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INTRODUCTION

THE PRESENT REPORT is concerned mainly with pseudoscorpions from that part of Colorado included in the Southern Rocky Mountains province as outlined by Fenneman (1946). The collections on which this study is based were obtained chiefly by the writer in the summer of 1958 and, to a much lesser extent, in the summer of 1959. Field work during these two summers was supported by National Science Foundation Grant G-5283. Colorado collections made by the writer in 1958 and 1959 have been supplemented by collections taken by the writer in earlier years, by numerous collections obtained by Philip F. Van Cleave at Mesa Verde National Park, and by miscellaneous collections received from several colleagues.

The present study is not a monographic account of the pseudoscorpions of Colorado and, because of sparse field collecting in many localities, certainly cannot be considered a complete study of the pseudoscorpion fauna of the mountainous central part of Colorado, this being the part included in the Southern Rocky Mountains province. No special attempt was made to collect in areas of Colorado outside the Southern Rocky Mountains province because the present study is one phase of an investigation concerned with and restricted to the pseudoscorpions of the Southern, Middle, and Northern Rocky Mountains provinces as these are delineated by Fenneman (1946). As most of the Southern Rocky Mountains province lies in Colorado, the present study can almost be considered a study of the pseudoscorpions of this province. The pseudoscorpions of the extension of the province into northern New Mexico have already been studied by Hoff (1956a, 1956b, 1956c, 1956d, 1959), and the pseudoscorpions of the narrow extension into southern Wyoming will be considered in a future report. The limiting of field collecting to the central mountainous part of Colorado leaves two large areas of the state virtually unstudied. The larger of the areas occurs east of the Rocky Mountains, occupies most of the eastern two-fifths of the state, and is a part of the Great Plains province (Fenneman, 1946). While ecologically the area is occupied by a grassland community, and, according to Hoff (1959), pseudoscorpions have not become adapted to grassland conditions, species are often found in woody debris and litter of trees along watercourses and near lakes and springs, as well as in the debris of nests of birds and rodents. The second extensive area of Colorado receiving little attention in the present study occupies roughly the western one-fifth of the state. Of this area, a part is in the Colorado Plateaus province and a part is in the more northern Wyoming Basin province (Fenneman, 1946). Because of the many broad, but nevertheless frequently isolated, areas occupied by yellow pine, pinyon, juniper, and oak, many species of pseudoscorpions from the western one-fifth of Colorado are no doubt the same as those found in the mountainous central part of the state. Fortunately it has been possible to include in the present study a number of collections from Mesa Verde National Park, which lies just within the eastern part of the Colorado Plateaus province, as well as a few collections taken along the very eastern edge of the Wyoming Basin province.

RECORDS OF PSEUDOSCORPIONS FROM COLORADO

The pseudoscorpions of most states are very inadequately known, and Colorado is no exception. No published account deals exclusively with pseudoscorpions from Colorado, and apparently no organized effort has ever been directed towards making a faunal survey of the pseudoscorpions. The few published records obviously are based on chance collections and on collections incidental to other studies. These published records are found in several papers appearing at widely spaced intervals during a period of more than 60 years.

According to a list compiled by Hoff (1958), there are valid published records for only nine species of pseudoscorpions from Colorado. The first reference to Colorado pseudoscorpions occurred with the publication by Banks in 1893 of the description of *Chelanops grossus* (now *Lustrochernes grossus*), a species based on type specimens from "Colorado." A second

species, the virtually cosmopolitan *Chelifer cancroides* (Linnaeus), was reported by Banks in 1895. The third species reported from Colorado and the second species for which the state is the type locality is *Ideobisium tibiale*, a species described by Banks in 1909. The type specimens came from Florissant, at an elevation of 8000 feet above sea level. It is unfortunate that the generic assignment of the species is uncertain at the present time. Hoff (1956b) considers as a strong probability the assignment of the species to the genus *Microcreagris*. During the present study, specimens of *Microcreagris* were not found except for three nymphs. One of these nymphs came from Florissant. As nymphs and adults frequently differ in taxonomically important species characteristics, it is impossible to associate the Colorado nymphs with the species as described by Banks. Regardless of ultimate generic assignment, *Ideobisium tibiale* is certainly a valid species and must be included among pseudoscorpions known from Colorado.

Colorado is the type locality of two other species of pseudoscorpions. One of these is *Mundochthonius montanus*, a species described by Chamberlin in 1929 from specimens collected at Manitou, presumably in El Paso County, at a reported elevation of 8500 feet. In a paper published in 1930, Chamberlin described the previously unknown *Syarinus granulatus* from specimens collected at Manitou and reported *Microbisium parvulum* (Banks) from the same locality. No specimens of *Syarinus granulatus* occur among the collections considered in the present study, but the writer (1956b) has recorded the species from New Mexico. In 1950 Hoff published the first Colorado records of *Parachelifer persimilis* (Banks) and *Haplochelifer philipi* (Chamberlin), and in 1956 Hoff and Bolsterli mentioned specimens of *Microbisium confusum* Hoff from the foothill zone of the Rocky Mountains in Colorado. While the present writer considers the nine species as the only ones for which there are valid state records, Beier (1932a) lists Colorado as one of the localities of another species, *Pseudogarypus bicornis* (Banks). However, the record is considered inacceptable, as is explained in the discussion of *P. bicornis*.

The present study adds materially to the knowledge of the pseudoscorpions of Colorado and brings to 30 the number of species reported from the state. Of the nine species previously known from Colorado, seven are represented by specimens from the present collections and one of the remaining two species, as mentioned above, may be represented by three nymphs. In the present study, new state records are given for 21 species. Of these 21 species, one is a provisional determination, and five are new to the literature. A few specimens, especially nymphs, remain unidentified. Some of the nymphs undoubtedly belong to one or two genera not otherwise represented in the present Colorado collections, but at the present time it would be futile to attempt genus and species determinations.

Materials and Methods

The present study is based on 159 collections. Unless otherwise indicated, collections listed among the records for each species were made by the writer or by members of his field party. When a collecting date is not mentioned, the collection was made during August and September, 1958. Representatives of each sex, and sometimes also of immature individuals, of each species in each collection are mounted on 315 microscope slides. These mounted specimens were used for detailed study, for making measurements, and for completing species determinations. Specimens remaining in alcohol were identified by comparison with mounted individuals from the same collection.

Methods of collecting and preparing specimens for study are found in papers by Hoff (1949, 1959). For a discussion of the morphology and classification of pseudoscorpions, the reader should consult publications by Chamberlin (1931), Beier (1932a, 1932b), Vachon (1949), and Hoff (1949). In the present paper, names and the systematic arrangement of taxa, including species, follow closely an earlier publication by Hoff (1958). Except where needed for purposes of revision or clarification, descriptions and complete synonymies are not given for genera, but for each genus at least one or two important references are listed. No attempt has been made to give complete species synonymies, but selected

references are included for each species discussed. No key is included for the genera and species of pseudoscorpions presently known from Colorado. For identification to genus, the key given by Hoff (1958) is satisfactory. When two or more Colorado species are reported in a single genus, the species can be separated on the basis of information given in species discussions. Until the pseudoscorpion fauna becomes well known, care should be taken to check specimens against at least a fairly complete species description. Such care is necessary even when a genus is represented by a single species, because of the possibility of finding species not previously known for the state. Hoff's (1959) key to species of pseudoscorpions of north-central New Mexico can be of some help in identifying specimens from south-central Colorado.

While most of the present paper is distinctly taxonomic, an attempt has been made to include information on the geographic distribution and ecology of Colorado pseudoscorpions. Relative to the distribution and habitat preference of many of these species, it is impossible to give more than a brief summary statement or provisional generalization. For other species, no separate reference is made to the ecology, and all available data are included in the listing of records. For a few species it is possible to discuss in some detail certain aspects of ecology and, at least provisionally, to correlate the known geographic range or habitat preference, or both, with the distribution of dominant plants or plant communities, with elevations (in the present paper, most elevations considered accurate within 100 feet above and below the figure given), or with climatic factors. On the basis of observed correlations, some attempts have been made to suggest possible factors that limit species distribution. Without designed experimentation, an explanation of the limits of spatial distribution and microhabitat preference on the basis of a single environmental factor or complex of factors must be theoretical.

While attempts to explain the distribution and habitat preference of pseudoscorpions in Colorado are sometimes made difficult and complicated by the great range in elevation and latitude and the diversity of climate, these same characteristics make the state suitable for studies of the factors that limit species distribution. As an aid in understanding some of the factors that can operate in limiting spatial, altitudinal, and habitat distribution of such microinvertebrates as pseudoscorpions, the reader will find available numerous publications containing information about the physiography, climate, and plant ecology of Colorado. Statistics relative to many important aspects of climate are given by Vischer (1954) in the form of maps and, because the included data are mapped for the entire United States, comparison can be made between Colorado and other areas. Climates of the mountainous areas of the western part of the United States are briefly characterized by Baker (1944) who gives, mainly in a series of graphs, information concerned chiefly with various aspects of precipitation and temperature. Thornthwaite's (1948) publication on classification of climate also will be found helpful for understanding the climates of Colorado and adjacent states. With respect to the plant communities of Colorado, a brief but very basic account is given by Costello (1954). For anyone interested chiefly in the Front Range (the easternmost range of the Southern Rocky Mountains, extending roughly from Fort Collins to Colorado Springs), reference should be made to Weber's (1953) outline of the plant zones found in the general area occupied by the range.

With respect to the specimens on which this study is based, representatives of most species are deposited among the collections of the American Museum of Natural History. Some specimens are retained by the writer, and others have been used for exchange. In general, specimens borrowed from the Museum of Comparative Zoölogy (Levi collections), the Illinois Natural History Survey, and the American Museum of Natural History have been returned to the lending institution. Holotypes and allotypes of the two new species described from collections taken at Mesa Verde National Park, as well as representative specimens of other species reported for the park, are deposited in the United States National Museum. The holotype and, if available, the allotype for each of the other three new species are deposited in the American Museum of Natural History.

Some paratypes have been retained in the writer's collections, and others are deposited in the collections of the United States National Museum and the American Museum of Natural History.

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Numerous individuals have been of assistance during the course of this investigation, either by aiding in the field work or by furnishing specimens for study. The writer is especially grateful for the help of members of his family who accompanied him during a part of the field work and for the aid of Dr. Eugene Rypka who assisted the writer during one period of two weeks of intensive collecting in central Colorado. A fairly large series of collections taken at Mesa Verde National Park by Mr. Philip F. Van Cleave made possible a more complete survey of the pseudoscorpions of this area than of any other area of comparable size in Colorado. Important collections were also obtained through the courtesy of Dr. and Mrs. Herbert W. Levi, Dr. and Mrs. Robert E. Gregg, Dr. Tyler A. Woolley, and Mr. Richard C. Funk.

SYSTEMATIC ACCOUNTS

ORDER **PSEUDOSCORPIONIDA** BANKS

SUBORDER **HETEROSPHYRONIDA** CHAMBERLIN

FAMILY **CHTHONIIDAE** HANSEN

GENUS **KEWOCHTHONIUS** CHAMBERLIN

Kewochthonius CHAMBERLIN, 1929, Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 65. HOFF, 1951, Amer. Mus. Novitates, no. 1483, p. 3.

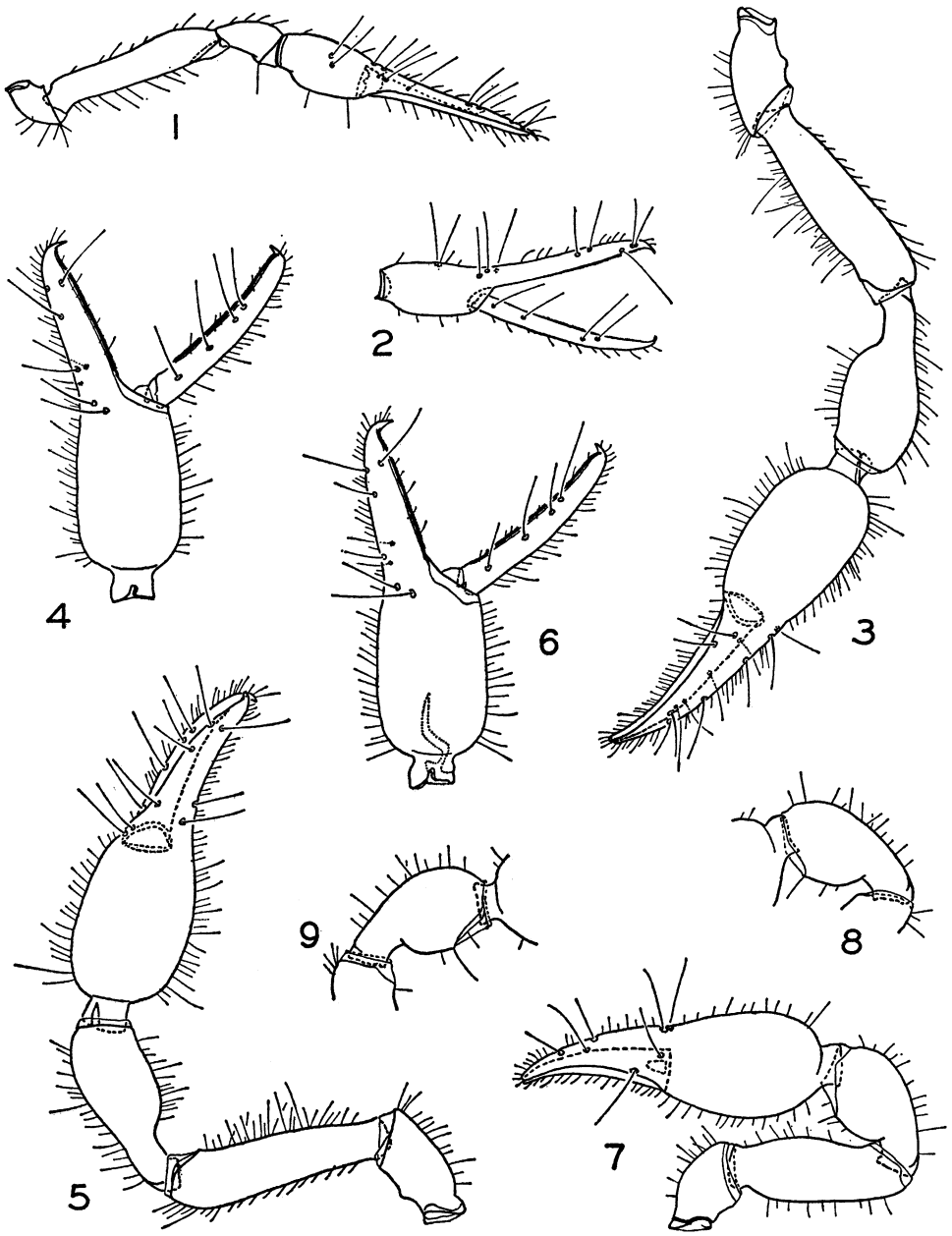
Kewochthonius paganus, new species

Figures 1, 2

FEMALE: The description of the female is based on four individuals (the holotype and three paratypes). Measurements given for the holotype are frequently followed in parentheses by the range of measurements for all four females. Body and appendages light golden yellow in color; abdomen of holotype torn, but length probably about 1.3 mm.; range of body length for all four females 1.25–1.4 mm. Carapace subrectangular in general outline, lateral margins gently and evenly convex; anterior margin with little indication of an epistome, but central portion of margin with numerous irregular, acute teeth; surface of carapace smooth, except for weakly developed, net-like markings along each lateral margin; surface with 18 setae, except that an extra seta occurs near the anterior eye on one side of the carapace of the holotype; posterior margin of carapace with two well-developed setae, anterior margin with four setae; with two pairs of eyes, anterior eye of each pair moderately well developed and with a convex cornea, posterior eye weakly developed to almost wanting and sometimes very difficult to observe after carapace has been cleared with caustic; carapace 0.345 (0.345–0.360) mm. in length, greatest width at a level just posterior to the posterior eyes and about 0.33 mm. in all specimens, posterior width about 0.31 mm. Abdomen weakly sclerotic; surface of both tergites and sternites with weakly developed, net-like markings; each of the first four tergites with four setae, each of the more posterior tergites with six setae; fourth sternite with a row of eight acuminate setae, with two (occasionally one) setae just anterior to each respiratory stigma; each sternite of central part of abdomen usually with eight setae, of which the lateralmost one at each end of the row is relatively small.

Chelicera much as in other species of the genus; surface of hand with five or six setae; outer surface of hand marked by a weakly developed, scale-like pattern which gives a granular appearance to the ventral and dorsal surfaces when these are seen in profile; chelicera 0.255 (0.25–0.27) mm. long, about 0.145 mm. wide (broken in holotype, width not obtained). Fixed finger with seven to 10, usually eight or nine, teeth along the inner margin, with teeth varying in size from relatively large and acute near the distal end of the row to extremely minute at the proximal end of the row. Movable cheliceral finger with a fairly well-developed knob representing the galea; six or seven teeth along the inner finger margin, teeth varying from minute at the proximal end to fairly large at the distal end of the row; movable finger 0.152 (0.150–0.155) mm. in length.

Palp much as in other species of the genus; surface of palpal segments smooth; shape of segments as shown in figure 1. Palp with trochanter 0.132 (0.132–0.148) mm. in length, 0.080 (0.080–0.088) mm. in width, length 1.65 (1.62–1.71) times the width. Femur 0.388 (0.388–0.420) mm. in length; in holotype width of one femur 0.081 mm. and width of other femur 0.083 mm., range of width for all four females 0.081–0.092 mm., length of femur 4.57–4.79 times the width. Tibia with length 0.165 (0.165–0.180) mm., width 0.092 (0.092–0.102) mm., length 1.79 (1.77–1.96) times the width. Chela with a length of 0.60 (0.600–0.632) mm., width of hand 0.117 (0.117–0.131) mm., length 5.13 (4.82–5.15) times the width; in lateral view chelal hand 0.205 (0.205–0.220) mm. in length, 0.116 (0.116–0.130) mm. in depth, length 1.77 (1.69–1.88) times the depth; movable finger 0.40 (0.395–0.420) mm. in length. Arrangement of tactile setae as shown in figures 1 and 2. Inner margin of both chelal fingers with contiguous teeth dispersed along virtually the entire finger margin. Fixed finger with between 50 and 55 teeth, a few of the teeth at



FIGS. 1–2. *Kewochthonius paganus*, new species, female holotype. 1. Dorsal view of palp. 2. Lateral view of chela.

FIGS. 3–6. *Neobisium (Parobisium) vancleavei*, new species. 3. Dorsal view of palp, male holotype. 4. Lateral view of chela, male holotype. 5. Dorsal view of palp, female allotype. 6. Lateral view of chela, female allotype; dotted lines near base of hand indicate a break on the interior or more median surface.

FIGS. 7–9. *Microbisium parvulum* (Banks). 7. Dorsal view of palp with tactile setae omitted from the movable chelal finger, female from Four-mile Mesa, Boulder. 8. Palpal tibia, female from Long Canyon, Boulder. 9. Palpal tibia, female taken 24 miles south of Pueblo.

the anterior end of the row acute and conical in shape, a few at the very proximal end of the row poorly developed, rounded, and without cusps; each tooth of the remainder of the row subrectangular in general outline and with a cusp directed towards the proximal end of the row. Movable finger with between 43 and 50 teeth; teeth of the distal end of the row triangular and acute, teeth of about the basal one-half of the row simple, rounded, and without cusps; teeth of the rest of the row subrectangular and with proximally directed cusps; in general, teeth of movable finger less strongly developed than those of the fixed finger.

Legs typically chthoniid in general appearance; one second coxa of holotype with three spines, the other with five spines; each second coxa of paratypes with three or four spines, except that seven spines occur on one coxa of one paratype; each third coxa of holotype with five spines; each third coxa of paratypes with five to seven spines, except that one third coxa of one paratype has only three spines. Bisetose tubercle between third and forth coxae well developed. Legs with surface of segments virtually unsculptured, except for a few very weakly developed, net-like markings on the femur and tibia of the fourth leg; setae relatively sparse except on the tarsal segments of each leg; fourth leg with a tactile seta just distal to the mid-point of the extensor margin of the tibia, both metatarsus and telotarsus with a well-developed tactile seta located proximal to the mid-point of the extensor margin. Fourth leg with entire femur 0.315 (0.315–0.339) mm. in length, 0.126 (0.126–0.141) mm. in depth, length 2.50 (2.41–2.51) times the depth; tibia 0.219 (0.219–0.239) mm. in length, 0.060 (0.060–0.063) mm. in depth, length 3.65 (3.65–3.80) times the depth; metatarsus 0.115 (0.111–0.123) mm. in length, 0.044 (0.044–0.045) mm. in depth, length 2.62 (2.52–2.74) times the depth; telotarsus 0.220 (0.220–0.227) mm. in length, 0.028 (0.028–0.030) mm. in depth, length 7.86 (7.56–7.86) times the depth. External genitalia much as in other species of this genus and related genera; anterior operculum with nine setae; posterior operculum with a row of nine or 10 setae, the row virtually continuous with the two or three smaller setae that are anterior to each of the respiratory stigmata.

MALE: The description of the male is based on one individual (the allotype). Male virtually identical with the female except for the genitalia. Body length 1.21 mm.; carapace 0.35 mm. long, 0.335 mm. wide, eyes as in the female; chaetotaxy of carapace and abdomen of male similar to that of the female. Chelicera 0.26 mm. in length, 0.139 mm. in width; hand with six setae, sculpturing of hand appearing a little stronger than in the female, especially when seen in profile along the ventral and dorsal margins of the hand; movable finger 0.148 mm. in length. Teeth of cheliceral fingers similar to those of the female, fixed finger with nine or 10 teeth, movable finger with seven teeth. Palp like that of the female in general appearance, chaetotaxy, sculpturing, and number and arrangement of tactile setae and marginal teeth of chelal fingers. Trochanter 0.135 mm. long, 0.082 mm. wide; femur 0.400 mm. in length, 0.085 mm. in width; tibia 0.172 mm. long, 0.092 mm. wide; chela 0.605 mm. long, 0.118 mm. wide; hand of one chela 0.205 mm. in length, of the other chela 0.210 mm. in length; depth of hand 0.116 mm.; movable finger 0.405 mm. in length. Fixed finger with 52 marginal teeth, movable finger with 43 marginal teeth, those near the proximal end of the row very small and difficult to count. Legs of male similar to the legs of the female. Each second coxa with three spines, each third coxa with six spines. Fourth leg with entire femur 0.319 mm. long, 0.136 mm. deep; tibia 0.227 mm. long, 0.064 mm. deep; metatarsus 0.111 mm. in length, 0.044 mm. in depth; telotarsus broken but probably about 0.225 mm. in length, 0.029 mm. in depth. External genitalia with no unusual characteristics; anterior operculum with 11 setae, including four setae on the very posterior margin of the operculum just anterior to the genital slit; posterior operculum with 11 setae on the face, including the seta at the median end of each respiratory stigma but not including the two or three much shorter setae anterior to each stigma; seven setae forming a somewhat irregular row along each sublateral margin of the genital slit; two groups of two setae, each seta with a strongly developed areole, forming a row of four setae along each lateral wall within the genital atrium.

TRITONYMPH: Data are based on five mounted tritonymph paratypes. Trito-

nymph similar to the adult in most characteristics. Movable chelal finger with three tactile setae, *t* and *st* as in the adult, *sb* or *b* wanting; tactile setae of fixed finger essentially as in the adult, but one seta of dorsum of hand wanting. Teeth of chelal fingers similar to those of the adult, except slightly fewer in number; movable finger with 35 to 40 teeth, fixed finger with 45 to 50 teeth. Coxal spines much as in the adult; each second coxa with two to four, usually three, spines; each third coxa with four to seven, usually six, spines. The following measurements, except where otherwise indicated, are ranges based on all five tritonymphs. Body length 0.95–1.07 mm. Palp with femur 0.287–0.300 mm. in length, 0.067–0.072 mm. in width, length 4.12–4.29 times the width; tibia 0.136–0.145 mm. long, 0.075–0.080 mm. wide, length 1.75–1.82 times the width; chela 0.465–0.475 mm. in length, 0.091–0.098 mm. in width, length 4.80–5.11 times the width; length of hand 0.155–0.165 mm., depth (available for only three tritonymphs) 0.095–0.097 mm., length 1.62–1.70 times the depth; movable finger 0.300–0.310 mm. long.

REMARKS: The genus *Kewochthonius* has been represented in North America by only two species, *K. paludis* (Chamberlin, 1929) from the southeastern part of the United States and *K. stanfordianus* (Chamberlin, 1929) from California. The new species is easily separated from each of these previously described species. *Kewochthonius paganus* has fairly coarse teeth along the median portion of the anterior margin of the carapace and two setae along the posterior margin, while *K. paludis* has much finer teeth along the anterior margin and four setae along the posterior margin. In addition the chela, chelal hand, and movable finger are longer in *K. paganus* than in *K. paludis*, with differences in size much more conspicuous in the male than in the female. A comparison of the characteristics of *K. paganus* with the very much abbreviated original and only description (Chamberlin, 1929) of *K. stanfordianus* indicates that, although the two species appear closely related, they are certainly not conspecific. *Kewochthonius paganus* is characterized by having a posterior pair of eyes (perhaps more properly eye spots), 18 setae on the carapace, and more than 40 teeth on the movable chelal finger, while *K. stanfordianus* is reported to have no posterior eyes or eye spots, only 16 setae on the carapace, and fewer than 25 marginal teeth on the movable chelal finger. In comparison with ratios given in the description of *K. stanfordianus*, the palpal femur and chela of *K. paganus* are slightly more slender. However, these differences may have little significance, because ratios given by Chamberlin (1929) are based on measurements of palps treated with caustic.

TYPE LOCALITY: *Montezuma County:* Female holotype, one female paratype, and five tritonymph paratypes from pinyon litter, and male allotype and two female paratypes from juniper litter, about 2 miles north of Park Headquarters at an elevation of 7000 feet, Mesa Verde National Park, July 21, 1955. The species is known only from the type locality. The holotype and allotype, one female paratype, and two tritonymph paratypes are deposited in the United States National Museum; one female paratype and one tritonymph paratype are in the American Museum of Natural History; and one female paratype and two tritonymph paratypes are retained by the writer.

GENUS MUNDOCHTHONIUS CHAMBERLIN

Mundochthonius CHAMBERLIN, 1929, Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 64. HOFF, 1956, Amer. Mus. Novitates, no. 1772, p. 10.

Mundochthonius montanus Chamberlin

Mundochthonius montanus CHAMBERLIN, 1929, Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 65. HOFF, 1956, Amer. Mus. Novitates, no. 1772, p. 10.

Mundochthonius montanus is one of the more frequently occurring species of the mountain regions of Colorado, where it is found throughout a wide altitudinal band and in a variety of habitats. The only previous record for this species in Colorado is based on one specimen, the female holotype, collected from surface soil at a reported elevation of 8500 feet above sea level, Manitou, presumably El Paso County (Chamberlin, 1929). Outside Colorado the species is known only from New Mexico (Hoff, 1956a, 1958). As the original description of the species is based on one specimen and does not include measurements of palpal segments, several individuals of each sex from Colorado were measured and

studied in detail. For the female, studies were made of 16 specimens, these being selected at random from collections made in eight different counties, from various elevations between 6900 and 9700 feet, and from eight kinds of habitats. Considerable variation was found in the spine of the second coxa. A single spine usually occurs and varies from an elongated and terminally incised blade, as described by Chamberlin (1929; 1931, fig. 21-*I*) for the female holotype, to a deeply subdivided blade with each ramus terminally incised. In a few specimens, two or even three blades occur, these apparently resulting from a complete subdivision of the original blade. Similar variations are reported (Hoff, 1952) for specimens from New Mexico. As in the type female, most Colorado females have four setae on the first and four on the second tergite, with six setae on each of the third and more posterior tergites. For 16 females studied in detail, one out of four shows some deviation from the usual condition. Each of two specimens has four setae on the first tergite and six on each of the second and more posterior tergites. One specimen has an extra seta on the second tergite, and another specimen has an extra seta on the third tergite. The following ranges are based on measurements of 16 mounted females. Body length 1.00–1.25 mm.; carapace 0.33–0.39 mm. in length. Palpal femur with a length of 0.275–0.338 mm., only three specimens with a femur longer than 0.315 mm.; width of femur 0.070–0.087 mm.; length 3.61–4.03 times the width. Chela with a length of 0.435–0.540 mm., with only three chelae longer than 0.495 mm. and only one chela longer than 0.515 mm.; width of chela 0.106–0.126 mm.; length 3.94–4.28 times the width. Chelal hand 0.159–0.203 mm. long, 0.104–0.123 mm. deep, length 1.46–1.65 times the depth, depth never more than a very little less than the width and sometimes equal to the width. Movable chelal finger 0.284–0.355 mm. in length, with only one specimen having a finger longer than 0.335 mm.

The male resembles closely the female, except that the male has a more slender chela (dorsal view) and chelal hand (lateral view). This more slender condition, however, is not clearly indicated by a comparison of the ranges of ratios for the chela and hand of males and females because of the overlapping of ranges and variation associated with elevation. The more slender nature of the chela and hand in the male becomes evident, however, when examinations are made of unpublished scatter diagrams and data tabulated according to elevation. On the other hand, there appears to be no significant difference in the length/width ratios of the palpal femur in the male and female. The spines of the second coxae of the male show much the same degree of variation as found in the female. Among the 10 males studied in detail, only one showed a variation from the usual number and arrangement of setae on the tergites. This individual has four setae on the first tergite, but has six setae on each of the second and more posterior tergites. Ranges given here are based on measurements of 10 males selected at random from collections taken from eight different counties, from various elevations between 7200 and 9700 feet above sea level, and from four kinds of habitats. Body length 1.00–1.19 mm.; carapace 0.33–0.38 mm. in length. Palpal femur 0.263–0.350 mm. in length, with the femur of only one male longer than 0.315 mm.; width of femur 0.068–0.094 mm.; length 3.73–3.93 times the width. Chela 0.420–0.545 mm. long, with only one chela longer than 0.50 mm.; width 0.100–0.123 mm.; length 4.16–4.50 times the width, with the chelae of only two specimens having length/width ratios greater than 4.35. Chelal hand 0.155–0.211 mm. in length, with only one specimen having a hand longer than 0.183 mm.; depth of hand 0.100–0.126 mm., depth equal or very nearly equal to the width; chelal hand with a length 1.49–1.68 times the depth. Length of movable finger 0.270–0.350 mm., with only one specimen having a finger longer than 0.330 mm.

Colorado specimens are very similar in size to specimens from New Mexico (Hoff, 1952). For New Mexico specimens, ranges of the length of the femur (except for one female in which the length is 0.272 mm.), chela, chelal hand, and movable finger fall within the limits given for the females and males from Colorado. In general, New Mexico specimens, both male and female, have somewhat stouter palpal femora than do specimens from Colorado. Differences in length/width and length/depth ratios of the chela and

chelal hand, respectively, of New Mexico and Colorado specimens are relatively small.

MORPHOLOGICAL VARIATION AND ELEVATION: As specimens of *Mundochthonius montanus* are common throughout a wide range of elevations and in a diversity of habitats in Colorado, the species is suitable for studying possible correlations between elevation and variations in size and stoutness (as expressed by length/width and length/depth ratios) of palpal segments. From unpublished scatter diagrams, in which lengths of palpal segments are plotted against the elevations at which the specimens were taken, it is apparent that lengths of the palpal femur (tibia not studied), chela, and chelal hand are not correlated with elevation. However, from a study of other unpublished scatter diagrams and from an examination of data in table 1, it is evident that correlations occur between length/width and length/depth ratios of the palpal femur, chela, and hand and the elevations at which the specimens were collected. Based on data from 26 specimens taken from collecting sites distributed at almost regularly spaced intervals from 6900 to 9700 feet above sea level, it is clear that specimens from a somewhat intermediate level of elevation (8100–8500 feet) have on the average more slender (indicated by larger ratios) femora, chelae, and chelal hands than do specimens from other levels of elevation. At elevations below 8100 feet (as shown in table 1) the femur in both sexes becomes gradually and distinctly stouter, as indicated by a decrease in the length/width ratio. The trend towards increased stoutness at lower elevations is also evident for the chela of the female (and male as well, data unpublished) and for the chelal hand (except for the chelal hand of the male, data unpublished). At the same time, the femur, chela, and chelal hand in both sexes (means of ratios for chela and hand of male unpublished) also become increasingly stouter in specimens taken above 8500 feet in elevation. Palpal segments are especially stout in the few available specimens taken at elevations of more than 9500 feet.

With respect to the statistics offered in table 1, the writer realizes the gross inadequacy of the data and the relative unreliability of unusually small samples. In the face of these limitations, however, the writer believes that a strong and definite trend is indicated and that palpal segments are more slender in individuals taken near the middle than in those taken near the upper or lower limits of the altitudinal range of *M. montanus* in Colorado. For the femur it is possible to combine data from the two sexes, as no significant difference appears to occur between the ratios of males and those of females, and similar results are obtained when data from each of the two sexes are tabulated independently. In contrast, however, sexual dimorphism in the ratios of chela and chelal hand makes it impossible to consider together the data from the two sexes. As measurements are available for more females than males, the data for females are considered more reliable and are presented in the table. Relationships between elevation and ratios of the chela and hand of the male are similar in general trend to those of the female, except that in

TABLE 1

DATA ON MORPHOLOGICAL VARIATION IN *Mundochthonius montanus* CHAMBERLIN

Elevation in Feet	Number of Specimens		Femur Ratio, L/W; Females and Males		Chela Ratio, L/W; Females	Hand Ratio, L/D; Females
	F	M	Range	Mean	Mean	Mean
6900–7000	3	0	3.68–3.73	3.71	4.12	1.55
7100–7500	3	3	3.73–3.93	3.82	4.08	1.57
7600–8000	3	1	3.81–3.93	3.89	4.13	1.53
8100–8500	2	2	3.87–4.03	3.95	4.16	1.60
8600–9000	2	2	3.82–3.94	3.89	4.11	1.50
9100–9500	1	1	3.70–3.87	3.79	3.94	1.49
9600–9700	2	1	3.61–3.75	3.67	3.98	1.42

males from elevations below 8100 feet the hand is no stouter, and indeed appears more slender (larger length/depth ratio), than the hand of specimens taken at intermediate elevations. Thus in the male the chelal hand tends to become stouter as elevation increases, with the tendency occurring throughout the reported altitudinal range of the species in Colorado. The sexual difference in the correlation of the length/depth ratio of the hand and altitude at the lower elevations seems clearly evident in unpublished scatter diagrams and is probably not an apparent difference resulting from unusually small samples or the lack of data for males taken below an elevation of 7100 feet.

In the absence of experimental evidence, it is impossible to determine the factor or factors responsible for the observed correlation of the stoutness of palpal parts and elevation. It appears probable that more favorable environmental conditions are found at intermediate elevations, with conditions becoming less favorable at lower and at higher elevations. A combination of adequate moisture and seasonal temperatures suitable for growth, feeding, and reproductive activity is certainly essential for survival of the species. At low elevations the growth pattern may be influenced by a moisture deficit during the summer when temperatures are relatively high, while at elevations above an intermediate level the moisture may be adequate, but the short growing season and seasonal and diel low temperatures may influence the rate and pattern of growth. It is interesting to compare ratios of palpal segments of specimens from Colorado with ratios of corresponding segments of specimens collected in Tejano Canyon at 8300 feet above sea level on the east side of the Sandia Mountains, immediately east of Albuquerque, New Mexico (Hoff, 1952; with some previously unpublished data considered here). Based on seven females and five males, the range of length/width ratios of the palpal femur of the Tejano Canyon specimens is 3.33–3.75, and the mean is 3.62. This range overlaps and extends a considerable distance below the range given in table 1 for specimens from 6900 to 7000 feet in elevation in Colorado. The mean of the Tejano Canyon specimens falls just below the level of the stoutest measured specimen taken at low elevations in Colorado. For the seven females from Tejano Canyon, the mean of the length/width ratios of the chela is 3.96, and the mean for the length/depth ratio of the chelal hand is 1.50. These means fall just below (so indicate increased stoutness) the corresponding means given in table 1 for Colorado specimens collected at elevations of 6900 to 7000 feet. A single female taken in Sulphur Canyon, below Tejano Canyon on the east side of the Sandia Mountains near Albuquerque, at 7300 feet (lowest recorded elevation for the species in New Mexico) has ratios (unpublished data) that are virtually equivalent to mean ratios for females from Tejano Canyon. The stoutness of these New Mexico specimens may be at the limit of stoutness found in specimens from low elevations. From unpublished and somewhat inadequate data relative to the male, it was found that the mean of the ratios of the chela of the Tejano Canyon males falls somewhat below the mean for males and is about equal to the ratio of the stoutest male taken between 7100 and 7500 feet in elevation in Colorado. In addition, the mean of the ratios of the chelal hand of the New Mexico males is about equal to the mean ratio that would be expected (by interpolation from available data) for Colorado males taken at 7500 feet in elevation. In general, it is clear that Tejano Canyon specimens taken at 8300 feet have palpal parts as stout as, or slightly stouter than, corresponding parts of specimens taken at elevations of 1000 or 1500 feet less in Colorado. Tejano Canyon, located east of Albuquerque, is a somewhat dry canyon in which precipitation is less in amount and more seasonally restricted than in mountain areas of relatively low elevation in central Colorado. When differences in elevation and latitude of New Mexico and Colorado collecting localities are considered, it seems feasible to consider the climate, especially with respect to moisture and temperature, of Tejano Canyon as corresponding to the climate found at a lower elevation, perhaps 6500 or 7000 feet, in the mountain region of central Colorado. If true, and if stoutness is correlated with one or more climatic factors, one would expect the palpal parts for the Tejano Canyon specimens to be as stout, or even slightly stouter, than the corresponding parts

of specimens taken in Colorado at or immediately below 7000 feet. The observed ratios for palpal parts of New Mexico specimens closely approximate the expected ratios and in general are about equal to ratios obtained by extrapolation of the Colorado data to an elevation slightly lower (perhaps about 6500 feet) than the lowest limit now known for *M. montanus* from Colorado. While correlations between the stoutness of palpal parts and elevations for specimens from Colorado and New Mexico appear decisive and fall into a common pattern, final conclusions can be made only after increased statistical reliability has been attained through the study of specimens taken from a variety of elevations at latitudes additional and intermediate to latitudes from which the presently available specimens come.

While there are correlations between stoutness of palpal segments and elevation, there appears to be no relationship between length and stoutness of palpal parts and microhabitats from which the specimens were taken. Such is true for specimens from Tejano Canyon, New Mexico, where several microhabitats occur as a result of topography and variations in exposure, and is also true for specimens from Colorado, where *M. montanus* has been taken from a diversity of microhabitats.

ECOLOGY: The occurrence of *Mundochthonius montanus* throughout a wide altitudinal band of 6900 to 10,000 feet above sea level in Colorado apparently results from a lack of microhabitat specificity. In general, the species is associated with the debris and litter of woody plants, specimens having been taken from litter beneath a variety of trees, including aspen, birch, juniper, pinyon, yellow pine, Gambel oak, spruce, and fir. Specimens are also found occasionally in the decomposing wood of logs and stumps of both coniferous and broad-leaved trees. Although the species occurs in many kinds of litter, distribution may not be entirely at random, as 10 of the 32 Colorado collections were taken from aspen litter. The species seems to be less common in New Mexico than in Colorado, but shows the same broad relationships to elevation and microhabitats (Hoff, 1959).

NEW RECORDS: *Archuleta County:* Two collections, one from Gambel oak litter and one from juniper litter, 9 miles west of Pagosa Springs, 7300 feet in elevation. *Boulder County:* From birch litter, Long Canyon, 6900 feet in elevation, Boulder, collected by H. Borchert, August 21, 1955, and contributed by R. E. Gregg; from aspen litter in a clump of common or dwarf juniper, 4 miles southeast of Nederland, 8400 feet in elevation. *Costilla County:* From aspen litter, less than 1 mile east of summit of La Veta Pass, west of Walsenburg, elevation 9350 feet, July 18, 1959. *Eagle County:* From lodgepole-pine litter, 7 miles southeast of Minturn, 8900 feet in elevation; one collection from mixed aspen and serviceberry litter and one from mixed juniper and aspen litter, 2.5 miles west of Minturn, 7600 feet in elevation; from litter in clump of common juniper, 13 miles north of Leadville, 10,000 feet in elevation. *Gilpin County:* One collection from aspen litter and one from an accumulation of aspen litter in a clump of common juniper, 1 mile south of Rollinsville, 8600 feet in elevation. *Gunnison County:* One collection from mixed spruce and fir litter and one from aspen litter, 16 miles north of Gunnison along Taylor River, 8200 feet in elevation; from rotten stump of conifer, 4 miles west of Crested Butte, 9600 feet; in aspen litter, 11 miles west of Crested Butte, 9400 feet; one collection from aspen litter and another from a rotting aspen log, 6 miles north of Crested Butte, 9700 feet; one collection from debris at base of dead yellow pine and a second collection from mixed juniper and Gambel oak litter, 21 miles west of Gunnison, 7500 feet in elevation. *La Plata County:* From Gambel oak litter, 7 miles west of Durango, 7500 feet in elevation; three collections, one from debris at base of yellow pine, one from rotting coniferous log, and one from Gambel oak litter, 19 miles north of Durango, 7600 feet in elevation; one collection from aspen litter and one from spruce litter, 22 miles north of Durango, elevation 8800 feet. *Las Animas County:* From yellow-pine litter, 10 miles south of Trinidad, 7200 feet in elevation. *Montezuma County:* From pinyon litter, 2 miles north of Park Headquarters, elevation about 7000 feet, Mesa Verde National Park, July 21, 1955; from Gambel oak litter, 8 miles north of Park Headquarters, about 8000 feet in elevation. Mesa Verde National Park, July 22, 1955,

Routt County: From Gambel oak litter, 5 miles north of Steamboat Springs, 7900 feet in elevation; from aspen litter, 6 miles north of Steamboat Springs, 8000 feet in elevation; from Gambel oak litter, 7.5 miles north of Steamboat Springs, 7500 feet in elevation. *Saguache County:* From aspen litter, 9 miles south of Poncha Springs, 8900 feet in elevation.

Genus LECHYTIA Balzan

Lechytia Balzan, 1891, Ann. Soc Ent. France, vol. 60, p. 498. Chamberlin, 1929, Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 77.

Lechytia pacifica (Banks)

Roncus pacificus Banks, 1893, Canadian Ent., vol. 25, p. 66.

Lechytia pacifica, Banks, 1895, Jour. New York Ent. Soc., vol. 3, p. 13. Hoff, 1956, Amer. Mus. Novitates, no. 1772, p. 11.

This species appears to range throughout much of the western part of the United States, having been reported from California, New Mexico, Utah, and Washington (Hoff, 1958). Records presented here are the first for Colorado. As intraspecies variation is inadequately known, a somewhat detailed study was made of a number of specimens. For the female, measurements and ratios given here are expressed as ranges based on seven individuals. Body 1.3–1.55 mm. in length; carapace 0.365–0.41 mm. long; a small and fairly well-defined eye located very near the anterior end of each lateral margin of the carapace. Tergal setae, contrary to the chaetotaxy outlined by Chamberlin (1929) in his diagnosis of the genus *Lechytia*, include six setae on each tergite beginning with the first, except that in one Colorado specimen only five setae occur on the first tergite; two setae form a pair located near each end of the tergite, the other two setae of each tergite well separated and much more median in position. Palpal femur 0.358–0.420 mm. in length, with only one female having a femur more than 0.400 mm. long; width 0.095–0.111 mm., width determined from femur attached to tibia and chela, because when separated from other segments the femur frequently rotates and the apparent width becomes conspicuously less; length 3.62–3.90 times the width. Chela 0.57–0.64 mm. long, with chela of only one female longer than 0.620 mm.; width of chela 0.145–0.170 mm.; length 3.76–3.93 times the width. Chelal hand 0.259–0.295 mm. long, 0.147–0.169 mm. deep, with the length 1.73–1.83 times the depth; movable finger 0.325–0.360 mm. in length. Virtually all measurements and ratios of the single female reported from Utah by Hoff and Clawson (1952) and of the two females reported by Hoff (1952; separate data for females unpublished) from New Mexico fall within the limits of ranges given for the seven females from Colorado. In Hoff's study (1952) measurements and ratios for specimens of the two sexes were combined, as the data were considered inadequate to allow the detection of possible sexual dimorphism. It now seems apparent that the chela and the chelal hand in the male are a little smaller and on the average slightly more slender than in the female. Ranges of measurements and ratios of four Colorado males are given here. Body length 1.25–1.35 mm.; carapace 0.36–0.38 mm. long. Carapace, eyes, and tergal chaetotaxy as in the female. Palpal femur 0.358–0.360 mm. in length, 0.092–0.096 mm. in width, length of femur 3.73–3.89 times the width; chela 0.535–0.555 mm. in length, 0.135–0.142 mm. in width, length 3.88–4.11 times the width; chelal hand 0.255–0.263 mm. in length, 0.136–0.143 mm. in depth, length 1.83–1.91 times the depth; movable finger 0.311–0.330 mm. in length. The lengths of palpal segments of males from Colorado are definitely smaller than for the four males previously reported from New Mexico (Hoff, 1952; separate statistics for males unpublished), but the length/width and length/depth ratios are virtually the same. The observed differences between males from the two states may result from inadequate data.

Ecology: In both Colorado and New Mexico *Lechytia pacifica* is adapted to living in the somewhat dry litter of junipers, pinyons, and yellow pines. In Colorado, but not in New Mexico, occasional specimens have been taken from the litter of broad-leaved trees. With the exception of one collection from an elevation of 8800 feet, all 11 Colorado collections were made at elevations of 6000 to 7000 feet. The 10 collections reported by Hoff (1959) from New Mexico were taken from elevations of 6500 to 8650 feet. Population densities for this species appear low, as

only one of the Colorado collections contains as many as three individuals, and most collections contain only one specimen. Population densities are little greater in New Mexico.

The geographic distribution of the species in Colorado is somewhat peculiar, as specimens have been taken only from Montezuma County in the very southwest corner and from two adjacent counties, Boulder and Larimer, in the north-central part of the state. Considering his efforts to collect pseudoscorpions in the intervening, more mountainous, central and west-central part of Colorado, the writer thought it reasonable to expect a few specimens of *L. pacifica* in his collections if the species occurs in this region. However, no specimens were found. Because litter apparently suitable as a habitat occurs beyond the geographic and altitudinal limits observed for the species in Colorado, it is suggested that distribution is limited by one or more climatic factors and not by the source or kind of litter. Similarities in many aspects of the climate of Montezuma County in the southwestern corner of the state and of the climate of areas at fairly low elevation along the eastern margin of the Front Range in Larimer and Boulder counties lend some credence to this suggestion. In many respects the climate of areas from which *L. pacifica* has been taken in Colorado seems to be very similar to the climate of collecting areas in New Mexico, and these climates differ strongly from the climate of the elevated area of complex mountains and intermontane basins in central Colorado. For the geographic areas under consideration, similarities and differences for various aspects of climate are well shown by several maps given by Vischer (1954). With respect to temperature, special attention is called to maps of the normal annual temperature (map 3), of the normal length of the frost-free season (map 206), and of the normal, the normal daily minimum, and the normal daily maximum temperatures for July (maps 23, 24, and 25, respectively). With respect to moisture, which may be more important than temperature relationships in limiting the geographic distribution of many organisms, some of the differences and similarities for the regions under consideration are shown in maps given by Vischer (1954), especially maps showing normal annual precipitation (map 492) and annual excess of precipitation over evaporation (map 487). For a clear and practical concept of moisture relations in the areas being discussed, the reader is referred to Thornthwaite's (1948, map A) map of the moisture regions in the United States, based on a moisture index that reflects precipitation and potential water loss by evaporation and transpiration. According to the map, both the eastern slope of the Front Range in Boulder and Larimer counties and the southwest corner of Colorado have dry climates, with very similar moisture deficiencies, while the intermediate area has a moist climate and a moisture surplus. Perhaps of importance equal to annual precipitation and precipitation-evaporation relationships is the seasonal distribution of precipitation. Baker (1944, figs. 17, 18) presents data indicating the very similar seasonal distribution of precipitation for the San Juan drainage in which nearly all of Montezuma County occurs and the area along the east slope of the Front Range in Boulder and Larimer counties. In these two areas, winter is the dry season, and much of the annual precipitation occurs during the growing season. In contrast, precipitation in the strongly elevated, intervening region is somewhat equally distributed through all months of the year (Baker, 1944, fig. 17). Although there are definite correlations between various aspects of climate and the distribution of *L. pacifica*, an attempt to determine from present data the exact factor or complex of factors limiting distribution is certainly unwarrantable. From a consideration of the climatic conditions under which *L. pacifica* is found in New Mexico and Colorado, it appears that the species is adapted to moisture-deficient areas at relatively low elevations, where precipitation occurs chiefly during the somewhat long growing season, and that the species avoids areas at higher elevations, where the growing season is shorter and where there is normally an annual excess of precipitation over evaporation.

NEW RECORDS: *Boulder County:* Two collections from "leaf mould, deciduous woodland," one collection from Green Canyon at an elevation of 6150 feet and the other collec-

tion from Bear Canyon at an elevation of 6000 feet, Boulder, August, 1955, both collections made by H. Borchert and contributed by R. E. Gregg; from yellow-pine litter, 6100 feet in elevation, 3 miles west of Boulder. *Larimer County:* From juniper litter, 27 miles west of Fort Collins, elevation about 6000 feet; from debris at base of dead yellow pine, 30 miles west of Fort Collins, elevation 6400 feet; from aspen litter, about 2 miles northeast of Chambers Lake, about 60 miles west of Fort Collins, elevation about 8800 feet. *Montezuma County:* Two collections from beneath stones in area of pinyon-juniper woodland, collected by P. F. Van Cleave, 1952 and 1953; from juniper litter, Van Cleave and Hoff, July 20, 1955; one collection from beneath a piece of wood and another from beneath stones in an area of pinyons and junipers, both collections by Van Cleave and Hoff, July 20–21, 1955; all Montezuma County collections taken in Mesa Verde National Park at an elevation of about 7000 feet.

Suborder **DIPLOSPHYRONIDA** Chamberlin

Family **NEOBISIIDAE** Chamberlin

Subfamily **NEOBISIINAE** Chamberlin

Genus **NEOBISIUM** Chamberlin

Neobisium Chamberlin, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 11. Beier, 1932, Das Tierreich, vol. 57, p. 78.

This genus contains pseudoscorpions with the following combination of characteristics: four eyes or eyeless; apical portion of maxilla with three, four, or five setae; eight tactile setae (in one species a ninth, probably anomalous, seta reported) on the fixed chelal finger, four on the movable chelal finger; tactile setae of fixed finger in two distinct and well-separated groups, one group of three or four setae within the distal one-half and sometimes within the distal one-third of the finger (the finger length considered to be approximate to the length of the movable finger) and the other group consisting of four or five setae in the basal part of the finger, except that tactile setae *eb* and *esb*, while remaining a part of the group, may in some cases at least appear to be on the surface of the hand near the finger base. Care should be taken in following the diagnosis of the genus *Neobisium* as given by Beier (1932a), because for the genus he has apparently given a description of the chaetotaxy of the fixed chelal finger as it occurs in the subgenus *Neobisium*. The genus is divided into three subgenera. One subgenus, *Blothrus*, is typically European in distribution. The subgenus *Neobisium* is characteristically European, but one species is found in the eastern part of the United States (Hoff, 1958). The subgenus *Parobisium* contains five species and one subspecies from Japan and one species from Oregon. A second North American species of *Parobisium* is described in the present paper. The key to genera given by Hoff (1958) is satisfactory for the identification of specimens of *Neobisium* as to the genus. The method for separating specimens of the subgenera *Neobisium* and *Parobisium* is given under the discussion of *Parobisium*.

Subgenus **PAROBISIUM** Chamberlin

Parobisium Chamberlin, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 17. Beier, 1932, Das Tierreich, vol. 57, p. 84.

Pseudoscorpions belonging to this subgenus have five tactile setae in the basal group and three tactile setae in the distal group on the fixed chelal finger, with basal and distal groups well separated. The statement given by both Chamberlin and Beier, that the length of the palpal femur is no greater than the length of the carapace, is no longer tenable and should be deleted from the description of the subgenus. Pseudoscorpions of the subgenus *Neobisium* differ from those of the subgenus *Parobisium* by having four tactile setae in each of the well-separated groups on the fixed chelal finger.

Neobisium (Parobisium) vancleavei, new species

Figures 3–6

Male: The description of the male is based on three individuals (the holotype and two paratypes). Measurements given for the holotype frequently are followed in parentheses by ranges of measurements based on all three males. Body and appendages, especially the legs, somewhat slender; carapace of moderately deep golden color, abdomen and legs a little lighter in color, palps of a deeper and somewhat glossy golden color; body length

3.25 (2.8–3.3) mm. Carapace nearly quadrangular in outline; posterior margin virtually straight, lateral margins parallel or subparallel posterior to the eyes; anterior margin moderately convex, with a triangular but relatively small epistome; margin of epistome and anterior margin of carapace entire; surface of carapace virtually smooth, except for net-like lines on the lateral surfaces; the two eyes of each side similar in size and separated by no more than two-thirds of the diameter of one eye; anterior margin with four setae, posterior margin with 12 (10–12) setae; carapace 0.76 (0.72–0.79) mm. in length, the greatest width at or very near the posterior margin and measuring 0.69 (0.65–0.74) mm.; ocular width 0.67 (0.60–0.67) mm. Abdomen slender and appearing unusually long in comparison with the carapace, not strongly sclerotic, surface of sclerites marked by very poorly developed, net-like lines, with the sculpturing definitely more conspicuous on the lateral portions of the tergites than elsewhere; tergites and sternites not divided; relatively long, slender, and conspicuous setae arranged in a row near the posterior margin of each tergite, number of setae varying from 11 to 14 on the first tergite to about 20 on each tergite of the central part of the abdomen; setae of sternites a little shorter and somewhat more slender than the setae of the tergites, each sternite of the central part of the abdomen with a marginal row of about 20 setae and a pair of submedian setae located on the face of each sternite.

Chelicera of golden yellow color, with the apical teeth of the fingers much darker; cheliceral hand with seven or eight setae, including the interior seta at the base of the fixed finger; hand and fingers virtually smooth, except for a few very poorly developed spinules on the surface at the base of the fixed finger and more numerous and more strongly developed spinules on the surface of the basal part of the movable finger; dentation of inner margin of fingers somewhat irregular, with large and well-developed teeth in some cases alternating with very minute teeth; fixed finger with 14–18 teeth, most of these acute and triangular in shape, but several of them in the form of very small denticles located between adjacent large teeth and near the ends of the row; movable finger with marginal teeth much as on the opposing finger but usually a little more acute, variable in size, eight to 10 in number, and located within the distal one-half of the finger margin; galea represented by a raised crest with a gently convex margin; serrulae well developed, but an accurate count of the plates is impossible in present specimens; chelicera 0.43 (0.39–0.43) mm. in length, 0.285 (0.240–0.285) mm. in width; movable finger 0.32 (0.30–0.34) mm. in length.

Palp as shown in figure 3; setae fairly numerous, slender, delicate, and relatively long except that the setae of the extensor surface of the femur are distinctly shorter; for the most part surfaces of segments appearing smooth, except for a few very small granules on the flexor surface of the trochanter, conspicuous and fairly well-developed granules along the flexor surface of the femur, and a few weakly developed granules near the distal end of the flexor margin of the tibia and on the flexor surface of the hand near the base of the fixed finger; small irregular areas marked by vestigial granules in some specimens on the extensor surface of femur and tibia. Four or five (in some cases perhaps six) setae along the margin of the apical portion of the maxilla. Trochanter 0.46 (0.42–0.46) mm. in length, 0.212 (0.200–0.212) mm. in width, length 2.17 (2.10–2.19) times the width. Femur 0.81 (0.78–0.84) mm. in length, 0.207 (0.189–0.215) mm. in width, length 3.91 (3.91–4.12) times the width. Tibia 0.69 (0.67–0.71) mm. in length, 0.275 (0.248–0.275) mm. in width, length 2.51 (2.51–2.70) times the width. Chela without pedicel 1.23 (1.16–1.26) mm. in length, 0.367 (0.342–0.380) mm. in width, length 3.35 (3.32–3.39) times the width. Chela in lateral view as shown in figure 4; marginal teeth of chelal fingers distributed along nearly the entire length of each finger, teeth more or less uniform on each finger but a little smaller towards the distal end of the row; teeth of fixed finger 47 (47–59) in number, each with a cusp except for one to four of the teeth at the basal end of the row, each tooth weakly asymmetrical and with the cusp directed slightly towards the basal end of the row; movable finger with 46 (46–54) teeth, teeth of the movable finger nearly as large as those of the fixed finger but only the distal five to eight

teeth with cusps; the symmetry and uniformity of the teeth of the movable finger suggest that the acuspid condition is natural; tactile setae of chelal fingers as shown in figures 3 and 4; length of hand without pedicel 0.57 (0.55–0.60) mm., depth of hand 0.370 (0.353–0.385) mm., length 1.54 (1.54–1.56) times the depth; length of movable finger 0.70 (0.69–0.71) mm.

Legs relatively slender, light golden yellow in color, surface of podomeres smooth; setae fairly long and conspicuous, somewhat sparse on femoral parts but becoming numerous and very conspicuous on the tarsal segments, telotarsus having a definitely hirsute appearance. Measurements for the first leg of the holotype include pars basalis 0.390 mm. in length, 0.118 mm. in depth; pars tibialis 0.270 mm. long, 0.110 mm. deep; tibia 0.385 mm. in length, 0.084 mm. in depth; metatarsus 0.175 mm. long, 0.068 mm. deep; telotarsus 0.265 mm. long, 0.065 mm. deep. Fourth leg with femur somewhat fusiform in general appearance, but tapering more strongly towards the basal than the distal end; greatest depth of femur at the place of articulation between femoral parts. Important measurements for the fourth leg of the holotype include pars basalis 0.320 mm. in length as measured along the flexor margin; pars tibialis 0.385 mm. in length as measured along the extensor margin; entire femur 0.72 mm. long, 0.190 mm. deep; tibia 0.675 mm. in length, 0.104 mm. in depth; metatarsus 0.225 mm. in length, 0.079 mm. in depth; telotarsus with a length of 0.345 mm., depth of 0.077 mm. Fourth leg with conspicuous tactile setae, one tactile seta basal to the mid-point of the extensor margin of the tibia, one near the basal end of the extensor margin of the metatarsus, and one near the mid-point of the extensor surface of the telotarsus.

Male genitalia very conspicuous; internal sclerotic structure includes a well-developed recurved plate, the deeper part of which is strongly sculptured with scale-like markings; the anterior recurved portion of the plate is more superficial, lies just beneath the anterior operculum, and is strongly marked by closely set granules; sculpturing of the two kinds merge imperceptibly. Lateral genital sacs very large and conspicuous, pyriform in general shape, rugose in appearance; bulb-like sac 0.175 (0.175–0.185) mm. in diameter (specimens cleared in caustic); neck of sac somewhat variable, 0.056–0.075 mm. in diameter, this being equal to or slightly less than twice the diameter of the anterior tracheal trunk. Chaetotaxy of genital operacula variable; anterior operculum with between 30 and 40 scattered, well-developed setae; posterior wall of genital slit with a group of three to five setae on each side of the median line; posterior operculum bearing a median group of 10–12 setae just posterior to the genital opening and a posterior row of 16–24 setae exclusive of setae associated with the respiratory spiracles.

FEMALE: Description of female based on one individual (the allotype). Female very similar to male in general appearance, size, color, and chaetotaxy; body length 3.2 mm. Carapace 0.775 mm. in length, greatest width across the posterior margin and equal to 0.70 mm.; ocular width 0.65 mm. Abdomen, except for genitalia, virtually identical with that of the male. Chelicera of female very similar to that of the male; hand with seven or eight setae, including the interior seta at the base of the fixed finger; inner margin of fixed finger with 20 teeth, a number of these very small and inconspicuous, so that only about 15 teeth are well developed; teeth of inner margin of movable finger nine to 11 in number; although difficult to observe and count subject to error, serrula interior seems to have about 18 plates, serrula exterior 27 plates; galea as in the male; chelicera 0.45 mm. in length, 0.30 mm. in width; length of movable finger 0.34 mm. Palps of female essentially like those of the male in color, chaetotaxy, surface sculpturing, and shape of palpal segments except that the chela in dorsal view and the chelal hand in lateral view are appreciably stouter. Each maxilla with four or five apical setae; trochanter 0.45 mm. in length, 0.205 mm. in width; femur 0.81 mm. in length, 0.207 mm. in width; tibia 0.67 mm. in length, 0.260 mm. in width; chela without pedicel 1.21 mm. in length, 0.397 mm. in width. Chela in lateral view much as in the male; tactile setae of fingers as shown in figures 5 and 6; marginal teeth of fingers essentially as in the male, fixed finger with 52 teeth, movable finger with 49 teeth; hand without pedicel 0.58 mm. in length,

0.394 mm. in depth; movable finger 0.70 mm. in length. Legs of female virtually identical with legs of male. First leg with pars basalis 0.375 mm. in length, 0.113 mm. in depth; pars tibialis 0.260 mm. in length, 0.108 mm. in depth; tibia 0.370 mm. in length, 0.087 mm. in depth; metatarsus 0.180 mm. in length, 0.072 mm. in depth; telotarsus 0.270 mm. in length, 0.068 mm. in depth. Fourth leg with the pars basalis 0.312 mm. in length as measured along the flexor margin; pars tibialis 0.380 mm. in length as measured along the extensor margin; entire femur 0.69 mm. in length, depth of femur greatest at the point of articulation between femoral parts and equal to 0.175 mm.; tibia 0.64 mm. in length, 0.103 mm. in depth; metatarsus 0.220 mm. in length, 0.079 mm. in depth; telotarsus 0.342 mm. in length, 0.077 mm. in depth. Anterior portion of ventral surface of abdomen somewhat damaged during preparation for study, and chaetotaxy of genital opercula difficult to observe; anterior operculum with probably 17 scattered short setae; excluding the setae associated with the spiracles, apparently 18 setae in a marginal row on the posterior operculum.

TRITONYMPH: One tritonymph paratype available for study. Tritonymph similar in general appearance to the adult, but lighter in color, less sclerotic, and with somewhat fewer setae; length of body 2.3 mm. Carapace less quadrangular in general outline than in the adult, but the posterior part is probably spread and distorted because of mounting; length of carapace 0.54 mm.; anterior margin with four setae, posterior margin with nine to 10 setae. Chelicera similar to that of the adult in general appearance; five setae on cheliceral hand, including the interior seta at the base of the fixed finger; galea as in the adult; fixed finger with 11–12 teeth on the inner margin, movable finger with seven to eight teeth along the inner margin; movable finger 0.23 mm. in length. Palp of tritonymph much like that of the male in color and chaetotaxy, surface of segments virtually smooth but with a few vestigial granules on the flexor surface of the hand at the base of the fingers; tritonymph with palpal segments much smaller than in the adult, the femur and tibia appreciably stouter and with much less strongly developed pedicels than in the adult; chela and hand with length/width and length/depth ratios much as in the adult; three or four setae along the margin of the apical part of the maxilla. Palpal femur 0.52 mm. in length, 0.147 mm. in width; tibia 0.44 mm. in length, 0.187 mm. in width; chela without pedicel 0.81 mm. long, 0.255 mm. wide; hand without pedicel 0.375 mm. in length, 0.27 mm. in depth; movable finger 0.46 mm. in length. Teeth of chelal fingers very similar to those of the adult in appearance and shape, except that the cusps of the teeth of the fixed finger are less well developed; fixed finger with 42, movable finger with 44, marginal teeth. Fixed chelal finger with seven tactile setae, *et* and *it* just within the distal one-third of the finger, *est* slightly distal to the mid-point of the finger, *eb* and *esb* on the outer surface at the base of the finger, *ib* and *isb* at a level slightly distal to the level of *eb* and *esb;* missing seta apparently is *ist.* Movable finger with three tactile setae, *t* and *st* much as in the adult except located near the mid-point of the finger, *b* near the base of the finger; missing seta is apparently *sb.*

REMARKS: Prior to the description of the present new species, the subgenus *Parobisium* included five species and one subspecies from Japan and one species, *N.* (*P.*) *hesperum* Chamberlin, 1930, from Oregon. The new species differs from previously described species by being smaller or by having fewer teeth on the chelal fingers, or both, except that the new species is separated from *N.* (*P.*) *flexifemoratum* Chamberlin, 1930, by having a somewhat larger body, longer chelal finger in relationship to the chelal hand, and more slender palpal femur and tibia. In addition to having a smaller body length and fewer teeth on the chelal fingers, *N.* (*P.*) *vancleavei* differs from *N.* (*P.*) *hesperum*, the only other American species of *Parobisium*, by having a carapacal epistome, a stouter palpal tibia, and a femur that has a much less strongly granulated surface.

TYPE LOCALITY: *Montezuma County:* Male holotype, female allotype, two male paratypes, and one tritonymph paratype taken in four collections by P. F. Van Cleave from beneath rocks in pinyon-juniper woodland, elevation about 7000 feet, Mesa Verde National Park, 1951–1953. The species is known only from the type locality. The holotype, the allo-

type, one male paratype, and the tritonymph paratype are deposited in the United States National Museum. One male paratype is retained by the writer.

Genus MICROBISIUM Chamberlin

Microbisium Chamberlin, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 20. Hoff, 1956, Amer. Mus. Novitates, no. 1780, p. 2.

Three species of *Microbisium* occur in North America. Two of these, *M. confusum* and *M. parvulum*, are reported from Colorado. In species of this genus males are unknown and, as in many animal groups having obligate parthenogenesis, gene scattering has resulted in such unusual morphological variation that discrete species are sometimes difficult to delimit. With respect to the two species found in Colorado, it is possible to identify most sexually mature specimens but, in the absence of usable discontinuous variables, the overlapping of ranges of measurements and ratios makes identification of some specimens virtually impossible. Hoff (1956b) gives ways of recognizing specimens of *M. confusum* and *M. parvulum* by size and length/width ratios of palpal femur and chela, but at the same time he points out that some specimens fall outside the limits given for each species. For Colorado specimens, it is clear that the lengths of palpal femur and chela are somewhat useful as taxonomic criteria, but that differences in the length/width ratios are of relatively little practical value because of severe overlap of ranges for the two species. Hoff (1956b) described the femur of *M. confusum* as typically less than 0.4 mm. in length and the femur of *M. parvulum* as typically more than 0.4 mm. in length, but he gives no indication of the reliability of the femoral length for the separation of the two species. From very careful measurements of Colorado specimens, it was found that 13 of 17 specimens identified as *M. confusum* have a femur 0.38 mm. or less in length, this being less than the observed minimum length for *M. parvulum* in Colorado, and that three of nine specimens identified as *M. parvulum* have a femur that is 0.40 mm. or more in length, this being more than the observed maximum for *M. confusum* in Colorado. It is evident that the length of the femur cannot be used for species identification of about one-third of the specimens of *Microbisium* from Colorado, as these specimens have femora with lengths that fall within the overlap of ranges for the two species. Hoff (1956b) also described the possible separation of *M. confusum* and *M. parvulum* on the basis of the stoutness of the femur. Unfortunately, through a transposition of species names, the statement by Hoff is entirely erroneous. Even if the statement were correctly expressed, the difference in length/width ratios would not be dependable for separation of *M. confusum* and *M. parvulum*, because recent studies make it clear that the ranges of the length/width ratios of the femur in the two species very strongly overlap. However, but for Colorado specimens only, the length/width ratio of the femur can be used for recognition of some specimens of *M. confusum*, as eight of 17 Colorado specimens of this species actually have a femur more slender (ratio of 2.95 or more) than observed for Colorado specimens of *M. parvulum* (largest ratio 2.89). It is evident that, while the length and the length/width ratio of the femur may aid in the identification as to species of some of the Colorado specimens of *Microbisium*, species determination of many specimens depends on other characteristics. Hoff (1956b) also suggested the separation of specimens of *M. confusum* and *M. parvulum* by means of differences in the length and length/width ratio of the chela. As with the femur, the ranges of the lengths and especially of the length/width ratios of the chela in the two species strongly overlap, and the limits given by Hoff are not entirely reliable. Based on present collections from Colorado and relative only to Colorado collections, specimens of *Microbisium* with a chela (without pedicel) 0.63 mm. or less (0.635 mm. is the lower limit for *M. parvulum* in Colorado) in length and/or with a length/width ratio of 2.90 or more belong to *M. confusum*, and specimens with a chela more than 0.67 mm. long (0.67 mm. is the upper limit known for *M. confusum* from Colorado) and/or with a ratio of 2.70 or less belong to *M. parvulum*. However, about one-half of the specimens of *Microbisium* from Colorado have a chela with a length between 0.635 and 0.67 mm. and a ratio between 2.73 and 2.86. For Colorado speci-

mens it is clear that identification based on the length and ratio of the chela is no more satisfactory than is identification based on the length and ratio of the femur.

The most reliable criterion for the separation of *M. confusum* and *M. parvulum* lies in the shape of the palpal tibia. Unfortunately the shape of the tibia is variable in both species, and observable differences are difficult to describe verbally and virtually impossible to express mathematically. In *M. confusum* the palpal tibia has a slightly longer and more slender pedicel and the inner or flexor margin is less convex and less bulging than in *M. parvulum*. In addition, the basal portion of the extensor or outer margin in some cases is a little less convex, so that the extensor margin appears less regularly curved in *M. confusum*. The shape of the tibia in typical specimens of each of the two Colorado species is shown in figures 7–11. After careful study of the properly oriented tibia, reliable species identification usually can be made. Regardless, however, of the criteria used, a few specimens are virtually impossible to identify with assurance. Separation of the tritonymphs of *M. confusum* and *M. parvulum* frequently can be made on the basis of the shape of the tibia, but the occurrence of specimens with tibiae of intermediate or indecisive shape sometimes makes species determination difficult. Accurate species identification of specimens belonging to instars earlier than the tritonymph is virtually impossible at the present time.

Microbisium parvulum (Banks)

Figures 7–9

Obisium parvulum BANKS, 1895, Jour. New York Ent. Soc., vol. 3, p. 12.

Microbisium parvulum, CHAMBERLIN, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 21. HOFF, 1946, Bull. Chicago Acad. Sci., vol. 7, p. 495; 1956, Amer. Mus. Novitates, no. 1780, p. 3.

This species has been reported from Colorado, New Mexico, Oklahoma, and Utah (Hoff, 1958). The seven collections reported here for Colorado are the first records for the state since Chamberlin (1930) published the record of a female from scrub-oak chapparal (Gambel oak) near Manitou, probably from El Paso County. In both New Mexico (Hoff, 1959) and Colorado, *M. parvulum* is associated chiefly with the litter of deciduous broad-leaved trees in somewhat dry areas at relatively low elevations. However, two of the Colorado collections were taken from the litter of conifers. All the present Colorado collections are from elevations below 7000 feet in counties along the east edge of the Rocky Mountains. The ranges of measurement and ratios given here are based on nine mounted females from Colorado, are similar to ranges for females from other localities (Hoff, unpublished; Hoff and Bolsterli, 1956), and include almost without exception the measurements and ratios given by Hoff (1946b) for two female cotypes (locality unknown). Palpal femur with length 0.385–0.435 mm., width 0.135–0.155 mm., length 2.75–2.89 times the width. Chela without pedicel 0.635–0.725 mm. long, 0.223–0.275 mm. wide, length 2.60–2.86 times the width.

NEW RECORDS: *Boulder County:* One collection taken by H. Borchert from birch litter, Long Canyon, 6900 feet in elevation, August 21, 1955, and one collection by R. E. Gregg from Four-mile Mesa, 5600 feet in elevation, June 18, 1955; both localities at Boulder. *Larimer County:* One collection by T. A. Woolley at an elevation of 5300 feet near Laporte, October 25, 1949, and one collection by Don Palmer near Spring Creek Dam, elevation probably between 5200 and 5400 feet, November 11, 1952; both localities near Fort Collins. *Pueblo County:* One collection from Gambel oak litter, about 5500 feet in elevation, 24 miles south of Pueblo; one collection from sparse yellow-pine litter and one from juniper litter at about 5900 feet in elevation, 23 miles north of Walsenburg.

Microbisium confusum Hoff

Figures 10, 11

Microbisium confusum HOFF, 1946, Bull. Chicago Acad. Sci., vol. 7, p. 496; 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 446.

This species occurs throughout much of the eastern part of the United States and has been reported from several states west of the Mississippi River (Hoff, 1958). Hoff and Bolsterli (1956) mention that the species extends as far west as the foothills of the Rocky Mountains in Colorado, but they give no definite localities. In order to supply de-

tailed locality records, collections studied by Hoff and Bolsterli are included among the new records given in the present paper. *Microbisium confusum* occurs more frequently and throughout a slightly larger geographic area in Colorado than does *M. parvulum*. As is *M. parvulum*, *M. confusum* is chiefly a litter-inhabiting species (Hoff, 1949) and in Colorado occurs chiefly in litter of such trees as aspen, Gambel oak, birch, and alder. Out of 21 collections from Colorado, only two are from litter beneath conifers. In Colorado the species extends to higher elevations than does *M. parvulum*, the present collections having been taken from elevations between 5700 and 8600 feet. The following ranges of measurements and ratios are based on 17 females from Colorado and are similar to measurements and ratios of females from other areas (Hoff, 1946b; Hoff and Bolsterli, 1956; and unpublished data). Palpal femur 0.34–0.395 mm. in length, 0.119–0.138 mm. in width (except 0.110 mm. for one female that appears to have recently molted), length 2.75–3.09 times the width. Chela without pedicel 0.55–0.67 mm. long, width 0.203–0.245 mm. (except 0.183 mm. for the female that appears to have recently molted), length 2.73–3.06 times the width.

NEW RECORDS: *Boulder County:* Seven collections from the litter of deciduous broad-leaved trees in Bear, Green, Bluebell, Gregory, and Long canyons, at elevations of between 5750 and 6900 feet, Boulder; collections made by H. Borchert during July, August, and September, 1955, and contributed by R. E. Gregg. *Gilpin County:* One collection taken from aspen litter and another from an accumulation of aspen litter in a clump of dwarf juniper, 8600 feet in elevation, 1 mile south of Rollinsville. *Larimer County:* Three collections from aspen litter (one on September 8, 1946), one from soil near a spring on August 18, 1946, one from yellow-pine debris and litter, and one from mixed yellow-pine and lodgepole-pine litter, Rist Canyon, from 5900 to 7600 feet in elevation, 10 to 19 miles west of Fort Collins; one collection from alder litter and one from mixed aspen-maple-fir litter, 7000 feet in elevation, 37 miles west of Fort Collins. *Las Animas County:* From Gambel oak litter, about 7800 feet in elevation, 15 miles south of Trinidad. *Routt County:* From aspen litter, 8000 feet in elevation, 6 miles north of Steamboat Springs; two collections from Gambel oak litter, one collection taken about 5 miles north of Steamboat Springs at 7900 feet in elevation and the other taken about 1 mile south of Steamboat Springs at 7200 feet in elevation.

Microbisium sp. indet.

The following are records of nymphs for which identification cannot be completed beyond the genus.

RECORDS: *Archuleta County:* Gambel oak litter, 7300 feet in elevation, 9 miles west of Pagosa Springs. *Eagle County:* From mixed serviceberry and aspen litter, 7600 feet in elevation, 2.5 miles west of Minturn. *Larimer County:* One collection by T. A. Woolley, from bank of Cache la Poudre River near Bellvue, about 5300 feet in elevation, October 14, 1949; one collection from aspen litter, 6400 feet in elevation, 32 miles west of Fort Collins; one collection from cottonwood litter, 7200 feet in elevation, 40 miles west of Fort Collins. *Routt County:* Gambel oak litter, 7600 feet in elevation, near Fish Creek Falls, about 3.5 miles east of Steamboat Springs.

SUBFAMILY **IDEOBISIINAE** CHAMBERLIN

GENUS **MICROCREAGRIS** BALZAN

Microcreagris BALZAN, 1891, Ann. Soc. Ent. France, vol. 60, p. 543. HOFF, 1956, Amer. Mus. Novitates, no. 1780, p. 4.

Microcreagris sp. indet.

Available collections contain only three specimens belonging to this genus. One of these specimens is a deutonymph collected by C. A. Ross, June 26, 1952, at Florissant, collecting site probably in Teller County, Illinois Natural History Survey collection, no details of locality or habitat available. Each of the other collections consists of a protonymph; one collected by H. and L. Levi on June 21, 1959, from beneath stones and wood at timberline, 11,500 feet in elevation, Silvanite Basin, 5 miles northeast of Gothic (Gothic is located 8 miles north of Crested Butte), and the other taken from beneath a stone by H. Levi on June 25, 1960, at Copper Creek, elevation 10,825 feet, 2 miles northeast of Gothic; both localities in Elk Moun-

tains, Gunnison County. The nymphs resemble somewhat the tritonymph of *M. laudabilis* described by Hoff (1956b) from New Mexico, but the similarity may be only in generic characteristics. Possibly the three nymphs are of the same species as Banks's (1909) *Ideobisium tibiale* from Florissant, Colorado. As previously stated by Hoff (1956b), *I. tibiale* may belong to the genus *Microcreagris*.

Family SYARINIDAE Chamberlin

Subfamily CHITRELLINAE Beier

Genus CHITRELLA Beier

Chitrella Beier, 1932, Das Tierreich, vol. 57, p. 165. Hoff, 1956, Amer. Mus. Novitates, no. 1780, p. 20. Malcolm and Chamberlin, 1960, Amer. Mus. Novitates, no. 1989, p. 2.

Chitrella transversa (Banks)

Obisium transversum Banks, 1909, Canadian Ent., vol. 41, p. 307.

Chitrella transversa, Hoff, 1956, Amer. Mus. Novitates, no. 1780, p. 21.

While this species has been known only from New Mexico (Hoff, 1958), it is not surprising to find it in Colorado, as some New Mexico specimens, including the types, were collected from the Sangre de Cristo Range and the San Juan Mountains, both of which span the New Mexico-Colorado border. A direct comparison with specimens from New Mexico leaves no question about the identification of Colorado specimens. However, some measurements, especially of females, from the two states do not agree so closely as might be expected. Many of the differences probably result from inadequate data and are a reflection of the small number of specimens measured.

As measurements and ratios for males of this species have been reported only for four males from New Mexico (Hoff, 1956b), the species description is supplemented by the following data based on five Colorado males. Body 2.05–2.45 mm. in length; carapace 0.54–0.65 mm. in length, greatest width near the mid-point or just posterior to the mid-point of the carapace and equal to 0.42–0.53 mm.; the two eyes of each side nearly equal in size and separated by less than the diameter of either eye. The similarity in size of the anterior and posterior eyes is contrary to the description given by Malcolm and Chamberlin (1960) in step 4 of their key to species of *Chitrella*. Palpal trochanter 0.285–0.365 mm. long, 0.139–0.170 mm. in width, length 2.03–2.26 times the width; femur 0.51–0.64 mm. long, 0.136–0.167 mm. wide, length 3.42–3.94 times the width; tibia 0.465–0.59 mm. in length, 0.186–0.227 mm. in width, length 2.42–2.91 times the width; chela without pedicel 0.76–0.96 mm. long, 0.235–0.310 mm. wide, length 2.95–3.24 times the width; hand without pedicel 0.355–0.46 mm. long, 0.220–0.290 mm. in depth, length 1.47–1.61 times the depth; movable finger 0.445–0.54 mm. in length. A comparison with four males from New Mexico (Hoff, 1956b) shows virtually no differences in size or ratios of palpal segments except that, on the average, the chelal hand in lateral view in some cases appears more slender in Colorado males.

For females from Colorado, sizes and ratios given here are expressed as ranges based on four females. Body length 2.15–2.55 mm.; carapace 0.57–0.62 mm. in length, 0.42–0.54 mm. in greatest width. Palps with trochanter 0.310–0.355 mm. long, 0.143–0.162 mm. wide, length 2.05–2.19 times the width; femur 0.52–0.595 mm. long, 0.144–0.159 mm. wide, length 3.56–3.75 times the width; tibia 0.45–0.52 mm. long, 0.192–0.215 mm. wide, length 2.32–2.42 times the width; chela without pedicel 0.81–0.87 mm. long, 0.255–0.287 mm. wide, length 2.91–3.18 times the width; chelal hand without pedicel 0.37–0.42 mm. long, 0.239–0.280 mm. deep, length 1.36–1.55 times the depth; movable finger 0.44–0.485 mm. in length. While the sizes of Colorado and New Mexico males agree closely, the Colorado females are smaller than New Mexico females, with ranges for the lengths of the body, carapace, palpal femur, chela, and chelal hand definitely extending below the ranges published by Hoff (1956b) for three females from New Mexico. The movable chelal finger of the Colorado females is decidedly shorter than that of New Mexico females, but the length of the palpal tibia is much the same. The length/width and length/depth ratios are virtually identical in females from the two states, except that the palpal tibia in Colorado females is a little more slender than in New Mexico females.

Ecology: According to Malcolm and Chamberlin (1960) species of *Chitrella* are

found typically in leaf mold and soil and under stones. In New Mexico *C. transversa* has been reported (Hoff, 1959) from juniper, scrub-oak, yellow-pine, Gambel oak, and alder litter at elevations ranging from 6400 to 8400 feet. The available data indicate that also in Colorado the species is associated with fairly dry litter at relatively low elevations.

NEW RECORDS: *Montezuma County:* Five collections, chiefly from beneath rocks, in pinyon-juniper woodland within 2 miles of Park Headquarters, 6900–7000 feet in elevation, and one collection from an area of pinyon and Gambel oak at Park Point, 8550 feet in elevation; all taken at Mesa Verde National Park by P. F. Van Cleave, 1950–1953.

FAMILY **GARYPIDAE** HANSEN
SUBFAMILY **GARYPINAE** SIMON
GENUS **LARCA** CHAMBERLIN, AMENDED

Larca CHAMBERLIN, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 616. BEIER, 1932, Das Tierreich, vol. 57, p. 224. HOFF, 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 447.

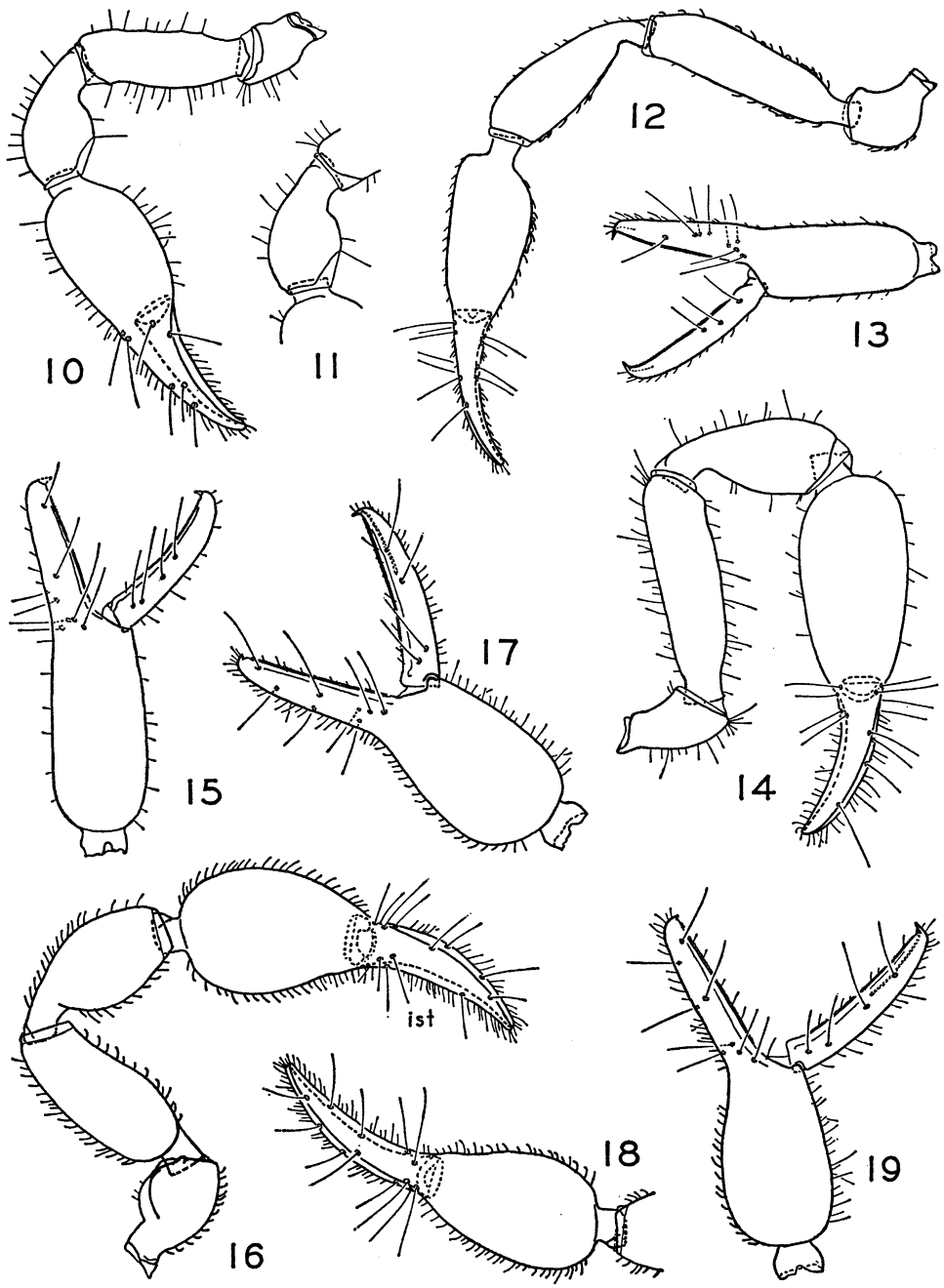
AMENDED DIAGNOSIS: Pseudoscorpions belonging to this genus have the following combination of characteristics: flagellum of four setae; investing setae, at least on some segments of the palps, arcuate and lanceolate; fixed finger with tactile seta *et* located not far distal to the mid-point of the finger, other tactile setae proximal to the mid-point; movable chelal finger with two or three tactile setae; pedal tarsi divided; first leg with pars basalis longer than pars tibialis; arolia longer than tarsal claws.

TYPE SPECIES: *Garypus latus* Hansen, 1884.

REMARKS: In order to make a generic assignment of the species described below, it was necessary to consider the species as the type of a new genus, to amend the genus *Larca* (originally characterized by the presence of two tactile setae on the movable chelal finger), or to amend the related genus *Archeolarca* Hoff and Clawson, 1952 (characterized by the presence of four tactile setae on the movable chelal finger). Of the three possibilities, amendment of the genus *Larca* was considered the most advisable, especially as the present new species (with three tactile setae on the movable chelal finger) appears more closely related to *Larca granulata* (Banks, 1891), a species found east of the Mississippi River in the United States, than to *Archeolarca rotunda* Hoff and Clawson, 1952, the only species in the genus *Archeolarca*, from New Mexico and Utah (Hoff, 1956b, 1958). The new species is more like *Larca granulata* in general appearance of the appendages, especially the legs, in the nature of the chelal teeth along the basal one-half of the marginal row on each finger, and in the shape of the palpal and tergal setae. As the four known *Larca* species, three from Europe and one from the United States, have only two tactile setae on the movable chelal finger and the new species has three, the genus is amended to include species characterized by having either two or three setae on the movable finger. Even after the genus is amended, the key given by Hoff (1958) will be found satisfactory for identifying as to genus specimens of the new species of *Larca*.

Larca notha, new species
Figures 12, 13

MALE: The description of the male is based on a single individual (the holotype). General appearance much as in other species of this genus and related genera; abdomen, carapace, and legs of a moderately deep yellowish golden color, palps of a much deeper golden color; setae varying from strongly arcuate and lanceolate to virtually straight and non-lanceolate, setae terminally acute; body length 1.60 mm. Carapace somewhat triangular in general shape, but with strongly truncated anterior margin; surface moderately and uniformly granulate; posterior margin nearly straight; setae, especially in the anterior one-half of the carapace, moderately lanceolate and arcuate; investing setae relatively sparse and well separated; posterior margin with four setae; anterior margin with six conspicuous setae, the submedian two of which are separated by a small notch in the middle of the anterior margin; eyes well developed and strongly corneate, the two eyes of each side separated by less than one-half of the diameter of the anterior eye; carapace 0.45 mm. long, ocular width about 0.31 mm., maximum width of 0.62 mm. along the posterior margin. Abdomen broadly oval in general outline; pleural membrane conspicuous, wide, and marked by very irregular



FIGS. 10–11. *Microbisium confusum* Hoff. 10. Dorsal view of palp with tactile setae omitted from the movable chelal finger, female from Rist Canyon near Fort Collins. 11. Palpal tibia, female from Long Canyon, Boulder.

FIGS. 12–13. *Larca notha*, new species, male holotype. 12. Dorsal view of palp. 13. Lateral view of chela.

FIGS. 14–15. *Pseudogarypinus giganteus*, new species, female holotype. 14. Dorsal view of palp. 15. Lateral view of chela; apical teeth broken from chelal fingers.

FIGS. 16–19. *Acuminochernes tacitus*, new species. 16. Dorsal view of palp, male holotype; tactile seta *ist* abnormal in position. 17. Lateral view of chela, male holotype; accessory teeth of fingers not shown. 18. Dorsal view of palp, female allotype. 19. Lateral view of chela, female allotype; accessory teeth of fingers not shown.

and fairly coarse striations; no setae definitely associated with the spiracles; tergites 1 through 9 divided; surface of tergites granulate, with appearance similar to that of the carapace; each tergite with a submarginal row of subarcuate setae, with a conspicuous slit-like sensory structure usually occurring between adjacent setae in the row; each of the half tergites of the first two segments with two setae, each half of the third tergite with three or four setae, each tergal half of segments 4 through 8 usually with five, occasionally four or six, setae; sternites 4 through 9 divided, marked by conspicuous scale-like or net-like lines, setae finer and much less strongly blade-like and arcuate than the setae of the tergites, a slit-like sensory structure usually found between adjacent setae in the marginal row; each half of sternite 4 with four or five setae, including a seta at the extreme median end of each half sternite; each half sternite of central part of abdomen with three or four setae, none with a seta corresponding to the seta observed at the extreme median end of each half sternite of segment 4.

Chelicera similar to legs in color, apical teeth of fingers no more deeply pigmented than rest of chelicera; surface of chelicera apparently smooth except for some relatively coarse and conspicuous scale-like markings on the outer surface of the hand; the most distal of the four setae of the flagellum the longest, with a few minute spinules along the anterior edge. Fixed finger with two small conical denticles on the inner margin of the apical tooth, followed proximally by four or five somewhat well-developed triangular teeth along little more than the distal one-third of the finger length; plates of serrula interior strongly fused. Movable finger with three or four weakly developed denticles near the distal end of the inner margin; galea relatively short, apparently with a single subterminal ramus; serrula exterior consisting of 15 ligulate plates. Chelicera 0.155 mm. in length, 0.085 mm. in width; movable finger 0.101 mm. long.

Palp strongly sclerotic; all surfaces conspicuously, strongly, and uniformly granulate except surfaces of the movable finger and the distal one-half of the fixed finger; setae of the trochanter and femur and of the flexor surfaces of the tibia and chelal hand strongly lanceolate, moderately arcuate, and terminally acute; setae of the extensor surfaces of the tibia and chelal hand short and relatively inconspicuous, sublanceolate to non-lanceolate, very weakly arcuate, terminally acute; for the most part periderm wanting, except for small irregular remnants on the flexor surfaces of the femur, tibia, and chelal hand; shape of segments as shown in figures 12 and 13. Trochanter 0.243 mm. long, 0.143 mm. wide, length 1.70 times the width; femur 0.54 mm. long, 0.141 mm. wide, length 3.83 times the width; tibia 0.48 mm. long, 0.155 mm. wide, length 3.10 times the width; chela without pedicel 0.73 mm. in length, 0.195 mm. in width, length 3.74 times the width; chelal hand without pedicel 0.36 mm. in length, 0.170 mm. in depth, length 2.12 times the depth; movable finger 0.385 mm. in length. Each chelal finger with teeth along nearly the entire margin, teeth of virtually equal development on the two fingers; most of the teeth subquadrangular in general outline, with the free edge flattened or subtruncate and bearing a very weakly developed cusp near the proximal end of the free margin; a few teeth of the proximal end of the row of each finger less strongly developed than the others and definitely acuspid; eight to 10 teeth at the distal end of the row on each finger subtriangular in shape, with very weakly developed cusps; fixed finger with 39, movable finger with 36, teeth. Tactile setae of chelal fingers as shown in figures 12 and 13.

Legs with surfaces of most segments strongly granulate, with the granules less regular in size and distribution, more apically acute, and much more rugged in general appearance than the granules of the palps; granules poorly developed to obsolete on the pars basalis of the fourth leg and on the telotarsus of each leg. Setae of most pedal segments very similar to the setae of the palpal femur except that the setae are a little less lanceolate; setae of trochanter and pars basalis of fourth leg virtually simple acuminate; setae of tarsal podomeres more numerous than on other segments, varying from lanceolate on the metatarsus to sublanceolate and virtually acuminate on the flexor surface of the telotarsus. First leg with pars basalis 0.191 mm. in length, 0.073 mm.

in depth; pars tibialis 0.143 mm. long, 0.082 mm. deep; tibia 0.175 mm. long, 0.064 mm. deep; metatarsus 0.135 mm. long, 0.048 mm. deep; telotarsus 0.119 mm. long, 0.035 mm. deep. Fourth leg with entire femur 0.390 mm. long, 0.104 mm. deep; tibia 0.279 mm. in length, 0.077 mm. in depth; metatarsus 0.155 mm. long, 0.053 mm. deep; telotarsus 0.155 mm. long, 0.041 mm. deep. Genital area with fine, straight, acute setae that arise from well-marked areoles. Anterior operculum with 18 setae in a transverse row immediately anterior to the genital slit, with the setae concentrated near the center of the row; surface of operculum otherwise free of setae except for an apparently anomalous seta located anterior to one end of the row. Posterior operculum with 24 setae along the central half of the posterior margin, well-spaced setae at the ends of the row arranged seriatim, setae in the center of the row crowded to form a cluster of closely adjacent setae posterior to the center of the genital slit; a submedian row of three small setae on the posterior lip at each side of the more central part of the genital slit.

FEMALE: Unknown.

REMARKS: The new species is separated from other species of the genus by the presence of three, instead of two, tactile setae on the movable chelal finger and by differences in the palpal segments which, in general, are smaller and stouter than in other species of the genus.

TYPE LOCALITY: *Larimer County:* One male, the holotype, from aspen litter, 6400 feet in elevation, 32 miles west of Fort Collins, August 12, 1958. The species is known only from the holotype, which is deposited in the collections of the American Museum of Natural History.

FAMILY **OLPIIDAE** CHAMBERLIN

SUBFAMILY **GARYPININAE** DADAY

GENUS **NEOAMBLYOLPIUM** HOFF

Neoamblyolpium HOFF, 1956, Amer. Mus. Novitates, no. 1780, p. 27.

Neoamblyolpium alienum Hoff

Neoamblyolpium alienum HOFF, 1956, Amer. Mus. Novitates, no. 1780, p. 28.

Specimens from Colorado agree in detail with the type specimens from New Mexico (Hoff, 1956b). As the number of plates in the serrula exterior is not given in the original species description, a study was made of all currently available specimens in which the serrula is in a position favorable for making an accurate count. In two paratype males and one paratype female from New Mexico and in five males and one female from Colorado the serrula exterior has 17 plates, except that one chelicera of one specimen has 18 plates. In the original species description no reference is made to the cribriform plates of the female. In most females of this species the cribriform plates are difficult to observe, probably because they are either lost or displaced during treatment of the body with caustic. Fortunately the cribriform plates were clearly observed in two specimens from Colorado. The two median cribriform plates are approximate, with the median margins of the two plates apparently in contact, and each is the same size as or is a very little larger than the lateral plate of each side; diameter of cribriform plates 0.012–0.017 mm.

As the present records are the first for Colorado and the second report of the species in the literature, statistics are given for both males and females from Colorado. For the Colorado male, ranges of measurements and ratios are based on seven individuals. Body of male 1.90–2.00 mm. long; length of carapace 0.51–0.53 mm. Palp with trochanter 0.205–0.215 mm. long, 0.093–0.107 mm. wide, length 1.94–2.27 times the width; femur 0.428–0.465 mm. in length, 0.108–0.117 mm. in width, length 3.87–4.16 times the width; tibia 0.280–0.325 mm. long, 0.113–0.133 mm. wide, length 2.29–2.77 times the width; chela without pedicel 0.72–0.78 mm. long, 0.198–0.215 mm. wide, length 3.49–3.75 times the width; chelal hand without pedicel 0.302–0.333 mm. in length, 0.183–0.200 mm. in depth, length 1.60–1.80 times the depth; movable finger 0.420–0.473 mm. in length. Fourth leg with entire femur 0.380–0.425 mm. long, 0.146–0.163 mm. deep, length 2.54–2.72 times the depth.

For the female, ranges of measurements and ratios, except where otherwise indicated, are based on four specimens. Body length 2.05–2.20 mm.; length of carapace 0.53–0.55 mm. Palp with trochanter 0.210–0.220 mm. in length, 0.098–0.110 mm. in width, length 1.91–2.25 times the width; femur 0.440–0.465

mm. in length, 0.113–0.118 mm. in width, length 3.83–3.98 times the width; tibia 0.297–0.322 mm. in length, 0.120–0.127 mm. in width, length 2.47–2.58 times the width; chela without pedicel 0.75–0.78 mm. long, 0.208–0.228 mm. wide, length 3.42–3.60 times the width; chelal hand without pedicel 0.314–0.340 mm. in length, 0.202–0.213 mm. in depth, length 1.55–1.63 times the depth; movable chelal finger 0.438–0.458 mm. long. Fourth leg (for three specimens only) with entire femur 0.400–0.415 mm. long, 0.147–0.157 mm. in depth, length 2.65–2.79 times the depth.

ECOLOGY: From eight Colorado and eight New Mexico collections (Hoff, 1956b, 1959), it is clear that the species is definitely associated with debris and litter beneath junipers, pinyons, and yellow pines, with the only exception being a New Mexico collection from decaying yucca in an area of pinyon-juniper woodland. Evidently the species has a high degree of microhabitat specificity, as indicated by the virtual absence of specimens taken from habitats other than the seasonally dry litter of conifers at relatively low elevation of 6400 to 7500 feet in New Mexico and 6000 to 7200 feet in Colorado.

NEW RECORDS: *Chaffee County:* One female and four males from pinyon litter, 7200 feet in elevation, 6 miles northwest of Salida. *Garfield County:* Two females and one male from pinyon litter, 6000 feet in elevation, 4 miles east of Glenwood Springs. *Larimer County:* Two males from debris at base of dead yellow pine, elevation about 6400 feet, 30 miles west of Fort Collins. *Montezuma County:* Five collections, including numerous females, males, and nymphs, from juniper and pinyon debris and litter, about 7000 feet in elevation, Mesa Verde National Park; collections made by P. F. Van Cleave in 1951 and 1953, by Van Cleave and Hoff on July 20, 1955, and by Hoff on July 21, 1955.

GENUS PSEUDOGARYPINUS BEIER

Pseudogarypinus BEIER, 1931, Mitt. Zool. Mus. Berlin, vol. 17, p. 313; 1932, Das Tierreich, vol. 57, p. 206.

Pseudogarypinus marianae (Chamberlin)

Garypinus marianae CHAMBERLIN, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 591; 1931, Stanford Univ. Publs., Biol. Sci., vol. 7, figs. 11-*W*, 15-*L*, 19-*I*, 26-*B*, 37-*B*, and 47-*J*.

Pseudogarypinus marinae [*sic!*], BEIER, 1931, Mitt. Zool. Mus. Berlin, vol. 17, p. 314.

Pseudogarypinus marianae, BEIER, 1932, Das Tierreich, vol. 57, p. 206.

This is the first report of *Pseudogarypinus marianae* from Colorado, the species previously being known only from California and Utah (Hoff, 1958). The present specimens from Colorado agree in virtually every detail with the original and only description of the species (Chamberlin, 1930). According to Hoff (1956b) it is possible that *Olpium frontalis* (type locality, Las Vegas, New Mexico, at the southeastern margin of the Southern Rocky Mountains) described by Banks in 1909 belongs to the genus *Pseudogarypinus*. If Banks's species belongs to *Pseudogarypinus*, then the species may be conspecific with *P. marianae*.

As actual sizes of palpal and pedal segments are not given by Chamberlin in his description of the species, measurements are included here for several females and males from the Colorado collections. For the female, measurements and ratios are given as ranges based on four individuals. Body length 3.3–4.5 mm.; carapace 0.90–1.03 mm. in length, greatest width 0.78–0.85 mm. Palp with trochanter 0.465–0.510 mm. in length, 0.245–0.270 mm. in width, length 1.86–1.96 times the width; femur 0.86–0.915 mm. long, 0.275–0.303 mm. wide, length 3.02–3.12 times the width; tibia 0.735–0.82 mm. in length, 0.330–0.360 mm. in width, length 2.23–2.28 times the width; chela without pedicel 1.40–1.48 mm. in length, 0.445–0.505 mm. in width, length 2.93–3.21 times the width; length of hand without pedicel 0.79–0.85 mm., position of hand on slides precludes accurate measurement of depth; movable chelal finger 0.66–0.70 mm. in length. Movable chelal finger with 39–49 teeth, fixed finger with 48–50 teeth. First leg with pars basalis 0.350–0.380 mm. long, 0.162–0.169 mm. deep, length 2.15–2.25 times the depth; pars tibialis 0.260–0.270 mm. in length, 0.170–0.175 mm. in depth, length 1.50–1.54 times the depth; length of pars basalis 1.35–1.41 times the length of the pars tibialis. Fourth leg with entire femur 0.83–0.91 mm. long, 0.295–0.310 mm. deep, length 2.75–2.93 times the depth. Cribriform plates of female reproductive system observed in all four females. The median plates, each between 0.027 and 0.040 mm.

in diameter, located one behind the other and separated by about twice the diameter of the more posterior plate, which is slightly smaller than the anterior plate; each median plate embedded in one of the swollen ends of a narrow and weakly sclerotic band which is difficult to observe in some specimens. The lateral plates elongated, each with the long axis perpendicular to the median plane of the abdomen; length of lateral plate 0.10–0.14 mm., width usually about equal to the diameter of the median plates.

Male very similar to the female in general appearance and in the length/width and length/depth ratios of palpal and pedal segments, but significantly smaller than the female, with the upper limit of range of absolute size for various structures of the male at about the lower limit of range of size for the corresponding structure of the female. Unless otherwise indicated, ranges for males from Colorado are based on 11 individuals. Males with body 3.2–3.9 mm. in length except for one unusually small male with a body length of only 2.65 mm., the small size perhaps resulting from an unusual amount of contraction when the animal was killed; carapace 0.81–0.97 mm. in length, 0.70–0.79 mm. in width. Male with palpal trochanter 0.397–0.47 mm. in length, 0.213–0.245 mm. in width, length 1.80–2.00 times the width; femur 0.74–0.845 mm. long, 0.245–0.275 mm. wide, length 2.83–3.23 times the width; tibia 0.63–0.74 mm. long, 0.290–0.330 mm. wide, length 1.97–2.34 times the width; chela without pedicel 1.21–1.40 mm. long, 0.370–0.433 mm. wide, length 2.97–3.39 times the width; chelal hand without pedicel 0.685–0.80 mm. in length, depth based on seven specimens 0.360–0.390 mm., length 1.89–2.08 times the depth as obtained from the seven specimens; movable finger 0.59–0.66 mm. in length. Movable chelal finger with 34–44 teeth (based on 10 specimens), fixed finger with 40–48 teeth (based on nine specimens). First leg of male with pars basalis 0.298–0.350 mm. long, in only two individuals below 0.327 mm.; pars basalis 0.135–0.159 mm. in depth, in only one individual below 0.147 mm.; length of pars basalis 2.13–2.32 times the depth; pars tibialis 0.215–0.262 mm. in length, in only one individual below 0.235 mm.; depth of pars tibialis 0.145–0.170 mm., length 1.48–1.59 times the depth; length of pars basalis 1.32–1.44 times the length of the pars tibialis. Fourth leg with entire femur 0.71–0.835 mm. in length, in only two specimens below 0.78 mm.; depth of entire femur 0.267–0.291 mm.; length 2.62–2.99 times the depth, in only one individual below 2.76.

ECOLOGY: *Pseudogarypinus marianae* in Colorado is associated with fairly dry tree litter at relatively low elevations, 6000 to 7000 feet. Specimens were taken from litter and beneath stones in areas of pinyon, juniper, and yellow pine and from fir and aspen litter. In both California and Colorado the species seems to be found chiefly in areas where the dominant trees are conifers. Chamberlin (1930) reports California collections from beneath stones near some redwoods and from the bark of madrone and sequoia. Chamberlin does not give details of the habitats for his two Utah collections, but it is very possible that the collections came from somewhat dry areas occupied by conifers.

NEW RECORDS: *Larimer County:* Two males from beneath rocks among yellow pines on a dry hillside, 6000 feet in elevation, Rist Canyon, a few miles west of Fort Collins, July 20, 1946; a tritonymph and a deutonymph from aspen litter at 6400 feet in elevation, 32 miles west of Fort Collins; one male from litter at base of the trunk of a fir tree, 7000 feet in elevation, 37 miles west of Fort Collins. *Montezuma County:* Four collections from beneath rocks in areas occupied by pinyons and junipers, at about 7000 feet in elevation, collected by P. F. Van Cleave, 1951–1953; one collection from pinyon litter and one from juniper litter, about 7000 feet in elevation, July 21, 1955; all collections from Mesa Verde National Park.

Pseudogarypinus giganteus, new species

Figures 14, 15

FEMALE: The description is based on one individual (the holotype). Body somewhat robust, appendages moderately stout; length of body 4.5 mm. Abdomen, posterior and lateral portions of carapace, and legs of a yellowish golden color; central and anterior portions of carapace and the chelicerae somewhat more deeply pigmented; palp of a still deeper, somewhat polished, reddish golden color. Carapace with surface appearing

smooth and glossy, but close examination shows the presence of definite, but barely discernible, net-like markings on the anterior part of each lateral margin and on at least the more weakly sclerotic portion of the dorsal surface; posterior half of each lateral margin somewhat membranous and not well defined, posterior one-half or two-thirds of the lateral margins nearly parallel, the anterior one-third of each lateral margin strongly and evenly convex; setae fine and acuminate; both anterior and posterior margins with four setae; two pairs of well-developed eyes, the anterior eye of each pair more clearly defined, more regular in outline, and a little larger than the posterior eye; anterior eye with a strongly convex cornea, the cornea of the posterior eye scarcely raised above the surface of the carapace; the two eyes of each pair separated by about one-half of the diameter of the anterior eye; carapace 1.10 mm. long, maximum width 1.00 mm., ocular width 0.62 mm. Abdomen with tergites 1 through 5 undivided, tergites 6 through 10 clearly divided; anterior and posterior marginal areas of tergites unpigmented and weakly sclerotic, more strongly sclerotic and pigmented areas of tergites with very weakly developed, net-like markings; six, in some specimens seven, fairly long and very fine setae on each of tergites 1 through 9. Sternites very similar to tergites in color, relative extent of the more sclerotic and pigmented areas, and chaetotaxy; sternites 5 through 10 weakly divided; eight to 10 setae on each sternite of the central part of the abdomen. Setae associated with stigmatic plates heavier and more conspicuous than setae of the sternites; anterior plate with three setae, posterior plate with four setae.

Chelicera with surface unsculptured except for weakly developed, net-like markings on the outer surface of the hand; each of the five setae of the hand and base of fixed finger very long and slender; lamina exterior of the finger in the form of a narrow marginal band; flagellum of four well-developed, blade-like setae, the proximal and the third of about equal length, the second somewhat longer, the distal blade extending slightly beyond the second and with eight slender and acute serrations along the distal two-fifths; apical teeth of fingers no more strongly sclerotic and no more deeply pigmented than the rest of the finger. Fixed finger with five regularly distributed teeth that, except for the most basal one, are of nearly equal size; teeth confined to the distal one-third of the inner finger margin; three denticles along the inner margin of the apical tooth. Movable finger with subapical lobe distinctly obsolete, represented by no more than a poorly developed bulge along the inner finger margin at the level of the insertion of the galeal seta; galea relatively long, tapering gently towards the distal end, and terminating in three gently curved, distally rounded or blunt, subterminal and terminal rami; galeal seta not extending beyond the proximal two-thirds of the galea; serrula exterior of 19 ligulate plates. Chelicera about 0.35 mm. in length, width of hand 0.203 mm.; movable finger about 0.275 mm. in length.

Palp with general shape of segments as shown in figures 14 and 15; surface of segments distinctly smooth except for vestigial granules that can be observed only in profile view along the flexor margin of the femur; setae slender, acute, and of somewhat variable length, even for closely adjacent setae on the same segment; at least some of the setae of the inner or flexor surface of the trochanter, of both surfaces of the femur, and of the extensor surface of the tibia are relatively long; investing setae of chelal hand sparse, short, and inconspicuous; investing setae of chelal fingers distinctly much longer and more numerous than are the setae of the surface of the hand. Measurements of palpal segments indicate some variation in the two palps, but the variation, at least in part, may result from differences in orientation. Trochanter of one palp with a length of 0.565 mm. and a width of 0.290 mm., other trochanter 0.55 mm. in length and 0.295 mm. in width; femur of one palp 1.09 mm. in length, the other 1.13 mm. in length, width of each femur 0.305 mm.; length of tibia of both palps 0.93 mm.; width of one tibia 0.375 mm., of other tibia 0.365 mm.; chela without pedicel 1.735 mm. in length, 0.525 mm. in width; hand without pedicel 0.99 mm. long, 0.470 mm. deep; movable finger 0.80 mm. in length. Chelal fingers with tactile setae as shown in figures 14 and 15. Marginal teeth of both fingers relatively small, closely set, and extend-

ing along nearly all of the finger margin; basal eight or 10 teeth of the row of each finger progressively flatter and less elevated towards the basal end of the row; nearly all teeth of movable finger appear acuspid, but the teeth of the distal one-half of the row appear worn and poorly developed, cusps originally may have been present; teeth of the proximal one-half of the row on the fixed finger acuspid, teeth of the distal one-half or one-third of the row appear worn, but many of them still have a weakly developed and barely discernible cusp; some teeth of each row broken and damaged, but no doubt the fixed finger has between 50 and 55 teeth, the movable finger 47 or 48 teeth.

Legs without distinctive characteristics; surfaces of segments smooth; setae very similar to those of the palps, not very numerous except on the flexor surfaces of the tarsal segments. First leg with pars basalis 0.495 mm. in length, 0.178 mm. in depth; pars tibialis 0.335 mm. in length, 0.178 mm. in depth; tibia 0.52 mm. in length, 0.126 mm. in depth; length of pars basalis 1.47 times the length of the pars tibialis. Fourth leg with entire femur 1.10 mm. in length, 0.318 mm. in depth; tibia 0.81 mm. long, 0.185 mm. deep.

Female genitalia with relatively simple chaetotaxy; anterior operculum with seven or eight setae in an open cluster towards each side of the central opening of the genital slit; no setae on the face of the anterior portion of the anterior operculum; 14 setae arranged seriatim along the posterior margin of the posterior operculum, the setae of the central portion of the row slightly shorter and closer together than those towards the ends of the row. Each of the lateral cribriform plates about 0.12 mm. in length, 0.02 mm. in width; anterior plate of median pair irregular in outline, 0.07 mm. in greater diameter, plate somewhat tilted so that the lesser diameter cannot be determined with accuracy but probably greater than 0.05 mm.; posterior median cribriform plate much smaller than the anterior one, about 0.025 mm. in diameter; the two median plates connected by a narrow band of virtually nonsclerotic material that is very difficult to observe.

MALE: Unknown.

REMARKS: Only two species, *Pseudogarypinus marianae* (discussed above) and *P. costaricensis* described by Beier (1931, 1932a) from Costa Rica, have been definitely assigned to the genus *Pseudogarypinus*. In addition, as discussed by Hoff (1956b), the species *Olpium frontalis* described by Banks (1909) may belong to the genus. The new species, *P. giganteus*, is easily separated from *P. marianae* by the longer and generally more slender palpal and pedal segments. Differences in the lengths of the palpal chela and femoral parts of the first leg, in the length/width ratios of palpal femur and tibia, and in the length/depth ratios of the pars basalis of the first leg and the entire femur of the fourth leg are especially useful for the separation of species. The new species is distinguished from *P. costaricensis* by the smaller palpal femur, the stouter palpal segments, the absence of distinct granules from the inner surfaces of the palpal femur and tibia, and the shorter movable finger in relationship to the length of the chelal hand. A reliable comparison of *P. giganteus* and *Olpium frontalis* is difficult, because the very brief and entirely inadequate description given by Banks (1909) is the only published account of *O. frontalis*. The new species appears to differ from *O. frontalis* by having a terminally trifid instead of a simple galea, the eyes of each side well separated and not touching one another, and strongly vestigial instead of clearly distinct granules on the inner surface of the palpal femur.

TYPE LOCALITY: *Weld County:* The single available specimen (the female holotype) is in a collection from the American Museum of Natural History, unaccompanied by data except for a label reading "Stoneham, Colo." As Stoneham is very close to the border of Weld County, it is possible that the collection may have been taken a few miles from Stoneham in closely adjacent Logan County or Morgan County. The holotype is deposited in the collections of the American Museum of Natural History.

SUBORDER **MONOSPHYRONIDA** CHAMBERLIN

FAMILY **PSEUDOGARYPIDAE** CHAMBERLIN

GENUS **PSEUDOGARYPUS** ELLINGSEN

Pseudogarypus ELLINGSEN, 1909, Boll. Lab. Zool. Portici, vol. 3, p. 217. CHAMBERLIN, 1931, Stanford Univ. Publs., Biol. Sci., vol. 7, p. 231.

JACOT, 1938, Occas. Papers Boston Soc. Nat. Hist., vol. 8, p. 301.

In his original description of *Garypus bicornis* in 1895 Banks recognized the distinctive nature of the species and suggested the possibility that the species might serve as the type of a new genus. In 1909 Ellingsen took advantage of the opportunity to describe the genus *Pseudogarypus* based on *Garypus bicornis*. Unfortunately the single specimen from which Ellingsen obtained his description of *Garypus bicornis* was incorrectly identified. Not until 1938 was the true nature of Banks's *Garypus bicornis* recognized and the genus *Pseudogarypus* correctly indicated (Jacot, 1938). At this time Jacot erected the still monotypic genus *Cerogarypus* for the species that until 1938 was confused with *Garypus bicornis*. The genera *Pseudogarypus* and *Cerogarypus* are the only genera in the family Pseudogarypidae. They can be separated by the presence of spines (often called pseudocoxal spines; probably more correctly coxal pseudospines) on the first pedal coxa in the genus *Pseudogarypus* and the absence of these spines in *Cerogarypus*. The genus *Pseudogarypus* contains three recent species, all from the United States (Hoff, 1958), and three fossil species from Baltic amber (Beier, 1937, 1947). One or more of the fossil species, however, may belong in the genus *Cerogarypus*.

Pseudogarypus bicornis (Banks)

Garypus bicornis BANKS, 1895, Jour. New York Ent. Soc., vol. 3, p. 8.

Pseudogarypus bicornis, JACOT, 1938, Occas. Papers Boston Soc. Nat. Hist., vol. 8, p. 301. HOFF, 1946, Jour. Washington Acad. Sci., vol. 36, p. 198. *Non* Ellingsen, 1909, Boll. Lab. Zool. Portici, vol. 3, p. 218. *Non* Chamberlin, 1931, Stanford Univ. Publs., Biol. Sci., vol. 7, pp. 231, 232. *Non* Beier, 1932, Das Tierreich, vol. 57, p. 239.

Prior to the work of Jacot (1938) the nature of Banks's *Garypus bicornis* was so poorly understood that evidently all published records except the one for the type collection are based on incorrectly identified specimens. According to Hoff (1958) there is no acceptable record for any state except Wyoming, the state from which Banks obtained his type specimens. Among the records considered inacceptable by the present writer is the record for Colorado given by Beier (1932a). Beier must have either obtained his record from a published source or the record is new to the literature. The present writer carefully searched without success for the published report on which Beier might have based his record. Apparently the Colorado record for *P. bicornis* originated with Beier, but he does not indicate that the record is new. Even so, it is possible that Beier had access to specimens from Colorado and that the record actually is new to the literature. However, if Beier had specimens and they agreed with his description of *P. bicornis*, the specimens were not correctly identified, because Beier's (1932a) description is distinctly different from the description given by Hoff (1946a) for the lectotype. Beier states very definitely in both his key and text that no spines occur on the first pedal coxa, but both Jacot (1938) and Hoff (1946a) report that spines are present. On the basis of available information, the only possible conclusion appears to be that the record by Beier for Colorado cannot be accepted as valid and that the present report is the first for *P. bicornis* from Colorado.

The present record is based on a single male that agrees in nearly every detail with the lectotype from Wyoming, except that in general the Colorado male has slightly larger palpal and pedal segments. The length/width and length/depth ratios of segments are very similar in the two specimens, except that the pars tibialis and the tibia of the fourth leg are somewhat stouter in the Colorado specimen. The observed differences between the two specimens are no doubt intraspecific and are by no means sufficient to preclude the assignment of the Colorado male to *P. bicornis*. In order to supplement published data relative to this species, the following measurements relative to the Colorado male are included here. Body length 2.65 mm.; carapace 0.69 mm. long. Serrula exterior of chelicera formed of 17 plates. Palpus with trochanter 0.30 mm. long, 0.24 mm. wide; femur 1.20 mm. in length, 0.227 mm. in width; tibia 0.575 mm. long, 0.219 mm. wide; chela without pedicel 1.45 mm. in length, 0.307 mm. in width; hand of chela without pedicel 0.52 mm. long, 0.279 mm. deep; movable finger 0.93 mm. in length. Fixed chelal finger with 46 teeth, movable finger with 38 teeth. First leg with pars basalis 0.435 mm.

long, 0.123 mm. deep; pars tibialis 0.380 mm. long, 0.127 mm. deep; tibia 0.345 mm. in length, 0.098 mm. in depth; tarsus 0.59 mm. long, 0.068 mm. deep. Fourth leg with trochanter 0.425 mm. long, 0.162 mm. deep; pars basalis with length of 0.360 mm., depth of 0.123 mm.; pars tibialis 0.480 mm. long, 0.148 mm. deep; tibia 0.60 mm. in length, 0.097 mm. deep; tarsus 0.76 mm. in length, 0.070 mm. in depth.

It is interesting to note the similarity in habitat between the type specimens which were found "between the laminae of rocks at Specimen Ridge, Yellowstone National Park" (Banks, 1895) and the present Colorado specimen which was taken from rock debris at the edge of a slope.

NEW RECORD: *Gunnison County:* One male from talus at edge of slope, 10,000 feet in elevation, Copper Creek Valley, 4 miles northeast of Gothic (Gothic is 8 miles north of Crested Butte); collection made on July 24, 1957, by H. and L. Levi.

FAMILY CHEIRIDIIDAE CHAMBERLIN

GENUS APOCHEIRIDIUM CHAMBERLIN

Apocheiridium CHAMBERLIN, 1924, Pan-Pacific Ent., vol. 1, p. 34. HOFF, 1953, Trans. Illinois Acad. Sci., vol. 45, p. 192.

Apocheiridium stannardi Hoff

Apocheiridium stannardi HOFF, 1953, Trans. Illinois Acad. Sci., vol. 45, p. 193. HOFF AND BOLSTERLI, 1956, Trans. Amer. Micros. Soc., vol. 75, p. 164.

The single available adult, a male, from Colorado agrees very closely with specimens described by Hoff (1953) and by Hoff and Bolsterli (1956) from Illinois, except that the Colorado specimen has a slightly longer body and palpal segments. The small difference in size is clearly intraspecific. In the male from Colorado there are slightly fewer marginal setae on the carapace (for example, 14 instead of 18 or 20 along the posterior margin) and tergites than reported in the original species description. This smaller number of carapacal and tergal setae is now known to occur in some specimens from Illinois. The present report is the first for this species from Colorado; all other records are from Illinois (Hoff, 1958). In connection with the Illinois collection reported by Hoff and Bolsterli (1956), Dr. Lewis Stannard has advised the writer that the locality is Wolf Lake in Union County and not Wolf Lake in Cook County.

The male from Colorado has a body 1.29 mm. in length and a carapace 0.405 mm. long and 0.46 mm. wide across the posterior margin. The chelicera has nine plates in the serrula exterior. Palpal segments have the following measurements: trochanter 0.165 mm. in length, width (including the granules seen in profile view) 0.107 mm.; femur 0.335 mm. in length, 0.091 mm. in width if the granules are included, 0.083 mm. in width when the measurement does not include the granules; tibia 0.270 mm. long, width including granules 0.095 mm., width exclusive of granules 0.093 mm.; chela without pedicel 0.435 mm. in length, 0.128 mm. in width; hand without pedicel 0.210 mm. long, 0.103 mm. deep; length of movable chelal finger 0.230 mm. Fixed chelal finger with 12 teeth, movable finger with 10 or 11 teeth. Fourth leg with tibia 0.181 mm. long, 0.043 mm. deep; tarsus 0.156 mm. long, 0.034 mm. deep.

The species is found associated with the bark and woody debris of trees. One of the two reported Illinois collections came from the bark of an oak tree (Hoff, 1953), and the other was made from the bark and twigs of a pine tree (Hoff and Bolsterli, 1956). The Colorado specimens were taken from debris beneath a dead yellow pine.

NEW RECORD: *Larimer County:* A male and a nymph taken from debris at the base of a dead yellow pine, 6400 feet in elevation, about 30 miles west of Fort Collins.

FAMILY CHERNETIDAE MENGE

SUBFAMILY LAMPROCHERNETINAE BEIER

GENUS LAMPROCHERNES TÖMÖSVÁRY

Lamprochernes TÖMÖSVÁRY, 1882, Math. Természet. Közlem., vol. 18, p. 185 (referred from Beier, 1932b). HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 5.

Lamprochernes oblongus (Say)

Chelifer oblongus SAY, 1821, Jour. Acad. Nat. Sci. Philadelphia, vol. 2, p. 64.

Lamprochernes oblongus, HOFF, 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 450.

This is the first record of *L. oblongus* for Colorado. Published records indicate that the species is widely distributed throughout much of the eastern part of the United States and

as far west as Nebraska and Texas (Hoff, 1958). The two specimens currently available from Colorado are males, and they agree very closely with males described by Hoff (1949) except that the palpal segments are a little larger. Such a condition is similar to that found in females by Hoff and Bolsterli (1956) who reported that a few females from some localities have palpal segments appreciably larger than reported by Hoff (1949). Measurements of the palpal tibia and chela illustrate the greater size of the Colorado males. For the two males from Colorado the tibia is 0.50 and 0.51 mm. long and the length/width ratios are 1.91 and 1.86, while the range given by Hoff (1949) for the length of the tibia is 0.41–0.47 mm., with a length/width ratio of 1.9–2.0. The chela without the pedicel has a length of 0.84 and 0.86 mm. and the length/width ratios are 2.64 and 2.57 for the Colorado males, while Hoff (1949) gives 0.69–0.77 mm. as the length and 2.4–2.6 as the length/width ratio for the male.

NEW RECORDS: *Boulder County:* One male from "plains zone," near Boulder, July 29, 1944, and one male from Four-mile Mesa, 5600 feet in elevation, Boulder, June 18, 1955; both collections by R. E. Gregg.

Lamprochernes ellipticus Hoff

Lamprochernes ellipticus HOFF, 1944, Amer. Mus. Novitates, no. 1271, p. 1; 1956, Amer. Mus. Novitates, no. 1800, p. 5.

This report of the species is the first from Colorado. The species previously has been reported from New Mexico, where specimens are much more common than in Colorado, and from the type locality in Baja California, Mexico. The single male and the one tritonymph available from Colorado agree closely with specimens from New Mexico.

ECOLOGY: In New Mexico 19 collections are reported (Hoff, 1959) from fairly dry debris and litter of both broad-leaved trees and conifers at elevations of 7000 feet and below, with only one collection at a higher elevation of about 8000 feet. The Colorado collections were also taken from dry debris and litter at relatively low elevations.

NEW RECORDS: *Larimer County:* One male from dry woody debris at the base of the trunk of a dead yellow pine, 6400 feet in elevation, 30 miles west of Fort Collins. *Pueblo County:* One tritonymph from juniper litter in open grove, about 5500 feet in elevation, 17 miles south of Pueblo.

Lamprochernes minor Hoff

Lamprochernes minor HOFF, 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 453. HOFF AND BOLSTERLI, 1956, Trans. Amer. Micros. Soc., vol. 75, p. 166.

This record of *L. minor* is the first from Colorado and greatly extends the known geographic range, as the species previously has been reported only from Illinois, Minnesota, Wisconsin, and North Dakota (Hoff, 1958). Ranges of measurements and ratios of palpal segments of four mounted females from Colorado strongly overlap and in some cases virtually coincide with corresponding ranges given in the literature (Hoff, 1949). While the present specimens were being studied, it was noticed that the basal and subbasal setae of the cheliceral hand are shorter, stouter, and more strongly denticulate than are the corresponding setae of the cheliceral hand of *L. oblongus*. This difference also occurs among specimens from the other areas (unpublished data).

ECOLOGY: Hoff (1949), Levi (1953), and Hoff and Bolsterli (1956) report specimens of *L. minor* from the bark of logs and stumps of deciduous broad-leaved trees, but some specimens have come from such peculiar habitats as a railroad grain car and a manure pile. The two Colorado collections with ecological data came from the bark of cottonwoods.

NEW RECORDS: *Boulder County:* Two females from beneath the bark of a cottonwood tree, elevation 5200 feet, a few miles northeast of Boulder at Valmont, August 10, 1949, collected by R. E. Gregg. *Larimer County:* Three females from beneath the bark of a dead cottonwood tree, Fort Collins, January 5, 1947, collected by T. P. Maslin. *Morgan County:* One female from northwest of Snyder, May 13, 1937, collected by F. Christensen, the American Museum of Natural History collection.

GENUS **LUSTROCHERNES** BEIER

Lustrochernes BEIER, 1932, Zool. Anz., vol. 97, p. 259. HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 9.

Lustrochernes grossus (Banks)

Chelanops grossus BANKS, 1893, Canadian Ent., vol. 25, p. 65.

Lamprochernes grossus, HOFF, 1947, Bull. Mus. Comp. Zoöl., Harvard College, vol. 98, p. 475.

Lustrochernes grossus, HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 10.

Banks (1893) described this species from specimens collected in Colorado, but he gives no details of the locality. Hoff (1947) examined the type collection and found no indication of a more restricted locality. It now is probably impossible to determine the exact part of Colorado from which the type specimens came. Banks in his original description indicated that specimens of the species are apparently common, and in 1895 he repeated this assertion, probably without having seen additional specimens. The present writer has found the species rare in Colorado, although it is somewhat common in New Mexico (Hoff, 1956c). The only two Colorado collections available to the writer were obtained in the southwestern corner of the state and, if further studies show that the species is restricted to this part of Colorado, it may be advantageous to designate either Archuleta County or La Plata County as a restricted type locality. In addition to records of *L. grossus* from Colorado and New Mexico, the species has been reported from Arizona (Hoff, 1958).

One female and two males from Colorado were mounted for detailed study. These specimens agree very closely with published descriptions of the female (Hoff, 1947, 1956c) and male (Hoff, 1956c). In the study of the Colorado specimens, it was found that very weakly developed eye spots occur on the carapace in both sexes, although eyes were earlier reported as being absent (Hoff, 1947, 1956c). The eye spots are usually difficult, sometimes virtually impossible, to observe in specimens cleared in caustic, but they can be seen in specimens preserved in alcohol. As measurements have not been published for males from Colorado, it seems advisable to include here some of the more important statistics. Measurements of the male from Yellow Jacket Pass follow in parentheses the corresponding measurements of one of the males taken north of Durango. Body length 3.7 (3.3) mm.; carapace 1.05 (1.00) mm. long; 18 to 20 plates in the serrula exterior. Palpal femur 0.90 (0.94) mm. in length, width 0.42 (0.430, 0.442) mm.; length of tibia of one palp 0.95 and of the other 0.96 (0.98) mm., width 0.42 (0.432) mm.; chela without pedicel 1.36 (1.38) mm. long, 0.495 (0.465) mm. wide; chelal hand without pedicel 0.76 (0.74) mm. long, 0.48 (0.455) mm. deep; movable chelal finger 0.64 (0.67) mm. long. Fourth leg with entire femur 0.85 (0.82) mm. in length, 0.270 (0.285) mm. in depth; tibia 0.64 (0.595) mm. long, 0.167 (0.167) mm. deep; tibia 0.425 (0.43) mm. in length, 0.113 (0.114) mm. in depth; tactile seta of tarsus removed by 0.100 (0.096) mm. from the proximal margin of the tarsus. For the female, the reader is referred to Hoff's (1947) description of females in the type collection.

ECOLOGY: In New Mexico *L. grossus* is invariably found in areas of yellow pine, where specimens are common beneath the started bark of yellow-pine logs, stumps, and dead trees (Hoff, 1959). Specimens in one of the two Colorado collections were taken from beneath the started bark of a yellow-pine stump. The second Colorado collection is reported from pine-oak woodland at an elevation where yellow pines are frequent, but microhabitat data do not accompany the collection.

NEW RECORDS: *Archuleta County:* One male from pine-oak woodland, Yellow Jacket Pass, about 7700 feet in elevation, west of Pagosa Springs and just east of the Archuleta-La Plata county line, July 21, 1955, collected by R. E. Gregg. *La Plata County:* Five males and four females from beneath the started bark of a yellow-pine stump, 6900 feet in elevation, 14 miles north of Durango.

SUBFAMILY **CHERNETINAE** BEIER

GENUS **HESPEROCHERNES** CHAMBERLIN

Hesperochernes CHAMBERLIN, 1924, Pan-Pacific Ent., vol. 1, p. 89. HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 31.

Hesperochernes canadensis Hoff

Hesperochernes canadensis HOFF, 1945, Amer. Mus. Novitates, no. 1273, p. 1.

This species, which is fairly common in Colorado, previously has been known only from the male holotype and the female allotype from Medicine Hat, Alberta, Canada (Hoff, 1945b). Four mounted Colorado males

agree closely with the male holotype; the lengths and the length/width and length/depth ratios of the more taxonomically important palpal and pedal segments of the holotype fall almost without exception within the ranges obtained from the four Colorado males. The only marked exception is the longer and more slender trochanter in the Colorado specimens. The differences are not considered significant, especially as the length given for the palpal trochanter of the holotype may be incorrect as a result of damage to the trochanter or because of improper orientation. Not only do the Colorado males agree closely with the holotype, but among themselves they show very little intraspecific variation. A few of the observed variations are of some significance and are mentioned because they may cause confusion when species or generic determinations are made. In one of the males a fairly well-developed acuminate tactile seta occurs on the tarsus of one fourth leg, while a denticulate seta is located in the corresponding position on the tarsus of the other fourth leg. In one chelicera of one male, the tactile seta *sb* of the hand is acuminate instead of denticulate. Anomalies and variations, especially with respect to the chelicera, have been reported previously in other species of *Hesperochernes*. For example, Chamberlin (1935) reports two galeal setae on one of the chelicerae of the holotype male of his *H. montanus*.

Because the only published measurements for males of *H. canadensis* pertain to the holotype from Canada, the following measurements and ratios are given as the ranges based on four mounted males from Colorado. Body length 2.7–2.8 mm.; carapace 0.84–0.91 mm. in length. Movable cheliceral finger 0.220–0.240 mm. in length; in most specimens 19, in some 18 or 20, plates in the serrula exterior. Palp with trochanter 0.43–0.45 mm. in length, 0.235–0.270 mm. in width, length 1.69–1.87 times the width; femur 0.63–0.69 mm. in length, 0.243–0.259 mm. in width, length 2.47–2.74 times the width; tibia 0.64–0.67 mm. in length, 0.275–0.300 mm. in width, length 2.18–2.33 times the width; chela without pedicel 1.14–1.22 mm. long, 0.475–0.55 mm. in width, length 2.19–2.40 times the width; chelal hand without pedicel 0.60–0.64 mm. long, 0.52–0.58 mm. deep, length 1.04–1.17 times the depth; movable chelal finger 0.63–0.69 mm. in length. Fourth leg with entire femur 0.62–0.67 mm. long, 0.175–0.191 mm. deep, length 3.50–3.60 times the depth; tibia 0.50–0.54 mm. in length, 0.115–0.124 mm. in depth, length 4.20–4.52 times the depth.

For the female, five mounted specimens from Colorado were carefully compared with the allotype described by Hoff (1945). Measurements and ratios of the palpal and pedal segments of the allotype fall within the limits of ranges obtained from measurements of the five Colorado females, except that the palpal femur is a little longer and the palpal trochanter and tibia are somewhat stouter in the allotype. Observed differences are certainly the result of intraspecies variation.

While the four males studied show as a group a relatively small amount of intraspecific variation, the females have a much greater range of variation, which is especially noticeable in the shape and stoutness of the palpal chela. Studies of all available Colorado females, including five mounted specimens and six specimens in alcohol, make it clear that the variation is intraspecific, especially as it is impossible to assign the females to two or more groups on the basis of the characteristics of the chela. In addition, other variations appear not to be definitely correlated with the variation in stoutness of the chela, although there is a slight tendency for females with a stout chela to have a larger body, a slightly longer chela, and a few more setae on the carapace, tergites, and sternites. Even among females in a single collection, it is possible to observe an unusual amount of variation in the stoutness of the chela. The stoutest chela (with a ratio virtually identical to that of the chela of the allotype) observed is on a female taken from Gambel oak litter collected 5 miles north of Steamboat Springs. In the same collection is an unmounted female in which the chela falls near the center of the range of the length/width ratios given for the five mounted Colorado females. In a collection of six females (one mounted, five in alcohol) taken from cottonwood litter mixed with some boxelder litter west of Hayden, the length/width ratios of the chela vary from 2.6 to 2.96. The most slender chela (ratio of 3.07) observed was in a female un-

accompanied by other specimens and taken from Rist Canyon, west of Fort Collins. Without this unusually slender specimen, the upper limit of range observed for the ratio of the chela of Colorado females is 2.96. When one is working with species of such genera as *Hesperochernes*, care must be taken to avoid considering as discrete species females with unusually slender or unusually stout chelae.

Anomalies and variations similar to those found in the males occur among the females and, in the absence of a series of specimens for study, may lead to some difficulty in the making of generic and species identifications, For example, the tarsus of one of the fourth legs of one female has a well-developed acuminate tactile seta in the position occupied by a denticulate pseudotactile seta on the tarsus of the opposite leg. Anomalies also occur in the chaetotaxy of the cheliceral hand. In all mounted females, seta *b* of the hand is acuminate except for a denticulate condition in one chelicera of one female. The tactile seta *sb* is typically denticulate, but was found to be acuminate in one chelicera in one female.

As measurements published for the female of *H. canadensis* are restricted to those of the allotype, ranges of measurements and ratios are given here for the five mounted females from Colorado. From observations made on the six females still in alcohol, it is clear that the ranges given would be modified very little by the inclusion of measurements and ratios for these six females. Body 2.65–3.2 mm. long; carapace 0.84–0.98 mm. in length. Movable finger of chelicera 0.205–0.248 mm. long; 18–19, occasionally 17, ligulate plates in the serrula exterior. Palp with trochanter 0.405–0.480 mm. long, 0.235–0.275 mm. wide, length 1.57–1.94 times the width; femur 0.655–0.76 mm. in length, 0.240–0.275 mm. in width, length 2.65–2.89 times the width; tibia 0.64–0.76 mm. in length, 0.267–0.305 mm. in width, length 2.38–2.51 times the width; chela without the pedicel 1.12–1.32 mm. in length, 0.375–0.52 mm. in width, length 2.54–3.07 times the width, three of the five females with length/width ratios falling in the range of 2.74–2.96; chelal hand without pedicel 0.585–0.705 mm. in length, 0.355–0.515 mm. in depth, length 1.37–1.65 times the depth, three of the five females with length/depth ratios of the hand within the limits of 1.47–1.51; movable finger 0.59–0.65 mm. long. Fourth leg with entire femur 0.64–0.74 mm. in length, 0.175–0.198 mm. in depth, length 3.57–3.95 times the depth; tibia 0.50–0.62 mm. in length, 0.117–0.134 mm. in depth, length 4.28–4.66 times the depth.

ECOLOGY: The eight Colorado collections were taken from litter, occasionally from a dead tree or stump, of deciduous broad-leaved trees, cottonwood, aspen, alder, and Gambel oak. Although Berlese samples were taken from the litter of conifers in the general area of the deciduous trees under which specimens were taken, specimens of *H. canadensis* were never taken from the conifer litter. Clearly the species is associated with the debris and litter of deciduous broad-leaved trees in situations where the soil and litter retain considerable moisture throughout much of the growing season. The Colorado collections were taken at elevations between 6400 and 8000 feet. It is of interest to note that the only two collections taken below 7500 feet came from the more mesic local habitats, as indicated by the presence of alder in one instance and boxelder in the other.

NEW RECORDS: *Eagle County:* One female from alder litter, 6900 feet in elevation, 3.5 miles west of Wolcott. *Larimer County:* One female from a dead aspen, Rist Canyon, 7900 feet in elevation, about 15 miles west of Fort Collins, June 7, 1947. *Routt County:* One male, one female, and two tritonymphs taken from aspen litter, 7500 feet in elevation, near Fish Creek Falls, 3 miles east of Steamboat Springs; one deutonymph from Gambel oak litter and one tritonymph from the rotten wood of a cottonwood stump, at Hot Spring, 7500 feet in elevation, 7.5 miles north of Steamboat Springs; one male, two tritonymphs, and one protonymph from aspen litter, 8000 feet in elevation, 6 miles north of Steamboat Springs; two males and two females from Gambel oak litter, 7900 feet in elevation, 5 miles north of Steamboat Springs; and two males, six females, and one tritonymph from cottonwood litter mixed with some boxelder litter, 6400 feet in elevation, 2 miles and 8 miles west of Hayden.

Hesperochernes utahensis Hoff and Clawson

Hesperochernes utahensis HOFF AND CLAWSON, 1952, Amer. Mus. Novitates, no. 1585, p. 15.

HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 32.

Previously this species has been reported only from Utah (from wood-rat nests; Hoff and Clawson, 1952) and from New Mexico (juniper litter; Hoff, 1956c). Specimens from Colorado agree closely with those reported from Utah and New Mexico. As earlier records and descriptions are based on very few individuals, supplementary data are given here. In the earlier accounts, no information was given relative to the setae of the stigmatic plates. In one reëxamined paratype and in nearly all the Colorado specimens, the anterior stigmatic plate has one very fine seta; the posterior plate has two similar setae. For the male, the following measurements and ratios are ranges obtained from six mounted specimens from Colorado. Body length 2.35–2.6 mm.; carapace 0.74–0.81 mm. long. Movable cheliceral finger 0.179–0.195 mm. long; serrula exterior with 16–17 plates. Palp with trochanter 0.35–0.38 mm. in length, 0.203–0.243 mm. in width, length 1.44–1.87 times the width; femur 0.555–0.62 mm. long, 0.247–0.263 mm. wide, length 2.22–2.47 times the width; tibia 0.57–0.62 mm. long, 0.270–0.283 mm. in width, length 2.05–2.30 times the width; chela without pedicel 0.95–1.03 mm. in length, 0.350–0.386 mm. in width, length 2.54–2.83 times the width; chelal hand without pedicel 0.48–0.51 mm. in length, 0.346–0.359 mm. in depth, length 1.34–1.46 times the depth; movable finger 0.49–0.55 mm. in length. Fourth leg with entire femur 0.535–0.57 mm. long, 0.159–0.175 mm. in depth, length 3.19–3.42 times the depth.

For the Colorado female, measurements were obtained from four mounted specimens. Body length 2.25–2.60 mm.; carapace 0.73–0.82 mm. long. Movable cheliceral finger 0.188–0.193 mm. long; 16–17 plates in the serrula exterior. Palpus with trochanter 0.350–0.375 mm. long, 0.205–0.233 mm. wide, length 1.50–1.76 times the width; femur 0.575–0.610 mm. in length, 0.222–0.243 mm. in width, length 2.39–2.59 times the width; tibia 0.570–0.600 mm. long, 0.250–0.267 mm. in width, length 2.19–2.28 times the width; chela without pedicel 1.00–1.02 mm. long, 0.375–0.388 mm. wide, length 2.57–2.66 times the width; chelal hand without pedicel 0.50–0.53 mm. in length, 0.356–0.380 mm. in depth, length 1.32–1.43 times the depth; movable finger 0.530–0.545 mm. in length. Fourth leg with entire femur 0.515–0.570 mm. long, 0.150–0.167 mm. deep, length 3.30–3.56 times the depth.

NEW RECORDS: *Montezuma County:* Six collections, with a total of 16 males, seven females, and four tritonymphs, from litter and from beneath stones and pieces of wood in pinyon-juniper zone, about 7000 feet in elevation, Mesa Verde National Park; three of the collections made by P. F. Van Cleave in 1951, 1952, and 1953 and three collections made by Hoff and Van Cleave on July 20, 1955.

Hesperochernes sp. indet.

Because of intraspecies variations and inadequate published descriptions, it is sometimes impossible to determine the species of specimens that do not belong to a series. In the Colorado collections are two females, one accompanied by a tritonymph, that have not been identified as to species. One female is from Mesa Verde National Park and in many respects resembles *H. pallipes* (Banks, 1893), a Californla species redescribed by Hoff (1947) from the female lectotype. If it is found that the specimen does not belong to *H. pallipes*, then consideration must be given the possibility that the specimen represents an undescribed species. The Colorado record of *H. pallipes* given by Coolidge (1908), who compiled a list of North American pseudoscorpions from the literature but who apparently had little first-hand experience with the group, is considered a possible error by Hoff (1958). If Coolidge actually saw Colorado specimens that he considered as belonging to *H. pallipes*, possibly his specimens and the present female from Mesa Verde National Park, an undetermined female and a tritonew to the literature. In addition to the unidentified female from Mesa Verde National Park, an undetermined female and a tritonymph of an apparently different species occur in a collection taken near Fort Collins. At the present time it is not possible to assign these specimens to described species, and it seems ill advised to consider the description of new species until additional specimens are available.

NEW RECORDS: *Larimer County:* A female and a tritonymph from beneath the bark of a

willow log, collected a few miles west of Fort Collins, August 28, 1946. *Montezuma County:* One female from Mesa Verde National Park, collected by P. F. Van Cleave between June and October, 1951.

GENUS **ACUMINOCHERNES** HOFF, AMENDED

Acuminochernes HOFF, 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 476.

DIAGNOSIS AMENDED: A genus of the subfamily Chernetinae; eyes reduced to barely distinguishable eye spots, or wanting; setae of carapace, tergites, and at least basal segments of palps clavate; chelicera with a flagellum of four setae, setae *b* and *sb* of hand acuminate; palp at least fairly stout, with the chela of the male stouter than that of the female, external digital condyle at base of movable finger more strongly developed in the male; accessory teeth of chelal fingers well developed; movable chelal finger with tactile seta *st* at least a little farther but never more than twice as far from tactile seta *sb* as from *t* and the distance from tactile seta *st* to *t* less than the distance between tactile seta *t* and the finger tip; fixed finger with tactile seta *ist* at the level of or somewhat distal to the level of *est;* tarsus of fourth leg with a tactile seta located on the extensor surface at a point between 0.60 and 0.70 of the length of the segment from the proximal margin of the tarsus; each of the two seminal receptacles in the form of a long, slender, somewhat convoluted tubule that ends in an ovoid or bulb-shaped sac. The genus is very closely related to *Dinocheirus*, from which it differs by having seta *sb* of the cheliceral hand acuminate.

TYPE SPECIES: *Hesperochernes crassopalpus* Hoff, 1945.

Acuminochernes tacitus, new species

Figures 16–19

MALE: The description of the male is based on two individuals (the holotype and one paratype). Measurements given for the holotype are followed in parentheses by corresponding measurements of the paratype. Body fairly robust, palps moderately stout, legs relatively more slender; abdomen and legs of a moderately deep golden color, carapace somewhat more strongly pigmented, palps of a deep golden color; body length 2.2 (2.3) mm., but abdomen of specimens, especially in the paratype, appear contracted and actual length may be greater. Carapace with the anterior half of each lateral margin well rounded, posterior part of the lateral margins subparallel; carapace with two transverse furrows, the median furrow slightly posterior to the mid-point of the carapace, the posterior furrow a little closer to the posterior carapacal margin than to the median furrow; eye spots chiefly absent, possibly very weak and vestigial in a few specimens; setae of carapace moderately clavate, distally widened, and fairly numerous on the face of the carapace; the anterior margin of carapace with four setae, the posterior margin with 12 setae arranged in an irregular row; surface of carapace regularly and moderately to strongly granulate, except weakly granulate on the central part of the dorsal surface, in some specimens dorsal surface between transverse furrows appears almost smooth; carapace 0.80 (0.88) mm. in length, 0.705 (0.78) mm. in greatest width, which is near the level of the median transverse furrow. Abdomen broadly oval in outline; tergites 1 through 10 divided, except that in the paratype the first or perhaps the first and second tergites appear not to be clearly divided; the tergal halves of each segment in the central part of the abdomen separated by a wide and somewhat strongly granulate intertergal band; setae of tergites moderately to almost strongly clavate; each tergal half of first segment with nine (seven or eight) setae, of second segment with eight (nine or 10) setae, and of the third segment with eight or nine (nine) setae; each tergal half of central part of abdomen with 10–12 setae; a long acuminate tactile seta near each lateral margin of the undivided eleventh tergite. Sternites 4 through 10 divided, intersternal spaces fairly wide and marked by striations varying from wavy to rugose; sternal halves with somewhat weakly developed net-like markings, becoming distinctly scale-like on the more posterior sternites; setae acuminate except for a few multidenticulate to weakly clavate setae on segments 9, 10, and 11; each sternal half of fourth segment with five or six setae; sternal halves of central part of abdomen with 11–13 setae, with three or four setae frequently located at the median end of the sternal half;

undivided eleventh segment with four long tactile setae, two of these submedian in position and one near each lateral margin. Anterior stigmatic plate with three (four) setae, posterior stigmatic plate with one (one) seta; pleural membrane wide, strongly papillostriate and granulostriate.

Chelicera moderately stout, similar to the legs in color; outer surface of hand marked by poorly developed and somewhat irregular net-like lines; flagellum with the two more basal setae of equal length, often so approximate and parallel that they appear as a single seta, each less than one-half of the length of the longest or distalmost seta, which has numerous strongly developed serrations along the anterior margin; setae *b* and *sb* less than one-half of the length of seta *is* or seta *ls;* chelicera 0.26 (0.26) mm. long, with the base 0.139 (0.141) mm. wide. Fixed finger with lamina exterior conspicuous, widened in the central part, with outer margin more strongly convex than the outer margin of the finger; apical tooth little more sclerotic than the rest of finger; inner margin of apical tooth with three denticles, four retroconical teeth along the distal two-fifths of the inner finger margin; serrula interior with the terminal four plates free, each with a strongly serrate margin. Movable finger relatively larger and much stouter than the fixed finger, weakly curved; serrula exterior of 19 (18–19) plates; apical tooth more sclerotic than the apical tooth of the opposing finger, terminally subdivided to form two small but acute and sclerotic cusps; well-developed and somewhat acute subapical lobe immediately basal to the apical tooth, with two or three small denticles in some cases observed just basal to the subapical lobe and near the level of the insertion of the galeal seta; galeal seta extending to about the mid-point of the galea; galea basally stout, with six or seven (six) simple rami confined to the distal three-fifths or two-thirds of the galea; length of movable finger 0.215 (0.219) mm.

Palp with surfaces of segments varying from smooth to moderately granulate; trochanter with most of surface granulate, the granules of the extensor margin coarser than elsewhere; femur with moderately developed granules on the flexor surface, these frequently extending as finer granules over the basal part of the femur and even along the extensor surface; tibia with weakly developed granules on the flexor surface; a few granules frequently observed on the flexor surface of the hand near the base of the fingers. Setae of the flexor surfaces of the trochanter, femur, and tibia fairly numerous, moderately clavate on proximal segments, becoming less strongly clavate on the tibia; setae of the extensor surfaces of the femur and tibia varying from moderately clavate to paucidenticulate, with adjacent setae in some cases showing different degrees of development; a few of the setae near the proximal end of the extensor margin of femur moderately to almost strongly clavate, setae of the extensor margin of tibia more regularly multidenticulate; chelal hand with setae chiefly multidenticulate except for a few subclavate setae on the proximal part; investing setae of chelal fingers numerous and acuminate. Shape of palpal segments of the holotype in dorsal view as shown in figure 16, with the paratype agreeing with the holotype except that in the paratype the center of the flexor margin of the tibia is a little less convex and bulging and the basal half of the extensor margin is less convex. In addition, the chelal hand in the paratype in dorsal view has the flexor-basal portion more strongly swollen and the condyle at the base of the movable finger much more conspicuous than in the holotype. To some extent the difference in appearance of the chelal hand and condyle may be the result of the orientation of specimens mounted on slides. Palpal trochanter 0.435 (0.46) mm. long; holotype with one trochanter 0.259 mm. and the other 0.235 mm. in width, trochanter of paratype 0.260 mm. wide; trochanter with length 1.68 and 1.85 (1.77) times the width; holotype with femur of one palp 0.66 mm. long and of the other palp 0.64 mm. long, paratype with femur 0.69 mm. long; width of femur 0.263 (0.287) mm., length 2.51 and 2.44 (2.40) times the width; tibia 0.66 (0.69) mm. long, width in holotype 0.285 and 0.280 mm., width in paratype 0.299 mm.; length of tibia 2.32 and 2.36 (2.31) times the width; chela without pedicel 1.14 (1.24) mm. long, 0.415 (0.465) mm. wide, length 2.75 (2.67) times the width; length of hand without pedicel 0.565 (0.60) mm., depth 0.395 (0.45) mm.,

length 1.43 (1.33) times the depth; length of movable finger 0.61 (0.67) mm. Shape of chelal hand and fingers in lateral view and position of tactile setae of fingers for the holotype as shown in figure 17; hand of paratype very similar to that of the holotype except that the hand is somewhat more quadrangular in outline and a little stouter; position of tactile setae virtually identical in the two males; surface of hand smooth except for a very few small granules that may sometimes be observed in profile along the ventral margin near the base of the movable finger; setae of dorsal margin of hand chiefly multidenticulate, setae of ventral margin of hand somewhat longer and distinctly acuminate except for a few paucidenticulate setae near the juncture of ventral and basal margins; setae of fingers acuminate except that a few of the setae along the dorsal surface of the fixed finger are somewhat stout and bear one or two microspinules along the distal one-third. Marginal teeth of each finger contiguous along nearly the entire finger margin, with the teeth subtriangular in shape and with strongly developed cusps except that the teeth of about the proximal one-fourth of the row become less triangular in shape, usually a few teeth along the very proximal end of the row with weakly developed cusps; fixed finger with 44 (46) marginal teeth, movable finger with 46 (48) marginal teeth; external accessory teeth varying from three to five and internal accessory teeth varying from three to six on each finger; movable chelal finger with nodus ramosus about twice as far from tactile seta *t* as from *st*.

Legs with surfaces of segments virtually smooth except that in both the first and fourth legs the trochanter and femoral parts have granules on the very extensor surface; the anterior surface of pars tibialis of both first and fourth legs marked by a weakly developed net-like or scale-like pattern, with this sculpturing very weakly developed or virtually wanting from the anterior surface of the tibia; tibia of both legs with fairly well-developed granules on the flexor surface. Setae of the extensor surface of pars tibialis, tibia, and tarsus of both first and fourth legs varying from moderately clavate to multidenticulate, in general these setae are more strongly clavate on the fourth than on the first leg; setae of extensor surface of trochanter and flexor surface of all pedal segments acuminate except that a varying number of setae of the flexor surface of both femoral parts of the first leg and of the pars tibialis of the fourth leg are paucidenticulate to multidenticulate. Shape of segments of legs without unusual characteristics. First leg with over-all length of pars tibialis 0.37 (0.385) mm., depth 0.123 (0.131) mm.; tibia 0.363 (0.395) mm. in length, 0.095 (0.100) mm. in depth; tarsus 0.378 (0.410) mm. in length, 0.066 (0.068) mm. in depth. Fourth leg with length of pars basalis as measured along the flexor side 0.258 (0.271) mm., depth 0.164 (0.179) mm.; pars tibialis as measured along the extensor side 0.48 (0.515) mm. in length, 0.183 (0.197) mm. in depth; entire femur 0.675 (0.72) mm. in length; tibia 0.55 (0.59) mm. in length, 0.108 (0.119) mm. in depth; tarsus 0.45 (0.465) mm. in length, 0.076 (0.079) mm. in depth; well-developed tactile seta located 0.305 (0.328) mm. or 0.68 (0.705) of the length of the tarsus from the proximal margin.

Genitalia with 19 (21) setae on the face of the anterior operculum and six (six) setae along the anterior lip of the genital slit; posterior operculum with four (five) setae along the posterior lip of the genital slit and with 19 (25) setae on the face of the operculum, with about one-half to two-thirds of these setae forming a very irregular row paralleling the posterior margin of the posterior operculum.

FEMALE: The description of the female is based on three mounted individuals (the allotype and two paratypes). Measurements given for the allotype are followed in parentheses by corresponding measurements expressed as ranges based on all three females. Female very similar to male in general appearance, color, sculpturing, chaetotaxy, and size. Body of female 2.35 (2.25–2.35) mm. long; carapace 0.89 (0.78–0.89) mm. in length, 0.76 (0.73–0.76) mm. in width. Carapace with little indication, if any, of vestigial eye spots; anterior margin with four setae, posterior margin with 13 (10–14) setae in an irregular row. Tergites 1 through 10 divided, with chaetotaxy and sculpturing essentially as in the male; sternal chaetotaxy also much as in the male but only two or three setae on

each half sternite of the fourth segment. Anterior stigmatic plate of each side usually with three setae, but four setae on one anterior stigmatic plate of one paratype; each posterior stigmatic plate with one seta. Chelicera virtually the same as in the male; either four or five teeth on the inner margin of the fixed finger; galea with five or six simple rami, serrula exterior with 17 or 18 plates; chelicera 0.255 (0.247–0.255) mm. in length, base 0.143 (0.137–0.143) mm. in width; movable finger 0.211 (0.207–0.211) mm. long.

Palp essentially as in the male except that the chela of the female is conspicuously more slender. Trochanter 0.445 (0.390–0.445) mm. in length; one trochanter of allotype 0.233 and the other 0.250 mm. in width, range for the three females 0.223–0.250 mm.; trochanter of allotype with length of 1.91 or 1.78 times the width; for all three females length of trochanter 1.75–1.91 times the width; femur 0.655 (0.600–0.655) mm. long, 0.257 (0.230–0.257) mm. wide, length 2.55 (2.55–2.61) times the width; tibia 0.65 (0.60–0.65) mm. in length, 0.275 (0.245–0.275) mm. in width, length 2.37 (2.36–2.45) times the width; length of chela without pedicel 1.14 (1.05–1.14) mm., width 0.365 (0.335–0.365) mm., length 3.12 (3.12–3.25) times the width; length of hand without pedicel 0.56 (0.51–0.56) mm., depth of hand 0.357 (0.330–0.357) mm., length 1.57 (1.46–1.60) times the depth; length of movable finger 0.61 (0.57–0.61) mm. In lateral view the chelal hand of the female somewhat more slender than in the male; arrangement of tactile setae of chelal fingers shown in figure 19; some small variations occur in chaetotaxy among the type females, in one paratype tactile seta *b* and tactile seta *sb* of the movable finger are appreciably closer to each other than in the allotype, but not so approximate as in the male holotype and male paratype; tactile setae *ist* and *est* of the fixed finger at virtually the same level in the allotype, but in the female paratypes tactile seta *ist* is a short distance distal to the level of *est;* the position of the nodus ramosus varies from a point about midway between tactile setae *t* and *st* to slightly more than twice as far from tactile seta *t* as from tactile seta *st*. Marginal teeth of chelal fingers as in the male; 43 to 46 teeth along the margin of each finger; fixed finger with six external and three or four internal accessory teeth, movable finger with five or six external and one to three internal accessory teeth.

Legs of female very similar to those of the male in general shape of segments and in color, chaetotaxy, and sculpturing, except that the sculpturing appears a little stronger and more extensive than in the male, with the scale-like markings sometimes observable on both anterior and posterior surfaces of pars tibialis and tibia. First leg with pars tibialis 0.365 (0.345–0.365) mm. in length, 0.126 (0.116–0.126) mm. in depth, length 2.90 (2.90–2.98) times the depth; tibia 0.365 (0.330–0.365) mm. in length, 0.092 (0.087–0.092) mm. in depth, length 3.97 (3.62–3.97) times the depth; tarsus 0.395 (0.350–0.395) mm. long, 0.064 (0.060–0.064) mm. in depth, length 6.18 (5.98–6.18) times the depth. Fourth leg with pars basalis 0.273 (0.247–0.273) mm. in length, 0.167 (0.159–0.167) mm. in depth, length 1.63 (1.55–1.63) times the depth; pars tibialis 0.500 (0.450–0.500) mm. in length, 0.181 (0.170–0.181) mm. in depth, length 2.76 (2.61–2.76) times the depth; entire femur 0.695 (0.63–0.695) mm. in length, length 3.84 (3.60–3.84) times the depth; tibia 0.56 (0.50–0.56) mm. in length, 0.108 (0.103–0.108) mm. in depth, length 5.18 (4.85–5.18) times the depth; tarsus 0.475 (0.43–0.475) mm. in length, 0.075 (0.074–0.075) mm. in depth, length 6.33 (5.80–6.33) times the depth; well-developed tactile seta on extensor surface of tarsus 0.320 (0.275–0.320) mm. or 0.67 (0.64–0.67) of the length of the segment from the proximal margin of the tarsus.

Genitalia of female with 20 (15–22) fine and acuminate setae on the face of the anterior operculum; posterior operculum with 13 (12–13) slender and somewhat long acuminate setae arranged seriatim along an arc posterior to the genital slit; each seminal receptacle as described for the genus; inner end of each tubule inflated to form a sac with strongly wrinkled surface, suggesting that the sac is flimsy in character or becomes wrinkled during preparation of the specimens for study; an elongated, conspicuous, and very irregularly shaped cribriform plate near each end of the genital slit.

TRITONYMPH: The description of the trito-

nymph is based on two paratypes; measurements for one paratype follow in parentheses the corresponding measurements of the other paratype. In general the tritonymph is similar to the adult, but with a lighter color, fewer setae, and much smaller size. Body length 2.1 (somewhat contracted, probably about 1.8) mm.; carapace 0.70 (0.66) mm. long. Chelicera very much as in the adult; galea with five simple rami confined to the distal one-half; serrula exterior with 15 or 16 plates. Palp with general shape of segments similar to those of the female but segments much stouter; setae of segments much as in the adult, but less numerous and somewhat less clavate; segments with surface sculpturing much as in the adult except that some surface areas marked by granules appear a little more extensive, in the case of the flexor surface of the chelal hand much more extensive. Palpal trochanter 0.36 (0.33) mm. long, 0.187 (0.175) mm. wide, length 1.93 (1.88) times the width; femur 0.46 (0.42) mm. long, 0.211 (0.187) mm. wide, length 2.18 (2.25) times the width; tibia 0.465 (0.43) mm. long, 0.222 (0.201) mm. wide, length 2.10 (2.14) times the width; chela without pedicel 0.825 (0.775) mm. in length, 0.283 (0.259) mm. in width, length 2.91 (2.99) times the width; chelal hand without pedicel 0.41 (0.375) mm. long, 0.291 mm. deep in one specimen but hand partly broken in second specimen and depth not obtained, length of hand in first specimen 1.41 times the depth; movable finger 0.44 (0.43) mm. long. From the side, chelal hand appears to be much like the hand of the female, but observations are incomplete, because the hand of one specimen is broken and an irregularity in the ventral margin of the hand of the other specimen suggests that the hand may be atypical. Teeth of chelal fingers much as in the adult except that the teeth of subtriangular shape are confined to about the distal one-fourth of the row, with the other teeth subquadrangular in shape and with proximally directed cusps; cusps less strongly developed than in the adult and entirely absent from the basal five to 10 teeth of the row; teeth of tritonymph fewer in number than in the adult, each finger with 33 or 34 marginal teeth, three or four external accessory teeth, and one or two internal accessory teeth. Tactile setae much as in the adult; movable finger with three tactile setae, *b* or *sb* wanting, *st* a very little farther from *t* than from the single basal seta; fixed finger with seven tactile setae, the two basal and two subbasal setae confined to a little less than the basal one-third of the finger (considering the length of the fixed finger equal to that of the movable finger), *est* a little distal to the mid-point of the finger, *ist* wanting, *et* and *it* as in the adult. Legs resembling those of the adult except segments distinctly smaller and usually stouter, with fewer setae and with a much lighter color; surface of segments with very little indication of sculpturing; tarsus of the fourth leg with a well-developed tactile seta located 0.62 (0.61) of the length of the tarsus from the proximal margin.

REMARKS: This is the second species assigned to *Acuminochernes*. In many respects the new species is similar to *A. crassopalpus* (described as *Hesperochernes crassopalpus* by Hoff, 1945a; Hoff, 1949), the type of the genus, known from Arkansas, Illinois, and Kansas (Hoff, 1958). Pseudoscorpions belonging to *A. tacitus* have palpal and pedal segments somewhat larger than the corresponding segments of specimens of *A. crassopalpus*, with the ranges for *A. tacitus* immediately above the ranges for *A. crassopalpus* except for a few segments where there is a small overlap. Specimens of *A. tacitus* and *A. crassopalpus* are separated without difficulty because of the much more slender palpal and pedal segments in *A. tacitus*. As there is a possibility that some of the inadequately described species of *Dinocheirus* may actually belong in *Acuminochernes*, specimens of *A. tacitus* were checked against species currently in the genus *Dinocheirus*. No species of *Dinocheirus* was found conspecific with the new species of *Acuminochernes*.

The two species of *Acuminochernes* are somewhat similar in habitat, as both are associated with woody debris from hollow stumps and trees and from nests of birds and rodents. The type specimens of *A. crassopalpus* were taken from debris in a hollow tree in Washington County, Arkansas (Hoff, 1945a). Hoff (1949) reported the species from a decayed log, from debris in hollow trees, and from the stomach of a red-bellied woodpecker in Illinois and from the nests of pack rats in Kansas. The new species, *A. tacitus*, is based

on type specimens from woody debris in the nest of a flicker. In addition, a tritonymph taken from the cavity of a stump certainly belongs to *A. tacitus*, although it is slightly smaller than the tritonymph paratypes.

TYPE LOCALITY: *Larimer County:* The male holotype, the female allotype, one male paratype, two female paratypes, and two tritonymph paratypes taken from debris in the nest of a flicker, *Colaptes cafer* (Gmelin), at about 5000 feet in elevation, 2.5 miles east of Fort Collins; collected by Richard C. Funk, March 1, 1958. The holotype, allotype, and one tritonymph paratype are deposited at the American Museum of Natural History; one female paratype is deposited at the United States National Museum; and the male paratype, one female paratype, and one tritonymph paratype are retained by the writer.

NEW RECORD: *Larimer County:* One tritonymph from a cavity in a stump, about 5800 feet in elevation, Redstone Canyon, about 8 miles southwest of Fort Collins, November 23, 1946.

GENUS DINOCHEIRUS CHAMBERLIN

Dinocheirus CHAMBERLIN, 1929, Pan-Pacific Ent., vol. 5, p. 171. HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 43.

Dinocheirus validus (Banks)

Chelanops validus BANKS, 1895, Jour. New York Ent. Soc., vol. 3, p. 7.

Dinocheirus validus, HOFF, 1947, Bull. Mus. Comp. Zoöl., Harvard College, vol. 98, p. 526; 1956, Amer. Mus. Novitates, no. 1800, p. 59.

The present specimens from Colorado agree very closely with specimens formerly studied by Hoff (1947, 1956c) and serve to extend the range of the species, which formerly was known only from California and New Mexico (Hoff, 1958). Banks (1895) reported his type specimens as taken from beneath bark at Lake Tahoe, California, and Hoff (1956c, 1959) reported two New Mexico collections from beneath the bark of fir logs. As published descriptions of the male are based on a small number of specimens, the following ranges of measurements and ratios obtained from four males from Colorado are included here. Body length 2.6–3.1 mm.; carapace 0.83–1.00 mm. long. Chelicera with movable finger 0.190–0.227 mm. in length; serrula exterior with 17–18 plates. Palp with trochanter 0.43–0.48 mm. in length, 0.231–0.290 mm. in width, length 1.65–1.86 times the width; femur 0.65–0.755 mm. in length, 0.265–0.295 mm. in width, length 2.30–2.56 times the width; tibia 0.64–0.73 mm. in length, width 0.300–0.330 mm., length 2.12–2.21 times the width; chela without pedicel 1.08–1.23 mm. in length, width (based on only three specimens) 0.454–0.490 mm., length (for three specimens) 2.38–2.51 times the width; hand without pedicel 0.55–0.66 mm. in length, 0.41–0.50 mm. in depth, length 1.22–1.38 times the depth; movable chelal finger 0.55–062 mm. in length. Fourth leg with entire femur 0.61–0.70 mm. long, 0.191–0.207 mm. deep, length 2.97–3.40 times the depth; tibia 0.495–0.59 mm. in length, 0.120–0.131 mm. in depth, length 3.93–4.51 times the depth; tarsus 0.360–0.445 mm. in length, 0.080–0.091 mm. in depth, length 4.30–4.90 times the depth; tactile seta of extensor surface of tarsus removed from the proximal margin of the segment by 0.215–0.310 mm. or 0.58–0.70 of the length of the tarsus.

NEW RECORDS: *Chaffee County:* A single male taken from beneath the bark of a cottonwood log, 7600 feet in elevation, about 1 mile south of Poncha Springs. *La Plata County:* Five males, two females, and 11 nymphs taken from beneath the bark of cottonwood logs, 6700 feet in elevation, 10.5 miles east of Durango. *San Miguel County:* One male from started bark of standing dead aspen, about 10,200 feet in elevation, at Sunshine Camp, 8 miles southwest of Telluride; collected by H. and L. Levi, July 20, 1959.

Dinocheirus athleticus Hoff, tentative determination

Dinocheirus athleticus HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 48.

One male and four nymphs from Colorado have been provisionally assigned to *D. athleticus*, a species known previously from New Mexico (Hoff, 1956c, 1958) where specimens have been taken from stumps and logs of conifers. Although the male and nymphs from Colorado agree fairly well with specimens from New Mexico, some differences occur, and it seems advisable to give the Colorado specimens a tentative determina-

tion. If additional adult specimens were available and if there were additional information about variation within the species, it might be possible to make an unquestionable determination. While the male from Colorado differs from the type males by having smaller palpal and pedal segments, there is fairly close agreement in the length/width and length/depth ratios. The Colorado male has palpal segments virtually identical in length/width and length/depth ratios with segments of the small male described by Hoff (1956c) from Mt. Taylor, New Mexico, and assigned tentatively to *D. athleticus*. However, the actual sizes of palpal segments in the Colorado male are intermediate, sometimes virtually midway between the smallest type specimen and the small Mt. Taylor male. The Colorado male has a chela that, especially in lateral view, resembles more nearly the shape of the chela of the type specimens than it does the chela of the small Mt. Taylor specimen. Until studies of additional individuals have been made and the limits of intraspecific variation become known, identification of some specimens of *D. athleticus* will continue to be difficult.

NEW RECORDS: *Larimer County:* One male taken from beneath the bark of a yellow-pine stump, 7900 feet in elevation, 10 miles northeast of Chambers Lake, about 50 miles west of Fort Collins. *Routt County:* Four nymphs taken from well-rotted wood in cavity of aspen log, about 7500 feet in elevation, near Fish Creek Falls, 3 miles east of Steamboat Springs.

GENUS DENDROCHERNES BEIER

Dendrochernes BEIER, 1932, Das Tierreich, vol. 58, p. 171. HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 38.

Dendrochernes crassus Hoff

Dendrochernes crassus HOFF, 1956, Amer. Mus. Novitates, no. 1800, p. 39.

This species previously has been known only from the female holotype and the male allotype from New Mexico. The single available Colorado specimen, a female, agrees very closely with the type female from New Mexico, with differences no greater than those expected from intraspecies variation. As measurements of the chelal hand and movable finger of the female holotype were inadvertently omitted from the original and only description of the species, the following measurements for the holotype are included here: chelal hand without pedicel 0.78 mm. long, 0.58 mm. deep; length of movable finger 0.64 mm. The following measurements are based on the single available Colorado female. Body 2.8 mm. long, apparently contracted, resulting in the measured length's being less than that of the holotype; carapace 1.00 mm. in length, with six setae along the anterior margin and eight setae in an irregular row along the posterior margin; anterior stigmatic plate with three setae, posterior plate with one seta. Chelicera with 22–24 plates in the serrula exterior; movable finger 0.260 mm. in length. Palps with trochanter 0.54 mm. long, width of trochanter of one palp 0.365 mm., of the other palp 0.345 mm.; femur 0.84 mm. long, 0.363 mm. in width; tibia 0.85 mm. long, tibia of one palp 0.41 mm. wide, other tibia 0.405 mm. wide; chela without pedicel 1.41 mm. long, width 0.625 mm.; hand of chela without pedicel 0.82 mm. long, 0.63 mm. deep; movable finger 0.66 mm. long. Fourth leg with entire femur 0.81 mm. in length, 0.262 mm. in depth; tibia 0.66 mm. long, 0.159 mm. deep; tarsus 0.44 mm. long, 0.112 mm. in depth, with the tactile seta broken but apparently 0.275 mm. or about 0.62 of the length of the tarsus from the proximal margin. No information is available with respect to the habitat from which the single Colorado female was obtained, but on the basis of the habitats present in the Red Feather Lakes region, it is possible that the Colorado specimen was taken, as were specimens of the three New Mexico collections reported by Hoff (1959), from beneath the bark of yellow-pine logs.

NEW RECORD: *Larimer County:* One female, probably from an elevation between 8000 and 8500 feet, taken in the region of Red Feather Lakes, about 45 miles northwest of Fort Collins, by Ralph Hill, November 10, 1935.

FAMILY CHELIFERIDAE HAGEN

SUBFAMILY CHELIFERINAE SIMON

TRIBE CHELIFERINI CHAMBERLIN

GENUS CHELIFER GEOFFROY

Chelifer GEOFFROY, 1762, Histoire . . . des insectes, vol. 2, p. 617 (referred from Beier, 1932b).

BEIER, 1932, Das Tierreich, vol. 58, p. 235. HOFF, 1956, Amer. Mus. Novitates, no. 1804, p. 3.

Chelifer cancroides (Linnaeus)

Acarus cancroides LINNAEUS, 1758, Systema naturae, ed. 10, p. 616.

Chelifer cancroides, BEIER, 1932, Das Tierreich, vol. 58, p. 236.

This virtually cosmopolitan species has been reported from Fort Collins by Banks (1895) and by Hoff (1950), neither of whom gives ecological data. The record by Hoff is based on a series of males and females taken from a chicken house by Maurice T. James in April, 1947. Additional collections show that in Colorado, as elsewhere, the species is associated with man.

NEW RECORDS: *Denver County:* From Denver, S. C. Bishop collection, February 26, 1927. *Larimer County:* One collection made by T. A. Woolley, Fort Collins, October, 1939; one collection from wall of bathroom in motel, Fort Collins, by R. A. Ward, August 10, 1957. *Weld County:* A collection of several specimens from a chicken house, 2 miles east of Latham Reservoir, southeast of Greeley; collection made by E. E. Bennington, United States Public Health Service, July 12, 1955.

GENUS **PARACHELIFER** CHAMBERLIN

Parachelifer CHAMBERLIN, 1932, Canadian Ent., vol. 64, p. 19; 1952, Bull. Amer. Mus. Nat. Hist., vol. 99, p. 299.

Parachelifer persimilis (Banks)

Chelifer persimilis BANKS, 1909, Canadian Ent., vol. 41, p. 304.

Parachelifer persimilis, HOFF, 1956, Amer. Mus. Novitates, no. 1804, p. 4.

This species occurs in the western part (except coastal states) of the United States, being reported from Nevada to Nebraska and from New Mexico and Arizona to Montana (Hoff, 1958). In 1950 Hoff gave Colorado records based on collections from Colorado Springs, El Paso County; from Fort Collins and from the Red Feather Lakes area, about 45 miles northwest of Fort Collins, Larimer County; and Ouray, Ouray County. In the present paper records are given for 19 additional collections taken from 11 counties. Colorado specimens of both sexes agree very closely with specimens from other areas. The following statistics for Colorado males are expressed as ranges based on 10 specimens. Male with palpal femur 1.15–1.36 mm. in length, length 4.57–5.43 times the width; tibia 1.00–1.22 mm. in length, this being 3.49–3.81 times the width; chela without pedicel 1.73–2.00 mm. long, length/width ratio 3.63–4.17; movable chelal finger 0.90–1.06 mm. long. For the female from Colorado, the following ranges are based on 11 specimens. Female with palpal femur 0.92–1.28 mm. in length, the length 4.45–4.98 times the width; tibia 0.91–1.10 mm. long, length 3.34–3.54 times the width; chela without pedicel 1.59–1.92 mm. long, this being 3.60–4.04 times the width; movable finger 0.83–1.00 mm. in length. In addition to the 11 females for which measurements are included in the ranges, two other mounted females were measured. In each of these the absolute lengths of segments fall within the ranges given above, but the length/width ratios are less, indicating the definitely much stouter nature of the palpal segments. For these two specimens, one from Evergreen and the other from Woodland Park, the length/width ratios of palpal segments are, respectively, as follows: femur 3.91 and 3.84; tibia 3.03 and 2.95; chela without pedicel 3.44 and 3.61. Hoff (1956d) reported two New Mexico females with unusually stout palpal segments, and these are somewhat similar to the two Colorado females. Until more extensive studies have been made, it seems advisable to assign the two questionably atypical Colorado females provisionally to *P. persimilis*.

ECOLOGY: In both New Mexico (Hoff, 1956d, 1959) and Colorado *P. persimilis* occurs chiefly beneath the started bark of yellow-pine logs, stumps, and dead trees, but specimens are also taken from a variety of other microhabitats, including the bark, woody debris, and occasionally the litter of other conifers and, rarely, of broad-leaved trees. In New Mexico 28 collections are reported by Hoff (1959) from elevations of 5000 to 10,275 feet, with all but two of the collections taken at elevations of 6000 to 9200 feet. Colorado collections were also obtained from a wide altitudinal band, 6000 to 10,640 feet, but with only one collection from above 8500 feet.

NEW RECORDS: *Boulder County:* Under

bark of dead yellow pines, one collection 0.5 mile east and another 3 miles south of Nederland at elevations of 8800 and 8500 feet, respectively. *Gunnison County:* Under bark of spruce or fir stump, 8200 feet in elevation, 16 miles northeast of Gunnison; from Gambel oak litter, 7500 feet elevation, 20 miles west of Gunnison. *Jefferson County:* Evergreen, no ecological data, collection submitted by the Forest Insect and Disease Laboratory at Fort Collins (provisional determination); three collections from beneath the started bark of yellow-pine logs, 24, 26, and 29 miles northwest of Denver, elevations of 6800, 7000, and 7800 feet, respectively. *La Plata County:* From beneath the bark of a dead yellow pine, 6800 feet elevation, 3 miles west of Durango. *Larimer County:* Two collections from beneath the bark of dead yellow pines, 30 miles and 39 miles west of Fort Collins at elevations of 6400 and 7200 feet. *Montezuma County:* Taken in pinyon-juniper area, about 7000 feet in elevation, Mesa Verde National Park, June 23, 1945; collected by R. E. Gregg. *Routt County:* Beneath dead wood and bark at base of living pinyon, 7700 feet in elevation, 10 miles south of Toponas; one collection from beneath bark flakes on trunk of a yellow pine and one collection from debris at the base of a yellow pine, at Hot Spring, 7500 feet in elevation, about 7 miles north of Steamboat Springs. *Saguache County:* From debris and under rocks in spruce-fir area, Cochetopa Creek, 16 miles southeast of Gunnison, 8000 feet in elevation, July 15, 1957, by H. and L. Levi. *San Juan County:* Under bark of dead fir, Coal Bank Hill Pass, 10,640 feet in elevation, about 17 miles south of Silverton. *San Miguel County:* Under bark of standing dead aspen, nearly 10,200 feet in elevation, Sunshine Camp, 8 miles southwest of Telluride, July 20, 1959, collected by H. and L. Levi. *Teller County:* Woodland Park, no ecological data, August 4, 1943, collected by H. H. Ross (provisional determination).

Genus **HYSTEROCHELIFER** Chamberlin

Hysterochelifer Chamberlin, 1932, Canadian Ent., vol. 64, p. 18. Hoff, 1956, Amer. Mus. Novitates, no. 1804, p. 9.

Hysterochelifer proprius Hoff

Hysterochelifer proprius Hoff, 1950, Amer. Mus. Novitates, no. 1448, p. 4; 1956, Amer. Mus. Novitates, no. 1804, p. 11.

Colorado records are based on three females that agree very closely with the female allotype (Hoff, 1950) from the Flagstaff, Arizona, area. Among the Colorado specimens, there is little variation except in the extent of narrowing of the chelal hand near the base of the fingers and the degree of convexity of the inner or flexor margin of the hand as observed in dorsal view. The variations are clearly intraspecific. If the small amount of variation found among the Arizona and Colorado females is at all indicative of the limits of variation expected in the species, then the only New Mexico female (from the flowering stalk of a soaptree yucca in southern New Mexico) studied by Hoff (1956d) may be incorrectly assigned to *H. proprius*. Many of the palpal and pedal segments of the New Mexico female are decidedly more slender than those of the Colorado and Arizona females. For example, the New Mexico female has a length/width ratio of 4.86 for the palpal femur and 3.68 for the palpal tibia, while ranges of the ratios are 3.93–4.2 and 3.00–3.10 for the femur and tibia of the one Arizona and three Colorado females. Again, the tibia of the fourth leg has a ratio of 5.33 in contrast to a range of 4.02–4.38 for the four Arizona and Colorado females and the tarsus a ratio of 5.22 in contrast to a range of 3.89–4.21. Among the Colorado specimens is a tritonymph that, because of the longer and less clavate investing setae, may belong to another species. For the present, however, the nymph is tentatively assigned to *H. proprius*.

Because the published descriptions of the female are based entirely on the female allotype from Arizona (Hoff, 1950) and the one female of somewhat questionable assignment from New Mexico (Hoff, 1956d), it seems advisable to include the following measurements and ratios as ranges based on three females from Colorado. Body 3.2–3.6 mm. long. Carapace with two well-developed eyes; nine to 13 setae along the posterior margin of the carapace; length of carapace about 0.95 mm. in each of the three females. Each half of first tergite with five to seven setae; each half of sixth tergite with seven to nine, usually eight, setae; anterior stigmatic plates without setae, each posterior plate with one seta. Chelicera with well-marked, net-like sculpture on most of the exterior surface of

the hand; galea with three to five short and simple rami confined to the distal one-third; serrula exterior usually with 16 or 17 plates; movable finger with at least fairly well-developed, scale-like sculpture that appears in the form of overlapping scales in profile view; movable finger 0.200–0.207 mm. in length. Female with palpal femur 0.96–1.00 mm. long, 0.232–0.247 mm. in width, length 3.93–4.14 times the width; tibia 0.85–0.90 mm. long, 0.274–0.296 mm. wide, length 3.04–3.10 times the width; chela without pedicel 1.42–1.55 mm. long, 0.382–0.413 mm. wide, length 3.55–3.75 times the width; chelal hand without pedicel 0.76–0.86 mm. in length, depth of hand (based on two specimens) 0.338–0.350 mm., length 2.20–2.25 (for only two individuals) times the depth; movable chelal finger 0.69–0.77 mm. in length. Fixed finger with 37–42 marginal teeth; movable finger with 39–43 marginal teeth. Some variation occurs in the relative position of tactile setae of the chelal fingers. Movable finger with tactile seta *st* separated from *t* by slightly more than the distance between tactile setae *st* and *sb* and equal to or a very little less than the distance between tactile setae *st* and *b*. Fixed finger with tactile seta *ist* slightly basal to the level of *est*, tactile seta *it* midway between the levels of tactile setae *et* and *est* or closer to *et* than to *est*. Fourth leg with entire femur 0.765–0.835 mm. long, 0.255–0.270 mm. in depth, length 2.98–3.09 times the depth; tibia 0.565–0.610 mm. long, 0.129–0.152 mm. in depth, length 4.02–4.38 times the depth; tarsus 0.410–0.450 mm. long, 0.099–0.107 mm. deep, length 3.98–4.21 times the depth; tactile seta removed from the proximal margin of the tarsus by 0.310–0.350 mm. or 0.75–0.78 of the length of the tarsus. No males are present in the Colorado collections.

ECOLOGY: From the limited data available, it appears that specimens of this uncommon species are associated with living plants, chiefly yellow-pine trees. All three collections from Colorado and one of the New Mexico collections reported by Hoff (1956d, 1959) came from beneath bark flakes on the trunks of yellow pines. Of the other two New Mexico collections, one came from a soaptree yucca and the other, no doubt fortuitously, from clothes on a line. The habitat of the type specimens from Arizona is not known (Hoff, 1950).

NEW RECORDS: *Larimer County:* One female from beneath bark flakes on trunk of yellow-pine tree, 6100 feet in elevation, about 30 miles west of Fort Collins, August 7, 1957; one female from a similar habitat, about 7000 feet in elevation, 37 miles west of Fort Collins; and one female and one tentatively identified tritonymph from bark of yellow pine, about 7500 feet in elevation, Rist Canyon, about 19 miles west of Fort Collins.

GENUS HAPLOCHELIFER CHAMBERLIN

Haplochelifer CHAMBERLIN, 1932, Canadian Ent., vol. 64, p. 20; 1952, Bull. Amer. Mus. Nat. Hist., vol. 99, p. 305. HOFF, 1956, Amer. Mus. Novitates, no. 1804, p. 3.

Haplochelifer philipi (Chamberlin)

Chelifer philipi CHAMBERLIN, 1923, Proc. California Acad. Sci., ser. 4, vol. 12, p. 374.

Haplochelifer philipi, CHAMBERLIN, 1952, Bull. Amer. Mus. Nat. Hist., vol. 99, p. 306.

This species is very common throughout the Rocky Mountain and West Coast states (Hoff, 1958). The species was reported from Colorado by Hoff (1950), who studied four collections from Larimer County, and by Chamberlin (1952), who reported a single female in a collection labeled merely "Colorado." The specimens now available in large numbers from Colorado agree very closely with the detailed description given by Chamberlin (1952).

ECOLOGY: Pseudoscorpions of this species are usually found under stones and pieces of wood or in litter beneath a wide variety of conifers and broad-leaved trees and shrubs, usually in somewhat dry situations at fairly low elevations. Seven collections (one of these accidently omitted from Hoff's [1956d] list of records) reported from New Mexico by Hoff (1959) were taken from the litter of deciduous and live oaks, pinyon, and yellow pines at elevations between 6400 and 7600 feet. Three of the four (one without ecological data) Colorado collections previously reported by Hoff (1950) were taken under rocks and in litter and debris beneath pinyons and yellow pines at elevations within the limits given for the collections reported below. New records for Colorado are based on 23 collections, chiefly taken beneath stones and pieces of wood and from the litter beneath oaks and pines, occasionally from the litter of aspens,

junipers, firs, and serviceberry, at elevations ranging from 6000 to 8900 feet.

NEW RECORDS: *Archuleta County:* Piedra, 7000 feet in elevation, collector unknown, the American Museum of Natural History collection, July 29, 1952. *Chaffee County:* From yellow-pine litter, 8600 feet in elevation, 9 miles west of Poncha Springs. *Fremont County:* Pinyon litter, 6900 feet in elevation, 9 miles southeast of Salida. *Garfield County:* One collection from juniper litter and one from Gambel oak litter, 6000 feet in elevation, 4 miles east of Glenwood Springs. *La Plata County:* From juniper litter, 6900 feet in elevation, 12 miles east of Durango. *Montezuma County:* Fourteen collections from Mesa Verde National Park; all collections from beneath stones, pieces of wood, and pieces of paper or from litter in areas of pinyon-juniper woodland except one collection from fir litter, one from a fir stump, and one from serviceberry litter; taken at elevations between 6000 and 8000 feet; collections made at various times by R. E. Gregg, P. F. Van Cleave, and Van Cleave and Hoff. *Montrose County:* From area of pinyon and juniper, north rim of Black Canyon, Black Canyon of the Gunnison National Monument, collected by H. and L. Levi on July 29, 1957. *Routt County:* Pinyon litter, 7700 feet in elevation, 10 miles south of Toponas. *Saguache County:* Aspen litter, 8900 feet in elevation, 9 miles south of Poncha Springs.

TRIBE DACTYLOCHELIFERINI BEIER

GENUS DACTYLOCHELIFER BEIER

Dactylochelifer BEIER, 1932, Das Tierreich, vol. 58, p. 253. HOFF, 1956, Amer. Mus. Novitates, no. 1804, p. 28.

Dactylochelifer silvestris Hoff

Dactylochelifer silvestris HOFF, 1956, Amer. Mus. Novitates, no. 1804, p. 29.

This species has been known previously only from the male holotype, the female allotype, and one female paratype from New Mexico (Hoff, 1956d). Careful studies of four mounted males and four mounted females from Colorado show that the Colorado specimens are virtually identical with the type specimens from New Mexico and make possible an expression of some of the variations that occur in the species. There is considerable variation, for example, in the degree of development of the rami of the galea in the male. In two of the Colorado males, each galea has five or six simple, well-developed, and conspicuous rami, while in the other two males the rami are smaller and are reduced to two, three, or four in number. Also the weakly developed sinuation or concavity in the distal one-fifth of the flexor margin of the femur, as described and figured by Hoff (1956d) for the male holotype, is not a stable and constant character, being reduced or wanting in some specimens. Some variation has been observed in the position of tactile seta *ist* of the fixed chelal finger. This seta is at the level of *est* or a little proximal or distal to the level of *est*, especially when the chela is observed in dorsal view. To have tactile seta *ist* as far distal to the level of tactile seta *est* as shown by Hoff (1956d) in his figure of the chela of the holotype in lateral view may be somewhat unusual but is by no means unique, and it is suggested that the apparent relative position of tactile setae *ist* and *est* may be influenced by the position of the chela on the prepared slide. It is possible that the position of these two setae is more accurately observed when the chela is in dorsal instead of lateral view. Because of the small number of specimens on which the original and only published description of *D. silvestris* is based, supplemental information obtained from Colorado specimens is included here.

For the Colorado male, measurements and ratios are expressed as ranges based, unless otherwise indicated, on four specimens. Body 2.4–2.7 mm. long, with the use of an estimate for the body length of one individual in which the abdomen is strongly contracted and the body length is only 2.2 mm. Carapace 0.81–0.87 mm. long; posterior margin with a very irregular row of eight to 11 setae. Chelicera with movable finger 0.175–0.198 mm. in length; 17–18 plates in the serrula exterior. Palpal femur 0.75–0.82 mm. in length, 0.210–0.231 mm. in width, length 3.42–3.72 times the width; tibia 0.72–0.81 mm. long, 0.220–0.270 mm. wide, length 2.85–3.37 times the width; chela without pedicel 1.15–1.24 mm. long, 0.315–0.360 mm. wide, length 3.45–3.90 times the width; chelal hand without pedicel 0.56–0.63 mm. long, depth (based on three specimens) 0.287–0.298 mm., length/depth ratio (based on three specimens) 1.95–2.10;

movable finger 0.62–0.69 mm. in length. Fixed chelal finger with 43–49 marginal teeth, movable finger with 44–51 marginal teeth. First leg with tarsus 0.350–0.365 mm. long, 0.115–0.127 mm. deep, length 2.75–3.05 times the depth. Fourth leg with entire femur 0.66–0.71 mm. long, 0.179–0.208 mm. deep, length 3.36–3.72 times the depth; tibia 0.500–0.535 mm. long, 0.119–0.125 mm. deep, length 4.20–4.35 times the depth; tarsus 0.410–0.450 mm. in length, 0.092–0.095 mm. in depth, length 4.37–4.74 times the depth.

Measurements for the Colorado female are expressed as ranges based on four individuals. Body length 2.75–3.60 mm. Carapace 0.85–1.02 mm. long; eight to 11 setae in an irregular row along the posterior margin. Movable finger of chelicera 0.185–0.215 mm. in length; serrula exterior with 17–19 plates. Female with palpal femur 0.78–0.93 mm. long, 0.227–0.251 mm. wide, length 3.44–3.87 times the width; tibia 0.77–0.88 mm. in length, 0.247–0.281 mm. in width, length 3.06–3.25 times the width; chela without pedicel 1.27–1.45 mm. long, 0.350–0.420 mm. in width, length 3.45–3.62 times the width; chelal hand without pedicel 0.62–0.73 mm. long, depth 0.305–0.365 mm. (determined for two females), length 2.00–2.03 times the depth (ratio based on two specimens); movable chelal finger 0.69–0.76 mm. in length. Fixed chelal finger with between 45 and 50 marginal teeth, movable finger with about 50 marginal teeth. Fourth leg of female with entire femur 0.725–0.845 mm. long, 0.207–0.239 mm. deep, length 3.50–3.69 times the depth; tibia 0.535–0.655 mm. long, 0.119–0.143 mm. deep, length 4.48–5.00 times the depth; tarsus 0.432–0.480 mm. in length, depth 0.091–0.103 mm., length 4.66–4.89 times the depth.

A study of Colorado specimens supports the use, as suggested earlier by Hoff (1956d), of the stoutness of palpal segments for separating specimens of *D. silvestris* and *D. copiosus* Hoff (1945a), a species reported from several states of the central part of the United States (Hoff, 1958) and, except for *D. silvestris*, the only species of *Dactylochelifer* in the Western Hemisphere. Specimens of the two species can be separated by differences in the length/width ratios of palpal femur and chela. However, the ratio of the femur is slightly more reliable than the ratio of the chela, because in the two species there is a small overlap in the ranges of the ratios of the chela of the male and, when more specimens are studied, probably of the female as well. Based on the holotype from New Mexico and four Colorado specimens, the ratio of the femur has a range of 3.42–3.72 for the male and, based on two type females from New Mexico and four Colorado females, the ratio has a range of 3.44–3.87 for the female of *D. silvestris*, while for *D. copiosus*, according to published data (Hoff, 1945a, 1949), the length/width ratio of the palpal femur is between 3.90 and 4.35 for the male and 3.90 and 4.60 for the female. The length/width ratio of the chela for the male has a range of 3.45–3.90 in *D. silvestris* and 3.85–4.40 in *D. copiosus*. For the female the range of length/width ratios for the chela is 3.45–3.75 for *D. silvestris* and 3.75–4.30 for *D. copiosus*.

ECOLOGY: In both New Mexico (Hoff, 1959) and Colorado, *D. silvestris* is associated chiefly with litter and debris of several kinds of conifers and broad-leaved trees at relatively low elevations, 5300–7500 feet in New Mexico and 5500–9200 feet in Colorado, with only two of the Colorado collections taken above 8000 feet.

NEW RECORDS: *Fremont County:* One male, one female, and two nymphs from debris and litter at the base of a yellow pine, 6900 feet in elevation, 8 miles southeast of Salida. *Gunnison County:* One male from beneath logs and rocks, Taylor River, near One Mile Creek, August 3, 1952, collector unknown, the American Museum of Natural History collection; one male from beneath a piece of bark on the ground in an area of juniper and Douglas fir, about 9200 feet in elevation, at Biebel Spring, 7 miles northeast of Gunnison, taken by L. Levi, July 25, 1960; one tentatively determined tritonymph from aspen litter, 7500 feet in elevation, 23 miles west of Gunnison. *Larimer County:* A tentatively determined tritonymph from bark of willow log, 5500 feet in elevation, about 10 miles west of Fort Collins, August 28, 1946. *Montezuma County:* Two collections from Mesa Verde National Park; one male and one female collected by P. F. Van Cleave at about 7000 feet in elevation, June–October, 1951; one tentatively determined deutonymph from fir litter, 8000 feet in elevation,

collection by Van Cleave and Hoff, July 21, 1955. *Routt County:* One female from mixed cottonwood and boxelder litter, 6400 feet in elevation, 2 and 8 miles west of Hayden. *Saguache County:* One gravid female under piece of bark on ground in area of fir, 8850 feet in elevation, at Cochetopa Creek, 24 miles southeast of Gunnison, taken by H. Levi and A. Kostinsky on June 27, 1960.

CHELIFERINAE gen. et sp. indet.

In the Colorado collections there are 10 nymphs that cannot be assigned, even provisionally, to genus and species. These nymphs seem to be different from the identified nymphs and adults from Colorado and, as the nymphs for virtually none of the Cheliferinae have been described in detail, genus and species identifications cannot be made at the present time. The 10 unidentified nymphs belong to at least two and perhaps as many as four different species, occur in nine different collections, and were collected from a variety of microhabitats between 5600 and 8600 feet in elevation. One or more of the nymphs are from each of the following counties: Boulder, Chaffee, Fremont, Gunnison, and Larimer.

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