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SOME GARYPOID FALSE SCORPIONS FROM WESTERN NORTH AMERICA (PSEUDOSCORPIONIDA: GARYPIDAE AND OLPIIDAE)

Ellen M. Benedict

Department of Biology
Portland State University
Portland, Oregon 97207

David R. Malcolm

Department of Biology
Pacific University
Forest Grove, Oregon 97116

ABSTRACT

A new genus and species, *Oreolpium nymphum*, and a new species, *Larca chamberlini* are described. *Olpium frontalis* Banks and *Pseudogarypinus marianae* (Chamberlin) are synonomized and redescribed. Distributional data is provided for the above species and *Archeolarca rotunda* Hoff and Clawson.

INTRODUCTION

This paper, one of a series resulting from studies originally centered upon pseudoscorpions collected in Oregon, reports on the four western garypoid species currently known to occur in the state. It includes several new records from various localities in the western United States, the description of a new genus and two new species, and a clarification of the relationship between *Olpium frontalis* Banks and *Pseudogarypinus marianae* (Chamberlin). This latter problem has been an area of confusion in the literature for a number of years.

For some time, we have found in making measurements of various structures that it is often nearly impossible to secure reliable measurements of the chela when it remains attached to the palp. Therefore, we have modified the system of reference lines and points as used by Chamberlin (1931) by taking the measurements from the lateral aspect of the detached chela as illustrated in Figure 1.

FAMILY GARYPIDAE

Hansen, 1894, p. 231 (erected family). Chamberlin, 1931, pp. 226-228 (revised diagnosis with six included genera). Hoff, 1956, p. 44 and 1964, pp. 39-40 (revised diagnosis).

Garypids, represented by about 20 genera from both hemispheres, are considered to be mostly tropical and subtropical in distribution (Hoff, 1964). In the United States, five species assigned to three genera have been reported: *Garypus floridensis* Banks from Florida, and *G. californicus* Banks from California; *Larca granulata* (Banks) from the central and eastern states, and *L. notha* Hoff from Colorado; and *Archeolarca rotunda* Hoff and Clawson from New Mexico and Utah.

Heretofore, garypids have not been reported in the literature from the Pacific Northwest although the specimens of *Larca* upon which the new species is based have been in the J. C. Chamberlin Collection since their recovery in Oregon in 1941 and in California in 1955. Our recent field work in central Oregon has further revealed a single specimen of *Archeolarca rotunda*.

As early as 1949, Hoff recognized the family Garypidae as belonging to the suborder Diplosphyronida. Later (1964), he delimited the family by the following characters: both fingers of chela with venom apparatus and tooth; pleural membrane not evenly and smoothly plicate; carapace triangular or subtriangular in shape; coxal area, in most species, wider posteriorly than anteriorly; investing setae of palps and tergites relatively short and inconspicuous. Both of the genera from Oregon belong to the Garypinae, one of the two subfamilies currently recognized.

Genus *Larca* Chamberlin

Larca Chamberlin, 1930, p. 609, p. 616 (original diagnosis; *Garypus latus* Hansen designated as generotype). Beier, 1932, p. 224 (key to two species). Hoff, 1949, p. 447 (expanded diagnosis); 1961, p. 435 (amended diagnosis).

The holarctic genus *Larca*, which includes fewer than ten species, was established by Chamberlin in 1930 for *Garypus latus* Hansen 1884 from Denmark and for *Garypus granulatus* Banks 1891 from New York. A second North American species, *L. notha*, from Colorado, was added in 1961 by Hoff. This paper describes a third North American species from Oregon and California.

Pseudoscorpions of this genus are characterized (Hoff, 1961) by: movable chelal finger of adult with only *two* or *three* tactile setae; some arcuate and lanceolate palpal vestitural setae; tactile seta ET of fixed chelal finger near mid-point, other setae proximal; pedal

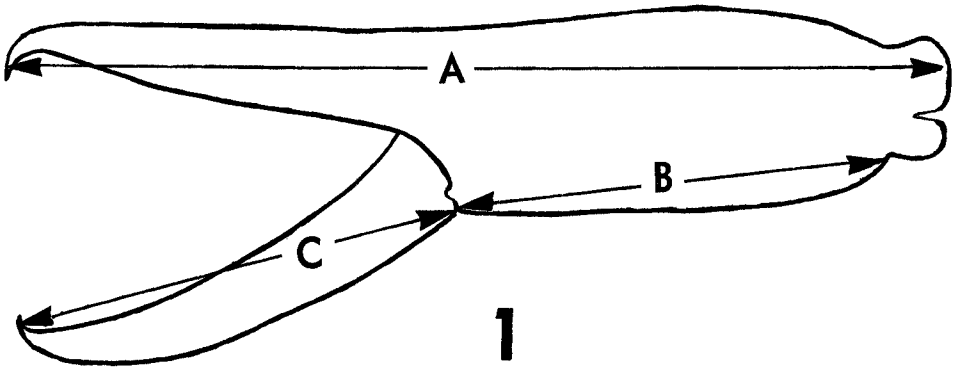


Fig. 1.–Reference lines and key points used to measure chelae: A, chelal length including pedicel; B, hand length; and C, movable finger length.

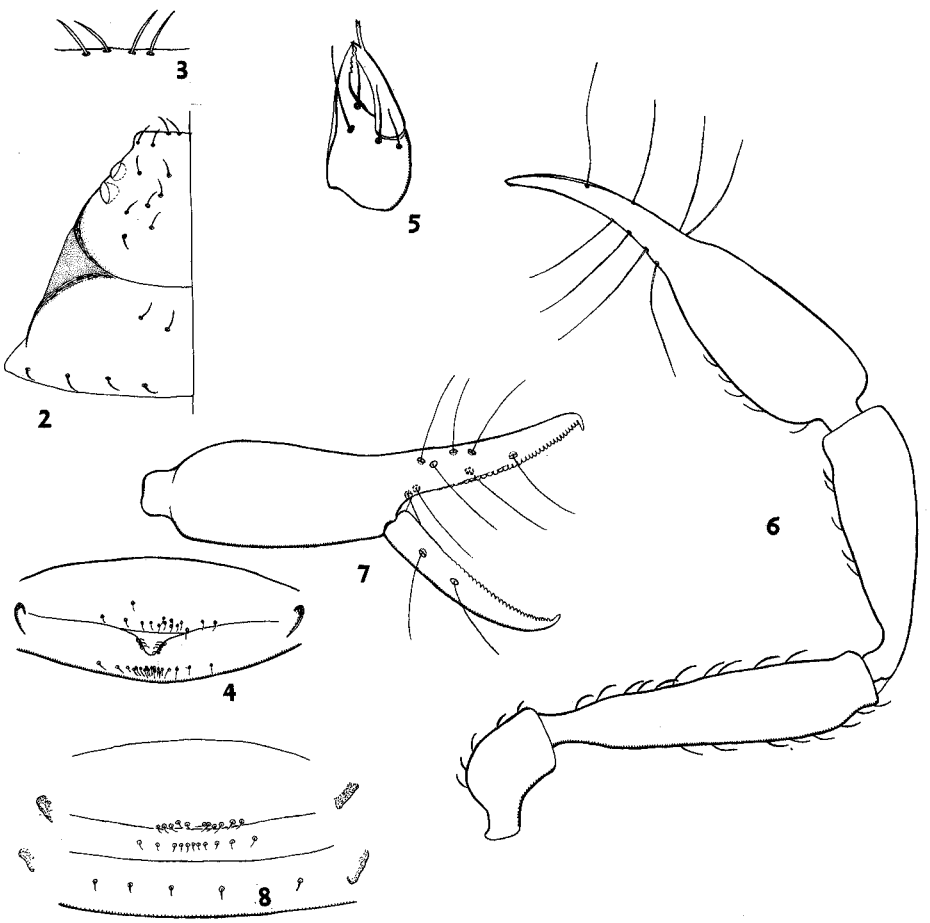
tarsi divided; pars basalis of leg I longer than pars tibialis; arolium longer than tarsal claws. The flagellum is described by Hoff as consisting of four blades, but since specimens from Oregon appear to have three blades, this character may not be constant in all species of *Larca*.

Larca chamberlini, new species
(Figs. 2 to 8)

Description.–Moderately-sized (male 1.82-1.92 ± mm body length, female 1.84 ± mm), four-eyed species; derm granulate to reticulate with more or less arcuate setae.

Male.–Measurements in Table 1.

Carapace (Fig. 2): one and one-half times longer than ocular breadth; subtriangular, with truncate anterior margin. Lacking distinct epistomal process but with weak dentations between two medial setae (Fig. 3); derm granulate; two pairs strongly corneate eyes,



Figs. 2 - 8.–*Larca chamberlini* n. sp., drawn from the holotype male (JC-1696.01001) except as indicated: 2, carapace; 3, epistomal area; 4, genital operculum of male; 5, chelicera; 6, dorsal aspect of palp of male; 7, external aspect of chela of male showing details of chelal teeth; 8, genital operculum of allotype female (JC-1696.01002).

Table 1.–Measurements (in millimeters) of type specimens of *Larca chamberlini*, new species

	Male		Female
Morphological Part[a]	Holotype	Paratype	
Body L	1.92±	1.82±	1.84±
Abdominal B	1.18±	1.18±	1.13±
Carapace L	0.53	0.53±	0.49
Ocular B	0.32	0.31±	0.32
Posterior B	indeterm.	indeterm.	0.61±
Ant. eye diam.	0.043	0.051	0.047
Post. eye diam.	0.043	0.047	0.055
Chelicera L/B	0.18/0.09	indeterm.	0.17/0.09
Pedipalp			
Trochanter L/B	0.29/0.14	0.25/0.13	0.29/0.14
Femur L/B	0.69/0.15	0.64/0.14	0.68/0.15
Tibia L/B	0.57/0.16	0.58/0.16	0.57/0.16
Chela (with pedicel) L	0.88	0.81	0.89
Chela B	0.22	0.21	0.23
Chela D	0.20	indeterm.	0.22
Hand L	0.43	indeterm.	0.41
Movable finger L	0.40	indeterm.	0.42
Leg I			
Basifemur L/D	0.22/0.08	0.21/0.08	0.24/0.08
Telofemur L/D	0.17/0.09	0.16/0.08	0.17/0.09
Tibia L/D	0.19/0.06	0.19/0.06	0.20/0.06
Metatarsus L/D	0.16/0.05	0.15/0.04	0.15/0.05
Telotarsus L/D	0.16±/0.04	0.14/0.03	0.14/0.04
Leg IV			
Entire femur L/D	0.49/0.13	0.45/0.12	0.48/0.13
Tibia L/D	0.34/0.08	0.31/0.07	0.34/0.08
Metatarsus L/D	0.19/0.05	0.18/0.05	0.19/0.05
Telotarsus L/D	0.19/0.04	0.19/0.04	0.19/0.04

[a]Abbreviations: B, breadth; D, depth; L, length

anterior pair about one and one-half ocular diameters from anterior margin, and one-fourth ocular diameter from posterior pair; chaetotaxy 8-8(40). Coxal area typical; holotypic chaetotaxy 2-mm-1-10:0-1-7:0-2-6 or 7:0-1-7-6.

Abdomen: broadly oval; most scuta weakly divided; derm granulate to reticulate; pleural membrane strongly wrinkled; genital area typical (Fig. 4); chaetotaxy of holotypic abdominal terga 6:6:10:11:12:12:11:12:10:9:11:mm, of sterna 15:(0-0):(0)3-4/19(0):(0)5(0):9:9:8:8:8:6:4:mm.

Chelicera (Fig. 5): derm reticulate; galea moderately long and terminally trifid; serrula exterior with 17 blades, serrula interior blade number indeterminable; flagellum of three blades; fixed finger with two small denticles along inner margin of apical tooth followed proximally by four slightly larger acute teeth; movable finger with three very weakly developed denticles just proximal of apical tooth; hand with four setae.

Palp (Fig. 6): derm coarsely granulate except distal surfaces of palpal fingers; vestitural setae strongly to weakly arcuate; proportions (Table 2). Chelal chaetotaxy and dentition as illustrated (Fig. 7); movable finger with only *two* tactile setae, fixed finger with typical eight setae; fixed finger with a graded series of 33 teeth, proximally acute and barely cuspid, basally lower, truncate, and acuspid; movable finger with 33 similarly arranged teeth.

Table 2.–Appendicular morphometric ratios of type specimens of *Larca chamberlini*, new species

Appendage[a]	Male		Female
	Holotype	Paratype	
Pedipalp			
Trochanter L/B	2.1	1.9	2.1
Femur L/B	4.7	4.5	4.6
Tibia L/B	3.5	3.5	3.6
Chela (with pedicel) L/B	4.1	3.9	3.9
Chela (with pedicel) L/D	4.5	indeterm.	4.2
Movable finger L/Hand L	1.1	indeterm.	1.02
Hand L/D	2.2	indeterm.	2.0
Leg I			
Basifemur L/D	2.6	2.6	3.0
Telofemur L/D	1.9	1.9	1.9
Tibia L/D	3.0	3.3	3.2
Metatarsus L/D	3.5	3.4	3.1
Telotarsus L/D	4.0	4.1	3.6
Leg IV			
Entire femur L/D	3.8	3.6	3.8
Tibia L/D	4.1	4.2	4.1
Metatarsus L/D	3.5	3.5	3.5
Telotarsus L/D	4.2	4.2	4.2

[a]Abbreviations: B, breadth; D, depth; L, length

Legs of typical facies; proportions (Table 2).

Female.–Measurements in Table 1. Similar to male except as noted. Genital area typical (Fig. 8), lateral cribriform plates 0.05 by 0.02 mm, median plate 0.05 by 0.03 mm; chaetotaxy of allotypic abdominal terga 5:7:9:12:12:10:13?:11:9:8:2:8-2, of allotypic sterna 11:(0)11(0):(0)5(0):7:8:8:9:6:0:5-?. Fixed finger of chela with 34 teeth and movable finger with 30 teeth. Palpal and leg proportions (Table 2).

Nymphal Stages.–Not represented in the collections.

Remarks.–Despite the efforts by Chamberlin, Hoff, Nelson, and others to update Banks' exceedingly brief description of *Garypus granulatus* [=*Larca granulata*], the nature of certain characters which appear to be diagnostic for the species is still unpublished. For example, our study of the series of specimens (JC-485.01001-2) collected from the type locality, Ithaca, New York, which was utilized by Chamberlin (1930) to place this species in the newly erected genus *Larca*, reveals the hitherto unreported fact that the cheliceral hand bears **five** setae. In contrast, this new western species exhibits but **four** such setae. Unfortunately the number of setae is still unavailable in the literature for *L. notha*. The lack of parallel descriptions makes it difficult to compare specimens representing the genus. However, at present, the new species can be distinguished from other North American species of *Larca* by the following couplets:

1a. Movable chelal finger of adult with *three* tactile setae; from Colorado . . . . . *L. notha* Hoff

1b. Movable chelal finger of adult with *two* tactile setae 2

2a(1b). Cheliceral hand with *five* setae; from eastern United States . . . . . *L. granulata* (Banks)

2b. Cheliceral hand with *four* setae; from western United States . . . . . *L. chamberlini*, n. sp.

From the data available, the species appears to be associated with mosquitoes. It has been collected: in CALIFORNIA, phoretically on a mosquito; and in OREGON in storage areas in an old house and an old shed associated with "roosting mosquitoes."

Type Records.—All specimens are mounted in Canada balsam. The holotype is deposited in the American Museum of Natural History; other types remain in the authors' collection.

Oregon. Benton County, 4 miles northeast of Corvallis, 28 October 1942, holotype male (JC-1696.01001) collected by R. Rosenstiel; 5 miles northeast of Corvallis, 6 November 1942, allotype female (JC-1696.01002) collected by R. Rosenstiel.

California. Yuba County, Camp Beale, 23 November 1945, one paratype male (JC-2040.01001) collected by S. E. Crumb.

This new species is named in honor of the late Joseph C. Chamberlin, who pioneered the modern study of pseudoscorpions.

Genus *Archeolarca* Hoff and Clawson

Archeolarca Hoff and Clawson, 1952, pp. 2-3 (original diagnosis; *Archeolarca rotunda* Hoff and Clawson designated as generotype). Hoff, 1956, p. 44 (expanded description).

The nearctic genus *Archeolarca* contains only the type species *Archeolarca rotunda* which Hoff and Clawson described in 1952 from material collected from rodent nests in Utah.

Pseudoscorpions of this genus are characterized (Hoff and Clawson, 1952; Hoff, 1956) by: the widely ovate abdomen; palpi slender with bent and sublanceolate vestitural setae; movable chelal finger of adult with *four* tactile setae, T and ST submedial, and SB and B proximal; fixed chelal finger with eight tactile setae, IST a little proximal to medially positioned EST and IT and only slightly closer to IT than to ISB; laminal seta of chelicera lacking; pars basalis of leg I conspicuously longer than pars tibialis; arolium longer than tarsal claws; flagellum with four blades.

Archeolarca rotunda Hoff and Clawson

Archeolarca rotunda Hoff and Clawson, 1952, pp. 3-8 (original diagnosis). Hoff, 1956, pp. 44-46 (additional description and record).

Direct comparison of our specimen from central Oregon (EB.E-60.01001) with Hoff's holotype and allotype from Utah shows that all three are conspecific. Phase microscopy reveals that the derm of the palps should be described as *strongly* instead of "moderately" granular (Hoff, 1952, p. 4).

Distribution.–The known distribution of *Archeolarca rotunda* as determined from the literature and from the study of specimens by the authors is as follows: NEW MEXICO, Bernalillo County (Hoff, 1956). OREGON (new record), Deschutes County: Unnamed cave, Arnold Lava Cave System, 11 miles south, 10 miles east of Bend, 3 June 1972, one male (E. M. Benedict, collector). UTAH, Utah County (Hoff and Clawson, 1952).

A specimen (JC-1545.01001) collected at Fort Bridger, Wyoming, may be this species but it is in such poor condition that accurate determination is difficult. Further specimens are needed for study to verify that *Archeolarca rotunda* occurs in the state.

FAMILY OLPIIDAE

Chamberlin, 1930, p. 588 (erected family with 12 genera); 1931, pp. 223-226.

Olpiids are considered to have reached their greatest development in the arid tropics and subtropics throughout the world (Chamberlin, 1930). Although species of this family have been reported from North Carolina, Florida, Texas, New Mexico, Utah, Colorado, and California, extensive collections from other parts of the United States have failed to contain olpiid pseudoscorpions. Therefore, it is particularly interesting that recent field searches in the Pacific Northwest have revealed the presence of two olpiid species in certain more xeric habitats: *Olpium frontalis* Banks [=*Pseudogarypinus frontalis* (Banks)] from Oregon and Washington and *Oreolpium nymphum*, a new genus and species from Oregon.

These two species clearly show the characteristics of the family as specified by Chamberlin (1930, 1931): diplotarsate legs; nearly parallel-sided carapace, coxal area and abdomen; venom apparatus in both chelal fingers; smooth evenly-plicate pleural membrane; long slender palpal and tergal setae; and arolium distinctly longer than tarsal claws.

Systematic work with the Olpiidae is frequently difficult and confusing. This family, subdivided into two subfamilies, includes about 20 genera in the Olpiinae, and about 10 genera in the Garypininae. Many of the diagnoses at the generic as well as at the specific level need revision before species can be identified with any degree of confidence and before accurate subfamilial relationships determined. The two species, herein discussed, clearly illustrate the problem.

SUBFAMILY OLPIINAE

Banks, 1895, p. 2, p. 10 (erected subfamily under the Obisiidae). Chamberlin, 1930, p. 588, p. 598 (transferred to Olpiidae and characterized); 1931, p. 225. Hoff, 1945, p. 1 (revised diagnosis).

The new genus *Oreolpium* with one species is the only pseudoscorpion of the Olpiinae currently known from the Pacific Northwest. Chamberlin (1930) characterized the Olpiinae as exhibiting entire arolia, entire tergites and sternites, and flagella with three blades. Although Chamberlin initially restricted the diagnosis of the Olpiinae to include only genera with three flagellar blades, Beier later (1932) assigned genera with four blades, and Hoff (1945) added a genus with two blades. Thus, in this character, the Olpiinae overlap the Garypininae, which have been considered as four-bladed.

The new genus *Oreolpium* may be tentatively assigned to the Olpiinae since it exhibits the characteristic arolia, tergites, and sternites which are entire.

Oreolpium, new genus

Diagnosis.–With the characteristics of the family Olpiidae and the subfamily Olpiinae; chelicera with galea terminally trifid; subapical lobe of movable cheliceral finger weakly bilobate; serrula interior weakly developed; flagellum four-bladed; palpal femur with a single dorsal sensory seta near the middle; marginal teeth of both chelal fingers well-developed; venom ducts short with nodus ramosus of the fixed finger distal to seta ET; tactile setae T, ST, SB, and B nearly equally spaced and all proximal to the midpoint of the movable chelal finger; ET on the distal one-third of the fixed finger, the other seven setae on the proximal half; IB on the dorsal surface of the hand just proximal to the finger base; ISB and IST paired and about one-third closer to IT than to IB; EB and ESB closely paired and closer to IB than to ISB and IST; scuta of abdomen entire; femur pars tibialis and pars basalis of leg I subequal in length; femur of leg IV at least two and one-half times longer than deep; arolia entire.

Generotype.–*Oreolpium nymphum*, new genus and new species.

Remarks.–The numerous inadequate descriptions of many species now assigned to the Olpiinae make it difficult to assess the relationships of the genus *Oreolpium* to related genera. The new genus is characterized by the subequal lengths of the basifemur (=pars basalis) and telofemur (=pars tibialis) of leg I; by the very short length of the poison ducts and the extremely distal position in each chelal finger of the nodus ramosus. These characters according to Hoff (1945, 1964) are typical of the tribe Xenolpiini. However, since the poison apparatus is so difficult to see in extremely diminutive or poorly cleared specimens and since the location of this structure is unreported in the literature for so many of the species, it seems desirable to withhold definitive tribal assignment of this new genus until a thorough study is made to determine if the above combination of characters actually reflects tribal relationships.

Our study of the few available illustrations in the literature and examination of type specimens of representative species of several genera shows that the new genus *Oreolpium* can be readily distinguished from similar genera by the unique chaetotaxy of the chelal movable finger. Setae T, ST, SB, and B are equally spaced and all are **proximal** to the median point of the finger. In *Austrohorus* Beier, *Pseudohorus* Beier, *Minniza* Simon, *Novohorus* Hoff, and *Horus* Chamberlin, seta T is located between the distal half and distal one-third of the finger. Geographically, the nearest relatives of the new genus are species of *Novorhorus* from the West Indies and Florida. In *Novohorus* seta IT of the fixed finger of the chela is distal to EST and in *Oreolpium* IT is proximal.

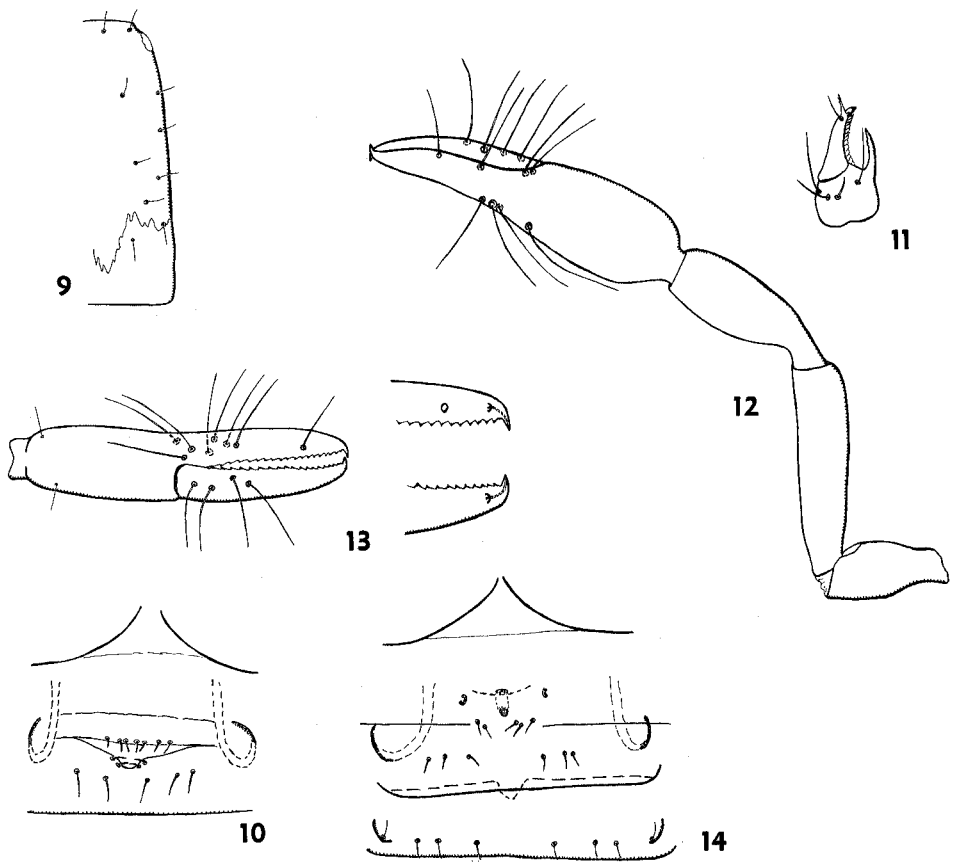
Oreolpium nymphum, new species
(Figs. 9 to 14)

Description.–Relatively small (male 1.87-2.00 mm body length, female 2.19-2.33 mm), two-eyed epigean species; derm mostly smooth with slender delicate setae. Measurements in Table 3.

Male.–*Carapace* (Fig. 9): at least twice as long as ocular breadth; derm smooth and only partially sclerotized, membranous posteriorly and laterally; epistomal process lacking; two weakly corneate eyes located about one ocular diameter from anterior carapacal margin; chaetotaxy somewhat irregular in number and arrangement but generally 4-4(20). Coxal area typical but with somewhat irregularly arranged setae, chaetotaxy typically 3-5 or 6-3:0-4-2:4-2:2-2:1-2 or 3.

Abdomen: long and slender; scuta entire; derm of anterior sternites faintly reticulate; anterior and posterior marginal areas of tergites and sternites lacking pigment and weakly sclerotic; pleural membrane smoothly plicate; genital area (Fig. 10); chaetotaxy of terga 6:4 to 6:4 to 6:5 to 6:6:6:6:6:6:10:10:2, of sterna 7 to 8:(0-0):(0) 2-2-5 to 6(0):(2)5 or 6(2):6:6:6:6:6:10:6:2.

Chelicera (Fig. 11): derm smooth except for weakly developed reticulations at base of fixed finger; galea relatively long and terminally trifid; lamina exterior lacking; serrula exterior with 14 blades; serrula interior a weakly developed membranous velum; flagellum of four blades; apical teeth of fingers no more strongly sclerotic nor deeply pigmented than rest of fingers, apical tooth of fixed finger with three denticles along inner margin



Figs. 9 - 14.–*Oreolpium nymphum* n. sp., drawn from the holotype male (EB-1503.01002) except as indicated: 9, carapace showing posterior margin of sclerotization; 10, genital operculum of male; 11, chelicera; 12, dorsal aspect of palp of male; 13, external aspect of chela of male showing details of chelal teeth and nodus ramosus (terminal tooth of fixed finger reconstructed); 14, genital operculum of allotype female (EB-1503.01001).

Table 3.—Measurements (in millimeters) of type specimens of *Oreolpium nymphum*, new species

Morphological Part[a]	Males	Females	Tritonymph	Protonymphs
Body L	1.87-2.00	2.19-2.33	1.92±	1.32±-1.42±
Abdominal B	0.38-0.46±	0.44-0.51	0.33±	0.26
Carapace				
L	0.48-0.51	0.65-0.69	0.45	0.36
Ocular B	0.22-0.23	0.21-0.27	indeterm.	0.22±-0.27±
Posterior B	0.28-0.32	0.32-0.39	0.27±	0.27±-0.30±
Eye diameter	0.02-0.03	0.03-0.04	0.025	indeterm.
Chelicera L/B	0.12/0.07	0.12-0.14/0.07	indeterm.	0.08/0.06
Pedipalp				
Trochanter L/B	0.20-0.21/0.09.0.10	0.22-0.23/0.09-0.10	indeterm.	0.11-0.12/0.07
Femur L/B	0.33-0.35/0.08-0.09	0.33-0.39/0.10-0.11	0.26/0.09	0.17/0.06-0.07
Tibia L/B	0.30-0.31/0.10-0.11	0.32-0.35/0.11-0.12	0.24/0.10	0.15-0.16/0.07
Chela (with pedicel) L	0.56-0.59	0.62-0.63	0.48	0.33
Chela B	0.13-0.15±	0.15±	0.12	0.08-0.09
Chela D	0.11	0.13-0.14	0.11	0.08-0.09
Hand L	0.25-0.26	0.29	0.23	0.16
Movable finger L	0.30	0.30	0.23	0.17
Leg I				
Basifemur L/D	0.10/0.07	0.11±/0.07-0.08	indeterm.	0.06/0.04
Telofemur L/D	0.11-0.13/0.06-0.07	0.11-0.12/0.07-0.08	indeterm.	0.06/0.04
Tibia L/D	0.14-0.16/0.04-0.05	0.15-0.16/0.05	indeterm.	0.08/0.04
Metatarsus L/D	0.06-0.04	0.06-0.07/0.03-0.04	indeterm.	0.04/0.03
Telotarsus L/D	0.08-0.09/0.02-0.03	0.06-0.08/0.03-0.04	indeterm.	0.04/0.03
Leg IV				
Entire femur L/D	0.36-0.38/0.09-0.10	0.34-0.35/0.10-0.11	0.18/0.08	0.17/0.06
Tibia L/D	0.22-0.23/0.06-0.07	0.22-0.24/0.07-0.08	0.15/0.06	0.11/0.05
Metatarsus L/D	0.08/0.04	0.08-0.09/0.04-0.05	0.05/0.04	0.06/0.04
Telotarsus L/D	0.09-0.10/0.04	0.10-0.11/0.04	0.05/0.03	0.05/0.03

[a]Abbreviations: B, breadth; D, depth; L, length

Table 4.–Appendicular morphometric ratios of type specimens of *Oreolpium nymphum*, new species

Appendage[a]	Males	Females	Tritonymph	Protonymph
Pedipalp				
Trochanter L/B	2.1-2.3	2.3	indeterm.	1.6-1.7
Femur L/B	3.6-4.0	3.4-3.9	2.9	2.5-2.6
Tibia L/B	2.6-2.7	2.6-3.0	2.4	2.0-2.3
Chela (with pedicel) L/B	4.4	4.0-4.1	4.1	3.8-4.0
Chela (with pedicel) L/D	5.2	4.5-4.8	4.5	3.8-4.0
Movable finger L/Hand L	1.2	1.1	1.0	1.03-1.09
Hand L/D	1.6	2.1	2.1	1.8-1.9
Leg I				
Basifemur L/D	1.4	1.3-1.6	indeterm.	1.3
Telofemur	1.6-1.7	1.4-1.7	indeterm.	1.3
Tibia L/D	2.8-2.9	2.8-3.0	indeterm.	2.0
Metatarsus L/D	1.6	1.6-1.9	indeterm.	1.3
Telotarsus L/D	2.2-2.6	2.0-2.3	indeterm.	1.5
Leg IV				
Entire femur L/D	3.4-3.5	3.2-3.4	2.6	2.9
Tibia L/D	3.4-3.5	2.9-3.4	2.5	1.8
Metatarsus L/D	1.8	1.7-2.0	1.1	1.5
Telotarsus L/D	2.3-2.5	2.5-2.9	1.6	1.4

[a]Abbreviations: B, breadth; D, depth, L. length

succeeded by three retrorse teeth basally; apical tooth of movable finger weakly bifid, subapical lobe small and bilobate; hand with five setae.

Palp (Fig. 12): vestitural setae slender and delicate; proportions (Table 4). Chela chaetotaxy and dentition as illustrated (Fig. 13); fixed finger with 18 spaced, retrorse teeth, becoming lower basally, movable finger with 18 similarly arranged but slightly less developed teeth basally.

Legs: short and stout; proportions (Table 4); basifemur and telofemur of leg I of equal length; leg IV with long tactile seta on tibia and metatarsus.

Female.–Similar to male except as noted. Genital area typical (Fig. 14), lateral cribriform plates of allotype 0.012 by 0.007 mm, anterior median plate 0.015 wide, posterior median plate 0.009 by 0.009 mm; chaetotaxy of allotypic abdominal terga 5:5:4:5:6:6:6:6:6:8:8:mm, of allotypic sterna 5:(0)6(0):(1)6(1):6:6:6:6:6:8:10:mm. Fixed finger of chela with 17 to 20 teeth and movable with 16 to 19 teeth. Palpal and leg proportions (Table 4).

Tritonymph.–(Based on EB-1558.02002). Similar to adult except as noted. Paler and smaller; carapacial chaetotaxy 4-2(18); abdominal chaetotaxy typical but indeterminable. Chelicera closely resembles adult with teeth of both fingers and chaetotaxy typical. Chelal movable finger with three tactile setae, fixed finger with seven setae; fingers each with 14 teeth. Palpal and leg proportions (Table 4).

Deutonymph.–Not represented in the collections.

Protonymph.–(Based on EB-1558.02001 and EB-1634.01001). Similar to adult except as noted. Much smaller; derm is less well-sclerotized, paler. Carapacial chaetotaxy

4-2(14); eyes much less developed, barely corneate. Chaetotaxy of terga 2:2:2:2:2:4:4:4:4:?:2:2, of sterna 0:(0)0(0):(1)0(1):4:4:4:4:5 or 6:?:4:2. Coxal chaetotaxy 3-1-1:1-0-0:0-0-1:0-0-1:0-0-1. Chelicera less developed, derm smooth, serrula exterior with about 10 blades; hand with four setae. Chelal movable finger with one tactile seta, fixed finger with three tactile setae, fingers each with 11 teeth. Palpal and leg proportions (Table 4).

Remarks.—The new species is based upon unusual adults of a slender nymph-like form which were extracted from Berlese samples of old mature bark taken from western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), and sugar pine (*Pinus lambertiana*) trees located in forests at elevations of 1,000 to 6,000 feet in western Oregon. Due to their tiny size and delicate structure, these specimens, which are lightly pigmented and weakly sclerotized, appear immature. However, under adequate magnification typical genitalia have been discerned. The **biparte** nature of the subapical lobe of the movable cheliceral finger is difficult to see except under the very best conditions due to their exceedingly small size. The new species can be discriminated, even under low magnification, from other Oregon species of a similar size and shape by the very distinctive pattern of sclerotization of the posterior half of the carapace (Fig. 9).

Type Record.—*Oregon*. Lane County, 4 miles north, 13 miles east of Lowell, 30 August 1973, male holotype (EB-1503.01002), female allotype (EB-1503.01001), one male (EB-1503.01003), and three female paratypes (EB-1503.01004, EB-1503.01005, EB-1506.01001). Additional paratypes as follows: Douglas County, 8 miles south, 4 miles east of Tiller, 13 September 1973, one female (EB-1558.02003), one tritonymph (EB-1558.02002) and one protonymph (EB-1558.02001); 14 September 1973, one male (EB-1566.01001). Jackson County, 6 miles south, 12 miles west of Ashland, 17 September 1972, one female (EB-864.01001); 8 miles south, 13 miles east of Ashland, 15 October 1972, one male (EB-951.01001) and one female (EB-951.01002). Linn County, 12 miles north, 28 miles east of Sweet Home, 17 September 1973, one male (EB-1621.02002) and one female (EB-1621.02001). Marion County, 5 miles due north of Mill City, 17 September 1973, one female (EB-1634.01002) and one protonymph (EB-1634.01001). All specimens collected by E. M. Benedict and mounted in modified Hoyer's Berlese medium. Holotype and allotype deposited in American Museum of Natural History; paratypes are retained in the authors' collection.

SUBFAMILY GARYPININAE

Daday, 1887, p. 123, p. 179 (erected subfamily). Chamberlin, 1930, p. 588, p. 590 (transferred to Olpiidae and characterized); 1931, p. 225.

Pseudogarypinus frontalis (Banks), the only currently known species of the Garypininae from the Pacific Northwest, exhibits most of the characters of the subfamily as specified by Chamberlin (1930): bifurcate arolia, some divided tergites and sternites, and flagella each of four blades. As discussed under the Olpiinae, the number of blades on the flagellum may not be a good criterion for distinguishing the two subfamilies. Not only are there genera with four-bladed flagella assigned to each subfamily but there appears to

be variation within a single specimen (one specimen of *Pseudogarypinus frontalis* has four blades in one flagellum and six in the other). In addition, even when blade number is constant, it is frequently difficult to determine it accurately on poorly oriented specimens.

Genus *Pseudogarypinus* Beier

Pseudogarypinus Beier, 1931, p. 313 (original diagnosis; *Pseudogarypinus costaricensis* Beier designated as generotype); 1932, p. 206 (key to species). Hoff, 1956, p. 33 (expanded generic description).

The North American genus *Pseudogarypinus* was established by Beier in 1931 for his species *Pseudogarypinus costaricensis* from Costa Rica and for *Garypinus marianae* Chamberlin 1930 from central California and Utah. Hoff (1956) suggested that *Olpium frontalis*, which had been described by Banks in 1909 from New Mexico, also should be assigned to this genus (see following discussion of *P. frontalis*). In 1961, *P. giganteus*, a species from Colorado, was described by Hoff.

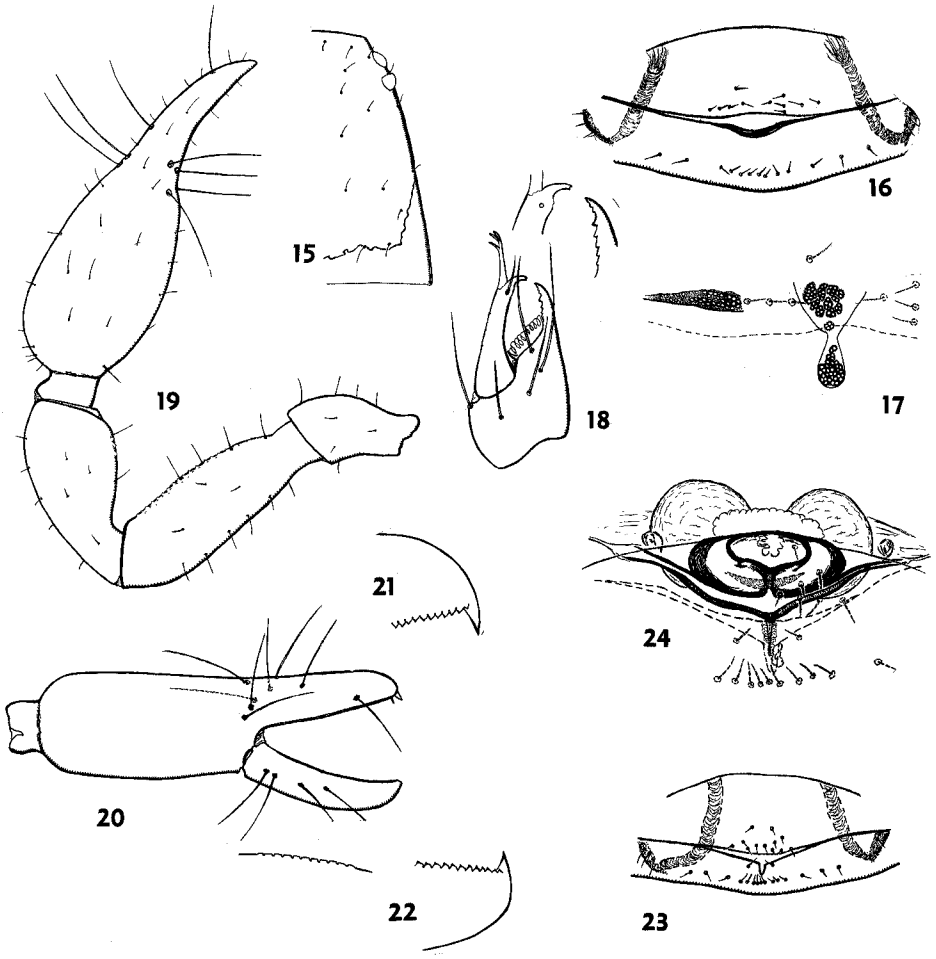
Pseudoscorpions of this genus exhibit the following characters (Hoff, 1956): femoral articulations of legs I and II partially mobile with pars tibialis of leg I distinctly shorter than pars basalis; fixed finger of chelicera with a lamina exterior; and tactile seta ISB of the fixed finger of the chela much closer to IB than to IST; teeth of the chelal fingers equally developed on both fingers.

Pseudogarypinus frontalis (Banks)
(Figs. 15 to 18)

Olpium frontalis Banks, 1909, p. 307 (original diagnosis). Hoff, 1961, p. 439, p. 442 (compared with *Pseudogarypinus marianae* (Chamberlin)).
Serianus frontalis (Banks), Beier, 1932, p. 213 ("Unsichere Art").
Pseudogarypinus frontalis (Banks), Hoff, 1956, pp. 33-34 (new combination and suggested synonymy with *Pseudogarypinus marianae* (Chamberlin)).
Pseudogarypinus ? frontalis (Banks), Hoff, 1958, p. 16; 1959, p. 4, p. 27.
Garypinus marianae Chamberlin, 1930, pp. 591-592 (original diagnosis).
Pseudogarypinus marianae (Chamberlin), Beier, 1931, p. 315 (new combination); 1932, pp. 206-207 (key). Hoff, 1958, p. 16 (suggested synonymy with *Olpium frontalis* Banks); 1961, pp. 439-440 (supplementary description based on records from Colorado).

The systematic affinities of the pseudoscorpion species *Olpium frontalis*, originally described by Banks from specimens collected at Las Vegas, New Mexico, have long been in question. Beier (1932) assigned the species to the genus *Serianus* under the category of "Unsichere Art." Hoff (1956) listed the species as "*Pseudogarypinus frontalis* Banks, new combination," but in the following discussion he appeared to qualify this conclusion by stating that "there is a *possibility* [emphasis added] that *Olpium frontalis* Banks, 1909, may belong to this genus" (p. 34). Hoff continued this equivocation in subsequent papers (1958, 1959) by listing the species with a question mark–"*Pseudogarypinus ? frontalis* (Banks).

Not only has the generic assignment of *Olpium frontalis* been somewhat in doubt, but its relationship to Chamberlin's species *Pseudogarypinus marianae* from California has also been puzzling. Hoff in 1956 noted from the original description of *O. frontalis* and *P. marianae* close agreement in their body size, shape of carapace, division of tergites, shape and sculpturing of the palpal femur, and relative lengths of the palpal hand and fingers. The only discrepancy seemed to be in the shape of the galea. Banks had described the galea of *O. frontalis* as "rather long, simple and with an out-turned tip" (1909, p. 307), whereas Chamberlin had described the same structure for *P. marianae* as "slender and with three terminal recurved branches" (1930, p. 592). Despite their very similar descriptions, Hoff (1956) declined to synonymize the two species until the exact relationships



Figs. 15 - 24.–*Pseudogarypinus frontalis* (Banks): 15, carapace showing posterior margin of sclerotization (JC-391.02002); 16, genital operculum of female (JC-391.02002); 17, internal structures of female genitalia, with external setae superimposed (JC-391.02002); 18, chelicera (JC-391.02003) with detail of cheliceral fingers; 19, dorsal aspect of palp of female (Banks' lectotype); 20, external aspect of chela of female (Banks' lectotype female)–all teeth missing; 21, details of distal teeth of chelal fixed finger (JC-391.02002); 22, details of distal teeth and most proximal teeth of movable finger (EB-864.02001); 23, genital operculum of male (JC-391.01001); 24, internal structures of male genitalia, with external setae superimposed (JC-391.01001).

between *frontalis* and *marianae* could be established by the restudy of the types of both species. Hoff in 1958 again suggested that the two were conspecific. Nevertheless, in 1961 he retained the name *P. marianae* for collections from Colorado even though he again discussed its possible synonymy with *O. frontalis*.

In order to correctly assign a name to several series of specimens from diverse localities which are clearly identifiable as *P. marianae*, when compared with Chamberlin's diagnosis and with the *P. marianae* type series, we have examined in detail the only available syntypes of *O. frontalis* (a female and a tritonymph). Although the female (mounted by Schuster) is in very poor condition, it, as well as the tritonymph, exhibits the typical structures of *Pseudogarypinus*. Thus, as surmised earlier by Hoff, the species *O. frontalis* is assignable to the genus.

Direct comparison of these syntypes with the type series of *P. marianae* shows that they are similar in all visible features, including the nature of the galea, which is trifid. Therefore, we conclude that *Pseudogarypinus frontalis* (Banks) and *Pseudogarypinus marianae* (Chamberlin) are synonymous.

Revised Description.–Moderate-sized (male 3.15± - 3.89 mm body length, female 3.30 - 4.60 mm), four-eyed epigean species. Measurements in Table 5.

Female.–*Carapace* (Fig. 15): slightly longer than broad; derm weakly reticulate and only partially sclerotized, membranous posteriorly and laterally; epistomal process lacking; four moderately corneate eyes, anterior pair slightly more developed than posterior pair and located slightly less than one ocular diameter from anterior margin, interocular distance one-third to one-half ocular diameter; chaetotaxy generally 6-4(30). Coxal area typical, chaetotaxy 3-5-3 or 4:0-3 or 4-3:4-4:3-3:3-7.

Abdomen: relatively long and slender; tergite I entire, tergites II to V only faintly divided, tergites VI to X clearly divided, sternites II to X divided; derm weakly reticulate; anterior and posterior marginal areas of tergites and sternites lacking pigment and weakly sclerotized, pleural membrane smoothly plicate; genital area as illustrated (Figs. 16-17); lateral cribriform plate of lectotype 0.101 by 0.031 mm, posterior medial plate 0.020 by 0.019 mm, anterior medial plate 0.031 by 0.025 mm; range of variation of chaetotaxy given in Table 6, chaetotaxy of lectotypic terga 8:6:6:6:8:8:9:9:6:9:6:mm, of sterna 12 or 13:(3)12(3):(4)9(4):8:9:9:9:6:9:8:mm.

Chelicera (Fig. 18): galea relatively long and terminally trifid; lamina exterior a narrow marginal band; serrula exterior with about 20 blades; serrula interior membranous but distally divided into distinct blades; flagellum of four (rarely six) blades; hand with five setae; apical tooth of each finger sclerotized and pigmented to the same degree as rest of finger; apical tooth of fixed finger with three denticles along inner margin, succeeded by five retrorse marginal teeth diminishing in size basally; apical tooth of movable finger weakly bifid terminally, subapical lobe subdivided into three shallow denticles.

Palp (Fig. 19): derm mostly smooth except for weak to moderate granulations on the femur; vestitural setae of variable lengths, but mostly long and slender with several shorter setae on chelal fingers. Palpal proportions in Table 7. Chelal chaetotaxy and dentition as illustrated (Figs. 20-22); fixed finger with 41 to 50 teeth, distally acute and barely cuspid, basally becoming lower, truncate, and acuspid; movable finger with 33 to 49 similar but slightly more developed teeth.

Legs: relatively stout; proportions in Table 7; telofemur of leg I distinctly longer than basifemur; leg IV with a long tactile seta on metatarsus, and a somewhat shorter seta on tibia.

Table 5.—Measurements (in millimeters) of *Pseudogarypinus frontalis* (Banks)

Morphological Part[a]	Males	Females	Tritonymph	Deutonymph
Body L	3.15±-3.89	3.30-4.60	3.18±	2.56
Abdominal L	1.08±-1.33±	1.18-1.38	0.99±	0.70±
Carapace L	0.86-0.99	0.90-1.05	0.70	0.63
Ocular B	0.47±-0.58	0.50-0.68	0.42±	0.34±
Posterior B	0.70-0.79±	0.72-0.85	0.69±	0.39±
Ant. eye diam.	0.062-0.078	0.067-0.077	0.055	0.043
Post. eye diam.	0.054-0.074	0.056-0.068	0.030	0.037
Chelicera L/B	0.28-0.33/0.16-0.19	0.28-0.33/0.17-0.21	0.22/0.19	0.18/0.15
Pedipalp				
Trochanter L/B	0.38-0.47/0.22-0.27	0.41-0.48/0.23-0.29	0.32/0.16	0.27/0.16
Femur L/B	0.74-0.90/0.23-0.29	0.75-0.97/0.24-0.31	0.57/0.19	0.42/0.16
Tibia L/B	0.61-0.75/0.28-0.33	0.60-0.82/0.30-0.37	0.47/0.28	0.38/0.19
Chela (with pedicel) L	1.26-1.52	1.31-1.67	1.02	0.82
Chela B	0.36-0.44	0.39-0.50	0.31	indeterm.
Chela D	0.33-0.39	0.35-0.47	0.27	0.23
Hand L	0.64-0.80	0.70-0.89	0.50	0.39
Movable finger L	0.57-0.66	0.55-0.72	0.47±	0.37
Leg I				
Basifemur L/D	0.31-0.37/0.14-0.19	0.33-0.40/0.15-0.19	0.26/0.12	0.18/0.10
Telofemur L/D	0.22-0.28/0.14-0.17	0.23-0.30/0.16-0.19	0.12/0.13	0.08/0.10
Tibia L/D	0.32-0.39/0.09-0.12	0.33-0.41/0.11-0.13	0.16/0.09	0.20/0.07
Metatarsus L/D	0.13-0.16/0.07-0.08	0.14-0.17/0.07-0.08	0.10/0.07	0.08/0.06
Telotarsus L/D	0.17-0.23/0.06-0.08	0.17-0.21/0.07-0.09	0.15/0.06	0.13/0.05
Leg IV				
Entire femur L/D	0.73-0.88/0.25-0.32	0.78-0.96/0.24-0.33	0.60/0.20	0.49/0.19
Tibia L/D	0.51-.060/0.15-0.20	0.53-0.66/0.16-0.20	0.41/0.13	0.32/0.12
Metatarsus L/D	0.17-0.22/0.09-0.11	0.18-0.23/0.09-0.11	0.14/0.08	0.12/0.07
Telotarsus L/D	0.22-0.28/0.07-0.10	0.23-0.29/0.08-0.10	0.19/0.07	0.15/0.06

[a]Abbreviations: B, breadth; D, depth; L, length

Table 6.—Range of variation of abdominal chaetotaxy of *Pseudogarypinus frontalis* (Banks)

	TERGITES				STERNITES			
Segment	Male	Female	Trito-nymph	Deuto-nymph	Male	Female	Trito-nymph	Deuto-nymph
I	7 to 8	6 to 8	5	4	14 to 21	9 to 12	2	0
II	6 to 10	6 to 10	4	4	(0-0)			
III	7 to 8	6 to 8	6	4	(3 or 4)1 to 3-2 to 3(3 or 4) 13 to 16	(3)11 to 13(3)	(2)8(2)	(1)4(1)
IV	8	6 to 8	7	6			(3)8(3)	(2)6(2)
V	8 to 10	8	7	6	(3 or 4)7 to 11(3 or 4)	(4)7 to 10(4)	7	6
VI	7 to 10	8	6	6	9 to 11	8 to 9	8	6
VII	8 to 10	8 to 9	6	6	9 to 10	9 to 10	8	6
VIII	7 to 10	7 to 9	6	6	9 to 10	9 to 12	7	6
IX	6 to 9	6 to 8	6	6	9 to 10	6 to 8	6	6
X	8 to 12	9 to 12	8	6	7 to 10	9 to 12	8	6
XI	8 to 10	8	8(?)	4	8 to 10	12	8	4
XII	mm	mm	mm	mm	mm	mm	mm	mm

Table 7.–Appendicular morphometric ratios of *Pseudogarypinus frontalis* (Banks)

Appendage[a]	Males	Females	Tritonymph	Deutonymph
Pedipalp				
Trochanter L/B	1.7-2.0	1.7-1.9	2.0	1.6
Femur	2.9-3.4	2.8-3.2	3.0	2.7
Tibia L/B	2.1-2.6	1.9-2.3	1.7	2.0
Chela (with pedicel) L/B	3.1-3.4	3.1-3.4	3.4	indeterm.
Chela (with pedicel) L/D	3.4-3.9	3.3-3.9	3.8	3.6
Movable finger L/Hand L	1.1-1.3	1.0-1.3	indeterm.	1.1
Hand L/D	1.8-2.0	1.7-2.0	1.9	1.7
Leg I				
Basifemur L/D	1.9-2.2	2.0-2.2	2.1	1.8
Telofemur L/D	1.4-1.7	1.4-1.7	1.8	1.8
Tibia L/D	3.0-3.6	3.0-3.4	2.8	2.7
Metatarsus L/D	1.6-2.1	1.8-1.9	1.4	1.4
Telotarsus L/D	2.5-3.1	2.4-2.8	2.3	2.4
Leg IV				
Entire femur L/D	2.5-3.0	2.7-3.3	2.9	2.6
Tibia L/D	2.9-3.5	3.1-3.6	3.2	2.7
Metatarsus L/D	1.7-2.3	1.8-2.2	1.7	1.7
Telotarsus L/D	2.6-3.2	2.5-3.1	2.6	2.5

[a]Abbreviations: B, breadth; D, depth; L, length

Male.–Similar to female except as noted. Slightly smaller in general; range of abdominal chaetotaxy (Table 6); genital area as illustrated (Figs. 23-24). Palp slightly more slender; fixed finger of chela with 40 to 50 teeth and movable finger with 37 to 48 teeth; proportions in Table 7. Legs of typical structure (Chamberlin, 1930, Fig. 1T, 1AA); proportions in Table 7.

Tritonymph.–(Based on Banks' lectotype mounted by W. B. Muchmore). Similar to adult except as noted. Paler and smaller; carapacial chaetotaxy 4-4(26±); chaetotaxy of abdominal sterna and terga (Table 6). Chelicera closely resembles adult; tooth number of fixed finger indeterminable due to missing finger tip, but similar in form to adult. Chelal movable finger with three tactile setae, fixed finger with seven setae; fixed and movable fingers each with approximately 34 teeth. Palpal and leg proportions in Table 7.

Deutonymph.–(Based on JC-373.01001). Similar to adult except as noted. Much smaller; derm less well-sclerotized, paler. Carapacial chaetotaxy 4-4(22); eyes less well-developed, only slightly corneate. Chaetotaxy of abdominal sterna and terga (Table 6). Coxal chaetotaxy 3-3 or 4-2 or 3:2 or 3-2 or 3:2-2:2-1:2-1. Chelicera closely resembles adult unlike certain species in which the deutonymph exhibits immature chaetotaxy (Benedict & Malcolm, 1973). Chelal movable finger with two tactile setae; fixed finger with six setae; fixed finger with 30 teeth, movable finger with 25 teeth. Palpal and leg proportions in Table 7.

Protonymph.–Not represented in the collections.

Remarks.–This species shows a high degree of irregularity in the number of setae on the carapace, tergites, and sternites with the number frequently differing between the two

halves of the same sclerite. Only two species, *Pseudogarypinus frontalis* (Banks) and *P. giganteus* Hoff, are now assigned to this genus from the United States. While these two species still appear to be distinct, several differences which formerly were thought to exist have been invalidated by this study. Examination of syntypes and other specimens shows that, contrary to Hoff (1961), *P. giganteus* cannot be separated from *P. frontalis* by the nature of the galea, separation of the eyes, nor the distribution of granules on the palpal femur, since these characteristics are shared in common by both species. As a result, the only remaining distinguishing criteria are size and proportions. Since only one specimen of *P. giganteus* is known in the literature, it is impossible to predict the degree of intraspecific variation and thus the possible overlap of measurements and proportions with *P. frontalis*. At the present time, however, the following couplet will serve to separate the adults of the two species:

1a. Chelal length (without pedicel) of male 1.17-1.43 mm, of female 1.22-1.57 mm; palpal femur length of male 0.74-0.90 mm, of female 0.75-0.97 mm . . . . . *P. frontalis* (Banks)

1b. Chelal length (without pedicel) of female 1.74 mm; palpal femur length of female 1.09-1.13 mm . . . . . *P. giganteus* Hoff

Distribution.–The known distribution of *Pseudogarypinus frontalis* (including the synonymized species *P. marianae*) as determined from the literature and from the study of specimens by the authors is as follows: CALIFORNIA. Marin, Mariposa, San Mateo, and Santa Cruz Counties (Chamberlin, 1930). New records: Orange County: Laguna Beach, 28 December 1932, one female and one deutonymph (W. Ivie, collector). COLORADO. Larimer and Montezuma Counties (Hoff, 1961). NEW MEXICO. San Miguel County (Banks, 1909). OREGON. New records: Jackson County: 3 miles north of Copper, 13 November 1971, one female; 6 miles south, 12 miles west of Ashland, 17 September 1972, two females. Josephine County: 3 miles east of Selma, 10 August 1973, one female; 5 miles north of Galice, 14 September 1973, one male (all collected by E. M. Benedict). UTAH. Tooele and Washington Counties (Chamberlin, 1930). New records: Salt Lake County, 26 July 1932, one male (W. Ivie, collector); Mill Creek Canyon, 11-14 August 1941, six males and two females (J. C. Chamberlin, collector); Hughes Canyon, 20 May 1934, one deutonymph (W. Ivie, collector). WASHINGTON. New record: Klickitat County: 4 miles east of Mary Hill, 30 May 1941, three males and five females (J. C. Chamberlin, collector).

The disjunct distribution as presently known for *P. frontalis* probably reflects the lack of samples taken from suitable habitats rather than the actual nature of the species. Habitat data appear to indicate that the species is associated with bark or litter from relatively dry areas. It has been collected: in Utah, beneath stones in dry oak litter, in bark of dead cottonwood, and in maple and birch stumps; in Colorado, beneath stones and in litter of pinyon and yellow pines and juniper, and in litter of fir and aspen; in California, in dry litter, and in bark of madrone and sequoia; in Oregon, in litter of canyon live and California black oaks, and in Douglas fir bark; and in Washington, under bark of maple log.

Type Record.–New Mexico. San Miguel County, Las Vegas. Elevation approximately 6400 feet above sea level. Unknown number of syntypes, collected prior to 1909 by Cockerall, of which two are deposited in the Museum of Comparative Zoology: one

female [syntype of *Olpium frontalis* (Banks 1909, p. 307) = *Pseudogarypinus frontalis* (Hoff 1956, p. 33), hereby designated as lectotype] and one tritonymph. Unfortunately, these types are in very poor condition. The chelal teeth of both specimens are nearly obliterated, making it impossible to ascertain their true nature. Further, the distal portions of the terminal teeth of every chelal and cheliceral finger of the female also have been destroyed.

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