype from Tucson Mts., Arizona at 3000 ft. between July 20 and 30, 1967 by David Bixler in FSCA.

FAMILY AMMOTRECHIDAE ROEWER, 1934

Muma (1951, 1962, and 1963) supported Roewer's (1934) separation of ammotrechid subfamilies and genera on the basis of leg tarsal segmentation, tarsal spine-like setation, and cheliceral dental and flagellar patterns. However, recent studies have indicated that setal characters are subject to variation and may not be valid diagnostic structures, especially when used alone or without supporting characters, Muma (1970) and Muma and Nezaric (1971).

At the present time, male specimens of *Ammotrechula* Roewer can be distinguished from those of other ammotrechine genera by slight to extreme modifications of fixed cheliceral fingers. This is proving to be the largest genus in continental North America. Ten species are presently known. However, Roewer's other genera all contain males that have unmodified chelicerae that are either similar to those of females or lack dorsal carinae. Since most of his genera are South American this does not pose a problem in North American studies except with the genera *Ammotrecha* Banks, *Ammotrechella* Roewer, and *Ammotrechona* Roewer. The latter is known from only one Cuban species questionably recorded from Florida by Roewer (1934) but excluded by Muma (1951). *Ammotrecha* is widespread in North and Central America, Muma (1951-1970). *Ammotrechella* is found in Florida, southeastern Texas, Mexico, Central America, and the West Indies, Muma (1951 and 1970) and Muma and Nezaric (1971). Males cannot be distinguished generically except by tarsal spine-like setation. Females of all four genera cannot be distinguished except by counting the spine-like setae on tarsi. As a consequence of these problems, female Ammotrechinae in North America and the West Indies will not be further recorded or described until reliable generic characters have been found, delineated, and recorded or unless specific characters, color patterns, and distributions are unique. Male Ammotrechinae and distinctively marked females from these regions, especially *Ammotrechula* from southwestern North America, *Ammotrecha* from southwestern North America and Central America, and *Ammotrechella* from southeastern North America, the West Indies, and Central America will be tentatively placed generically on the bases of cheliceral

modification, specimen distribution, and leg, tarsal, spine-like setation and recorded.

The only other subfamily of Ammotrechidae known to occur in North America, the Saronominae, is represented by a single genus, *Branchia* Muma, and three described species. Females can be adequately placed morphologically if associated with males or their distribution coincides with known specific ranges. Males are distinctive.

Genus *Ammotrechula* Roewer, 1934

Roewer's (1934) leg, tarsal spine-like setal formulae for this genus are 1, 2, 2, 2, 1 for legs 2 and 3 and 2, 2-2-2, 2 for leg 4. Species have mesal tooth on movable cheliceral finger and one intermediate and two primary teeth distad of principal tooth on fixed cheliceral finger. Males of genus have fixed cheliceral finger thickened, attenuated, constricted, or otherwise modified.

Key to species of *Ammotrechula* Roewer

1. Palpi with two rows of numerous unpaired spine-like setae on metatarsus or without spine-like setae.....2
- 1.' Palpi with 2 to 8 pairs of spine-like setae on metatarsus..4
2. Palpal metatarsus and tibia both with two rows of numerous unpaired spine-like seta; male fixed cheliceral finger undulate ventrally.....*A. borregoensis* Muma
- 2.' Palpal metatarsus and tibia without spine-like seta.....3
3. Palpal tarsi and most of metatarsi pale, dusky on tibia and femora; male fixed finger attenuate, with one denticule and gradually tapered from base to tip.....*A. lacuna* Muma
- 3.' Palpal tarsi, metatarsi, tibiae, and femora dusky; male fixed finger attenuate, with two modified teeth and abruptly tapered near tip.....*A. pilosa* Muma
4. Palpal metatarsus with pairs of spine-like seta; tibia without.....5
- 4.' Palpal metatarsus and tibia both with pairs of spine-like setae.....7
5. Movable cheliceral finger with 2 intermediate teeth; palpal metatarsus with 5 pairs of spine-like setae; legs and palpi essentially pale; male fixed finger elongate and slender but toothed.....*A. saltatrix* (Simon)
- 5.' Movable cheliceral finger with 1 intermediate tooth; palpal metatarsus with less than 5 pairs of spine-like setae; legs and/or palpi essentially dusky; male fixed finger attenuate and with 2 reduced modified teeth.....6
6. Legs dusky except for coxae; palpal metatarsus with 2 pairs and 1 unpaired spine-like setae; male fixed cheliceral finger essentially straight.....*A. wasbaueri* Muma
- 6.' Legs pale except for femur and tibia of leg 4; palpal metatarsus with 4 pairs of spine-like setae; male fixed

- cheliceral finger bent downward.....*A. mulaiki* Muma
7. Palpal metatarsi and tibiae with 7 pairs of spine-like setae; palpi dark, legs dusky; male fixed cheliceral finger straight and evenly curved.....*A. venusta* Muma
- 7.' Palpal metatarsi and tibiae with 8 pairs of spine-like setae; palpi and leg markings variable; male fixed cheliceral finger constricted near tip.....8
8. Palpal tarsi and metatarsi dark; legs dusky or annulate with pale tarsi; peltidial and abdominal tergite coloration variable light to dark; known from males and females, widespread.....*A. peninsulana* (Banks)
- 8.' Palpal tarsi and metatarsi essentially light; legs 1-3 dusky, leg 4 pale with dark tarsi; peltidia and abdominal tergites dark; known only from females and young in southcentral Arizona.....*A. catalinae* n. sp.

Ammotrechula catalinae new species
 Figures 74 to 77

DIAGNOSIS: Although species seems to be related to *A. venusta* in *peninsulana* species group of genus, this cannot be assumed in absence of males. It is readily identified by its strikingly distinctive color pattern and presence of 8 pairs of strong, thickened cylinder bristles on palpal tibia and metatarsus.

FEMALE HOLOTYPE: Total length 14.5 mm. Chelicerae 1.3 mm. wide and 3.7 mm. long. Propeltidium 3.0 mm. wide and 2.2 mm. long.

Coloration in alcohol pale to rusty yellow with dusky purplish and dark, almost black, purplish brown markings as follows: venter, sternites, malleoli, and lower surfaces of appendage coxae and most leg segments pale to rusty yellow; chelicerae pale to rusty yellow with 2 dark, anteriorly-united, dorsal stripes, a short lateral stripe and scattered ectal spots; eye tubercle black; propeltidium mostly dark with a narrow yellow median stripe, a narrow submarginal stripe laterally and posteriorly, a pale ovate area on each side of eye tubercle, and lateral lobes dark, figure 74; mesopeltidium, metapeltidium, and abdominal tergites very dark in contrast to pale pleura; palpi with tarsi pale, metatarsi dusky to dark on apical third but pale basally, tibiae dark, and femora dusky to dark on apical two-thirds and pale basally, figure 75; legs 1, 2, and 3 dusky above on coxae, femora, tibiae, metatarsi, and tarsi; leg 4 pale to dusty yellow on all segments except tarsi which are distinctly dusky.

Structure similar to other females of genus. Dentition as shown in figure 76; mesal tooth present; carina with peak distal of first fondal tooth. Palpus as shown in figure 75; basal pair of strong, thick cylinder bristles on tibia not long and slender. Opercula as shown in figure 77.

Chelicerae 2.9 times longer than wide. Propeltidium 1.4 times wider than long. Opercula 1.9 times wider than long with opercula notch slightly more than $\frac{2}{3}$ as long as opercula.

TYPE LOCALITY: Female holotype and two immatures from 3000 ft. elevation in Santa Catalina Mountains, Pima County, Arizona in November 1967 by David Bixler in DPI.

Anmotrechula borregoensis Muma

Anmotrechula borregoensis Muma, 1962, p. 41; Muma, 1970, p. 53. (females).

Anmotrechula dolabra Muma, 1963, p. 5; Muma, 1970, p. 53. (males)

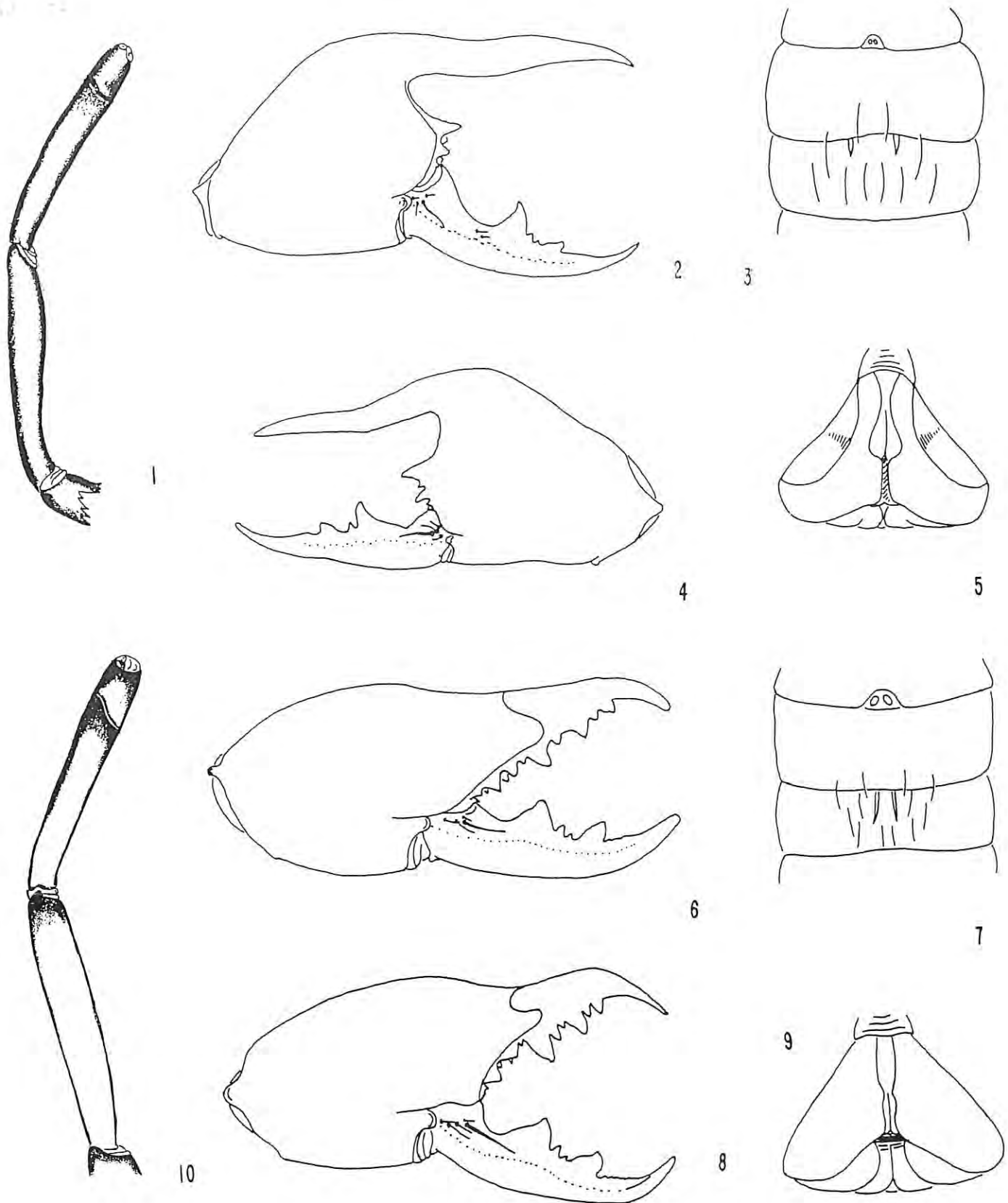
New Synonymy

The above synonymy was indicated by the collection of 3 males and 3 females in pit traps at San Diego, California, June 1971 by B. J. Kaston.

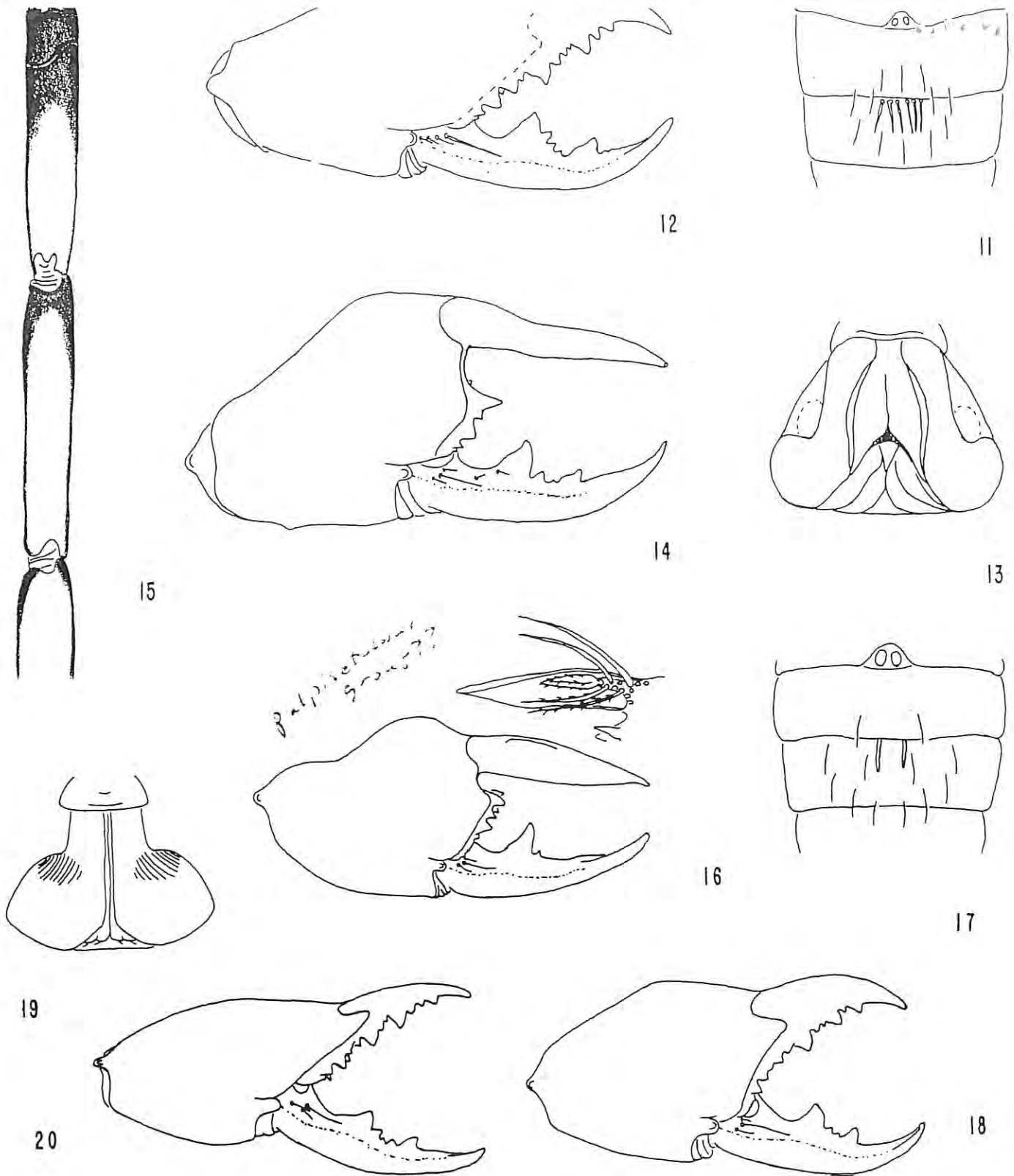
LITERATURE CITED

- Banks, Nathan. 1899. A new solpugid from California. Proc. Ent. Soc. Washington. 4:314-315.
- _____. 1900. Synopses of North American Invertebrates. IX The scorpions, solpugids and pedipalpi. American Nat. 34:421-427.
- _____. 1903. A new genus of Solpugida. Ent. News. 14:78-79.
- Brookhart, J.O. 1965. Two new solpugids from Colorado and notes on other species. Jour. New York Ent. Soc. 73:151-155.
- _____. 1972. Solpugida (Arachnida) in Colorado. Southwestern Naturalist 17(1):31-41.
- Brookhart, J. O. and Martin H. Muma. 1981. The *pallipes* species-group of *Eremobates* Banks (Solpugida:Arachnida) in the United States. Florida Ent. 64(2):283-308.
- _____. 1987. *Arenotherus*, a new genus of Eremobatidae (Solpugida) from the United States. Cherry Creek High School Print Shop, pp. 1-18 (Printed September 1987).
- Fichter, Edson. 1940. Studies of North American Solpugids: I The true identity of *Eremobates pallipes* (Say). American Midland Nat. 24:351-360.
- Kraepelin, Karl. 1899. Zur Systematik der Solifugen. Mitt Naturhist. Mus. Hamburg, 16 Jahrgang:197-259.
- _____. 1901. Palpigradi und Solifugae in Das Tierreich. Leipzig Deutsche Zoologischer Gesellschaft, No. 12:159 pp.
- Muma, Martin H. 1951. The arachnid order Solpugida in the United States. Bull. Amer. Mus. Natur. Hist. 92(2):35-141.
- _____. 1962. The arachnid order Solpugida in the United States: Suppl. 1. Amer. Mus. Novitates, No. 2092:1-44.
- _____. 1963. Solpugida of the Nevada Test Site. Brigham Young Univ. Sci. Bull. Biol. Ser. 3(2):1-14.
- _____. 1970. A synoptic review of North American, Central American, and West Indian Solpugida (Arthropoda:Arachnida). Arthropods of Florida and Neighboring Land Areas, Vol. 5:1-62.
- _____. 1971. A new *Ammotrechella* Roewer (Solpugida:Ammotrechidae) from Jamaica. Florida Ent. 54(1):97-99.

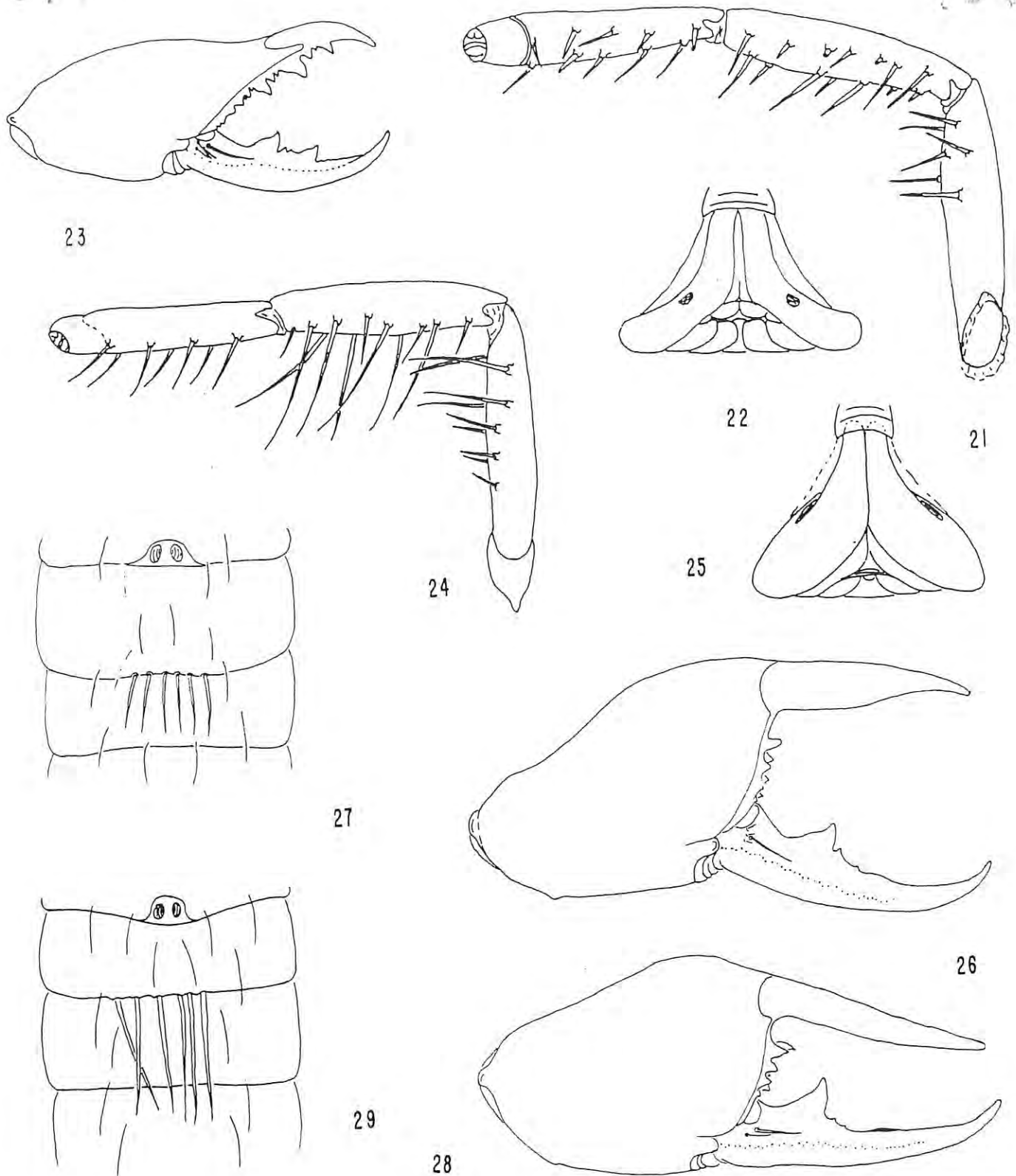
- Muma, Martin H. 1974. Solpugid populations in southwestern New Mexico, Florida Ent. 54(4):385-392.
- _____. 1985. A new, possibly diagnostic, character for Solpugida (Arachnida). Novit. Arthropodae (Jour. Nat. Hist), J-B Publ. Co., Crete, Nebraska, 2(2):1-5.
- _____. 1986 and 1987. New species and records of Solpugida (Arachnida) from Mexico, Central America, and the West Indies. Novitates Arthropodae (Jour. Nat. Hist.), J-B Pub. Co., Crete, Nebraska, vol. 2, no. 3, pp. 1-31 and privately published in Silver City, New Mexico, pp. 1-31 to satisfy printing requirements of I.C.Z.N., 1985.
- Muma, Martin H. and Maria L. Nezarario. 1971. New solpugids (Arachnida:Solpugida) from Puerto Rico. Jour. Agr. Univ. Puerto Rico 55(4):605-512.
- Pocock, R. I. 1895. Notes on some Solifugae contained in the collection of the British Museum with descriptions of new species. Ann. Mag. Nat. Hist., Ser. 6, 16:74-98.
- _____. 1902. Arachnida:Scorpiones, Pedipalpi and Solifugae: in Biologia Centrali Americana, London, Zoology, Arachnida. 3:1-72.
- Putnam, J. D. 1883. The Solpugidae of America: papers of J. Duncan Putnam, arranged for publication by Herbert Osborn. Proc. Davenport Acad. Natur. Sci. 3:249-310.
- Roewer, C. F. 1934. Solifugae, Palpigradi: in Bronn, H. G. Klassen und Ordnungen des Tierreichs. Leipzig 55 (div. 4, buch 4):1-723.
- Rowland, J. Mark. 1974. A new solpugid of the genus *Eremochelis* (Arachnida:Solpugida:Eremobatidae) from California with a key to males of the genus. Texas Tech Univ. Occ. Papers (25):1-8.
- Say, Thomas. 1823. (Descriptions of *Galeodes pallipes* Say and *Galeodes subulata* Say): in James Edwin, Account of an expedition from Pittsburgh to the Rocky Mountains under Major Stephen H. Long. Philadelphia 2:3.
- Simon, Eugene. 1879. Essai d'une classification des Galeodes. Ann. Soc. Ent. France, ser. 5, 9:93-154.



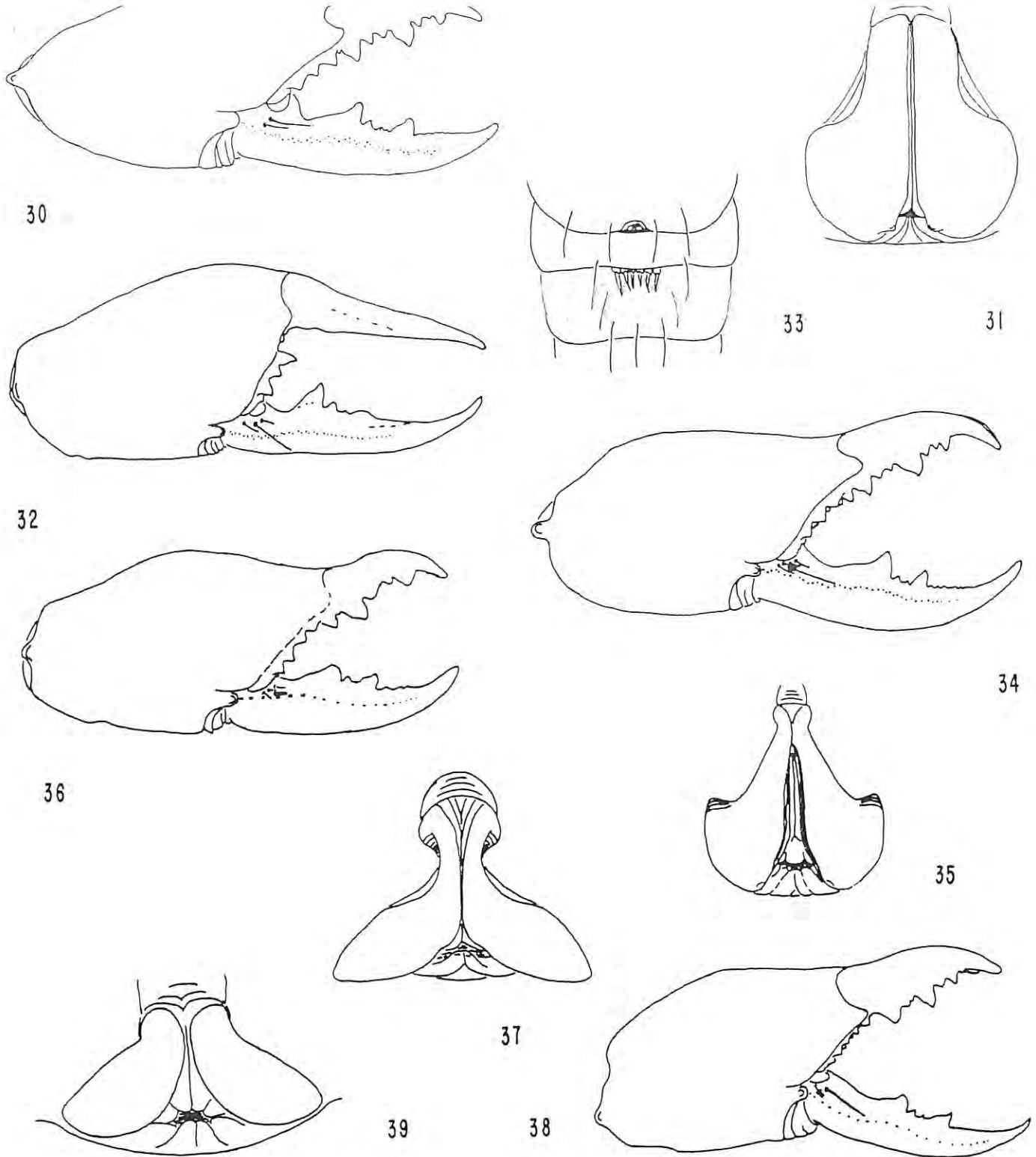
Figures 1 to 10: *Eremobates actenidia* new species. 1. Meso-lateral view of right male palpus; 2. Ecto-lateral view of right male chelicera. *Eremobates clarus* new species; 3. Ventral view of male ctenidia; 4. Ecto-lateral view of left male chelicera. *Eremobates consors* new species. 5. Ventral view of female opercula; 6. Ecto-lateral view of right female chelicera. *Eremobates flavus* new species. 7. Ventral view of male ctenidia; 8. Ecto-lateral view of right female chelicera; 9. Ventral view of female opercula. *Eremobates mimbrenus* new species. 10. Meso-lateral view of right male palpus.



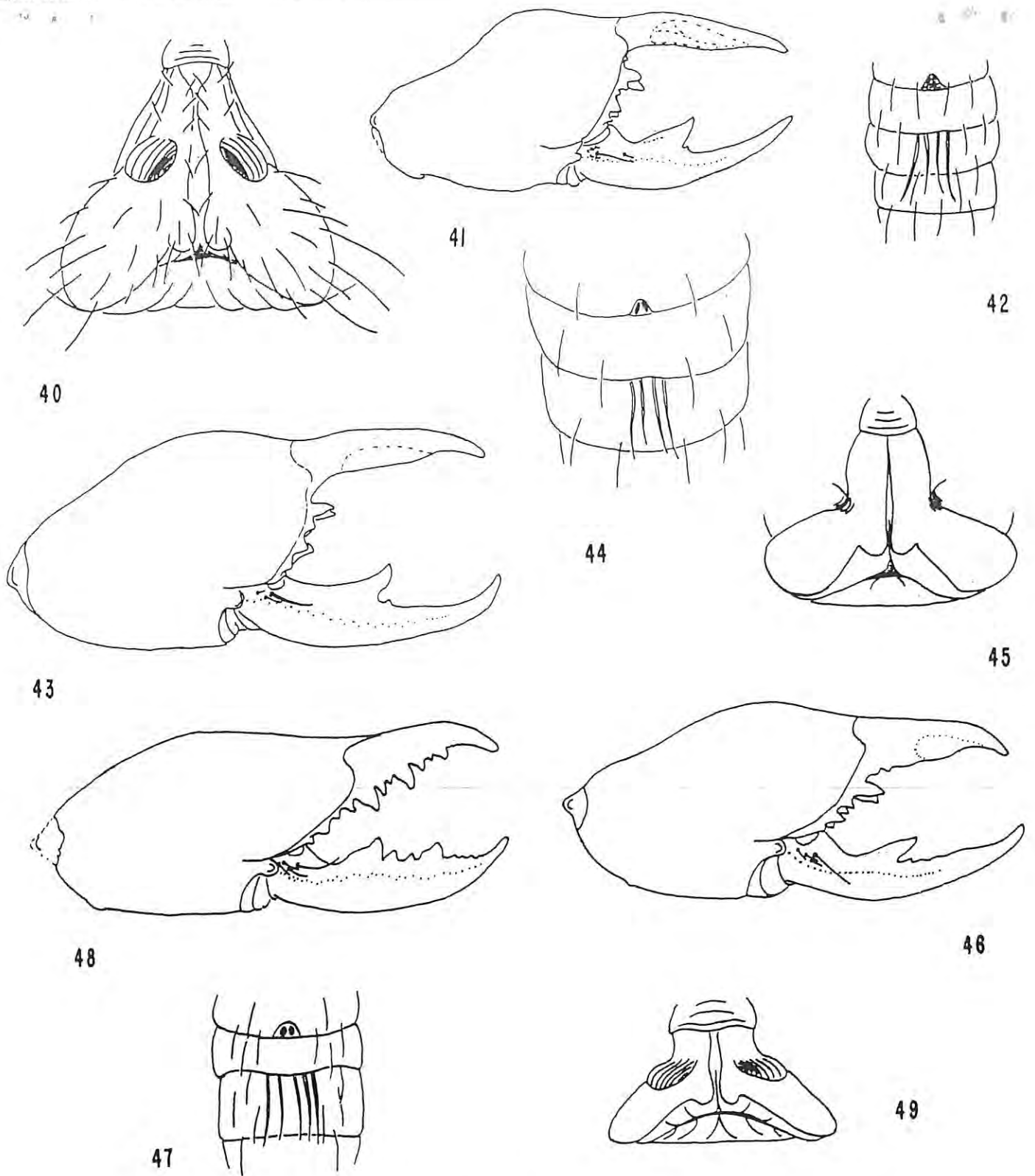
Figures 11 to 20: *Eremobates mimbrenus* new species. 11. Ventral view of male ctenidia; 12. Ecto-lateral view of right female chelicera; 13. Ventral view of female opercula. *Eremobates hodai* new species. 14. Ecto-lateral view of right male chelicera. *Eremobates vallis* new species. 15. Meso-lateral view of right male palpus; 16. Ecto-lateral view of right male chelicera and meso-lateral view of fixed cheliceral finger. 17. Ventral view of male ctenidia. 18. Ecto-lateral view of right female chelicera; 19. Ventral view of female opercula. *Horribates minimus* new species; 20. Ecto-lateral view of right female chelicera.



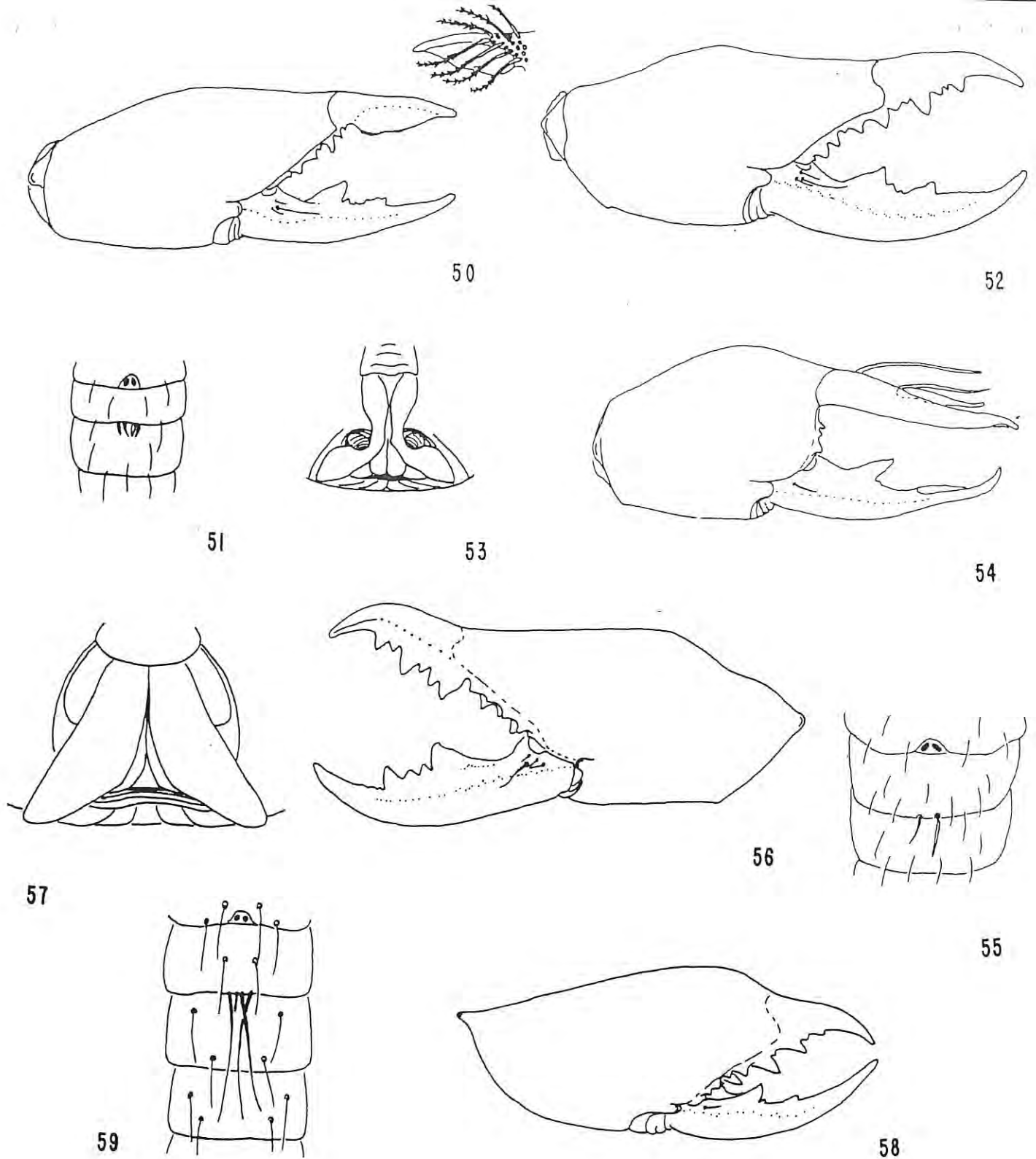
Figures 21 to 29: *Horribates minimus* new species. 21. Meso-lateral view of right female palp; 22. Ventral view of female opercula. *Horribates bantai* new species. 23. Ecto-lateral view of right female chelicera; 24. Meso-lateral view of right female palp; 25. Ventral view of female opercula. *Eremochelis iviei* (Muma). 26. Ecto-lateral view of right male chelicera; 27. Ventral view of male ctenidia. *Eremochelis fuscellus* new species. 28. Ecto-lateral view of right male chelicera; 29. Ventral view of male ctenidia.



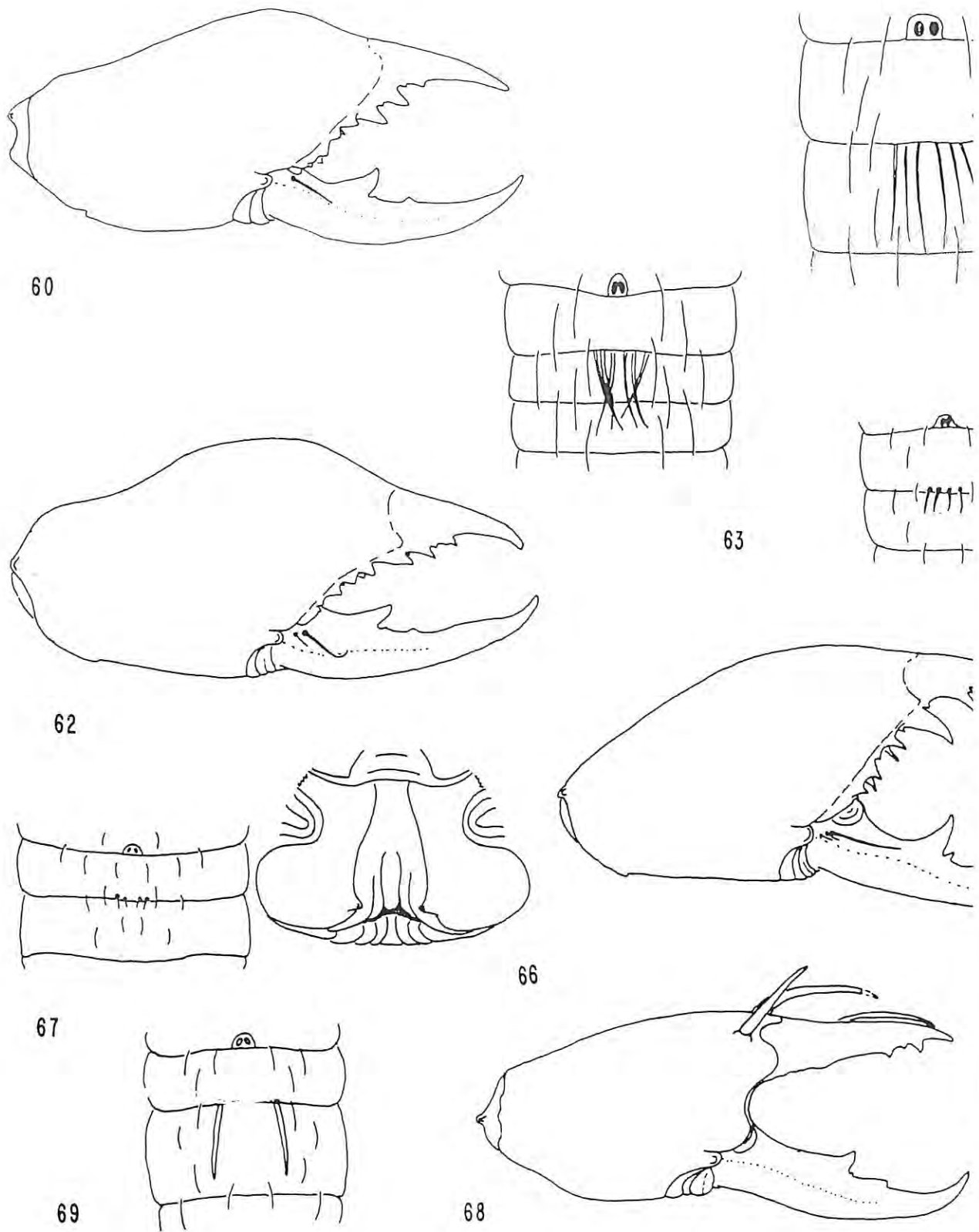
Figures 30 to 39: *Eremochelis fuscillus* new species. 30. Ecto-lateral view of right female chelicera; 31. Ventral view of female opercula. *Eremochelis bechteli* new species. 32. Ecto-lateral view of right male chelicera; 33. Ventral view of male ctenidia. *Eremochelis saltoni* new species. 34. Ecto-lateral view of right female chelicera; 35. Ventral view of female opercula. *Eremochelis tanneri* new species. 36. Ecto-lateral view of right female chelicera; 37. Ventral view of female opercula. *Eremochelis flavus* new species. 38. Ecto-lateral view of right female chelicera; 39. Ventral view of female opercula.



Figures 40 to 49: *Eremochelis bilobatus* (Muma). 40. Ventral view of female opercula (correction of Muma, 1951). *Eremochelis giboï* new species. 41. Ecto-lateral view of right male chelicera; 42. Ventral view of male ctenidia. *Eremochelis noonani* new species. 43. Ecto-lateral view of right male chelicera; 44. Ventral view of male ctenidia. *Eremochelis morrisi* (Muma). 45. Ventral view of female opercula. *Eremochelis kerni* new species. 46. Ecto-lateral view of right male chelicera; 47. Ventral view of male ctenidia; 48. Ecto-lateral view of right female chelicera; 49. Ventral view of female opercula.



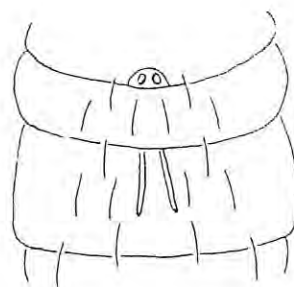
Figures 50 to 59: *Eremochelis attritus* (Muma). 50. Ecto-lateral view of right male chelicera and meso-lateral view of fixed finger; 51. Ventral view of male ctenidia; 52. Ecto-lateral view of right female chelicera; 53. Ventral view of female opercula. *Eremochelis undulata* new species. 54. Ecto-lateral view of right male chelicera; 55. Ventral view of male ctenidia. *Hemerotrecha maricopana* new species. 56. Ecto-lateral view of left female chelicera; 57. Ventral view of female opercula. *Hemerotrecha parva* new species. 58. Ecto-lateral view of right male chelicera; 59. Ventral view of male ctenidia.



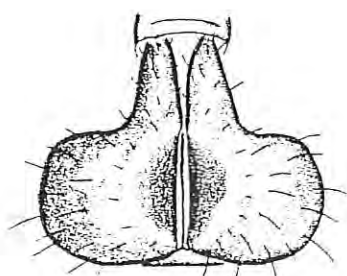
Figures 60 to 69: *Hemerotrecha delicatula* new species. 60. Ecto-lateral view of right male chelicera; 61. Ventral view of male ctenidia. *Hemerotrecha carsonana* new species. 62. Ecto-lateral view of right male chelicera; 63. Ventral view of male ctenidia. *Hemerotrecha neotena* new species. 64. Ecto-lateral view of right male chelicera; 65. Ventral view of male ctenidia; 66. Ventral view of female opercula; 67. Ventral view of female trace ctenidia. *Hemerotrecha milsteadi* Muma. 68. Ecto-lateral view of right male chelicera; 69. Ventral view of male ctenidia.



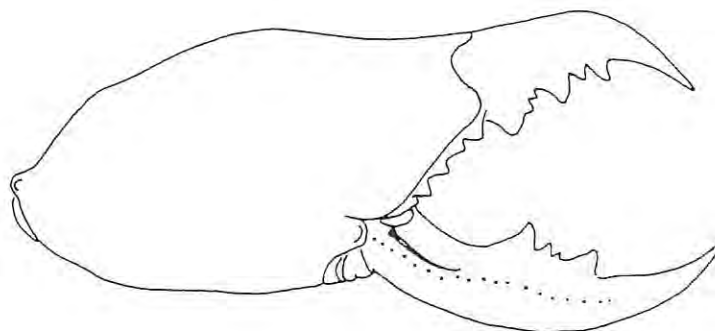
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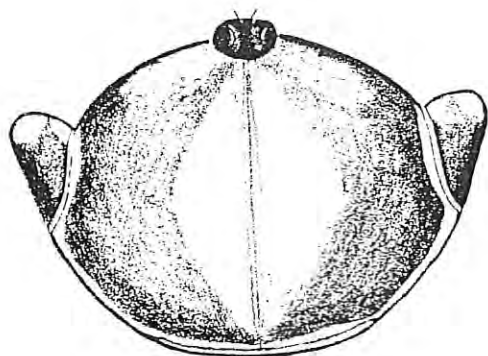
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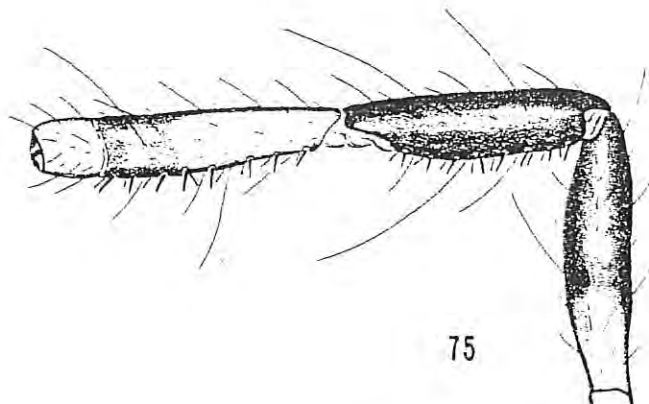
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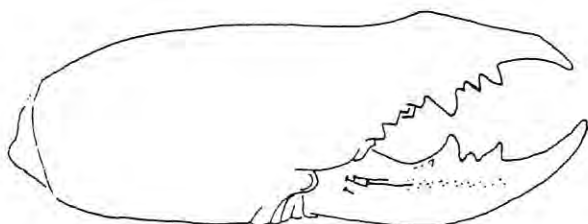
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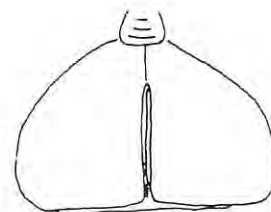
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Figures 70 to 77: *Hemerotrecha bixleri* new species. 70. Ecto-lateral view of right male chelicera; 71. Ventral view of male ctenidia; 72. Ecto-lateral view of right female chelicera; 73. Ventral view of female opercula. *Ammotrechula catalinae* new species. 74. Dorsal view of female propeltidium; 75. Meso-lateral view of right female palpus; 76. Ecto-lateral view of right female chelicera; 77. Ventral view of female opercula.