Some Pseudotyrannochthoniine False Scorpions From Western North America (Chelonethida: Chthoniidae)

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Abstract: A new species, *Pseudotyrannochthonius* gracilis, is described from the Pacific Northwest. *Pseudotyrannochthonius newelli* is synonymized with *P. incognitus* and the geographical range of the species is extended. Ecological data for both species are included.

Several new species of false scorpions, presently assigned to the genus *Pseudo-tyrannochthonius* Beier, have been described from diverse localities in the western United States in recent papers by Schuster (1966) and Muchmore (1967). Examination of the Pacific Northwest representatives of the genus in the authors' collection revealed some specimens in many ways resembling *Pseudotyrannoch-thonius incognitus* (Schuster), some specimens clearly identifiable as *Pseudo-tyrannochthonius newelli* Muchmore, a series intergrading between these two described species, and another series differing significantly from any of these groups. In an attempt to clarify the relationships, additional collections for further study were made from the western regions of Washington, Oregon, and northern California. The holotype and paratypes of *P. incognitus* (Schuster), two paratype males of *P. newelli* Muchmore, and the holotype and allotype of *P. utahensis* Muchmore were subsequently re-examined in detail.

Restudy of the holotype of *Pseudotyrannochthonius incognitus* shows that the total length, exclusive of the chelicerae, although difficult to ascertain precisely, is between 1.5 and 1.6 mm. Examination of the cheliceral fixed finger at relatively high magnification reveals that the dentition consists of a large medially-located tooth or macrodenticle preceded proximally by three, relatively distinct, tiny, marginal microdenticles which are continuous with a field of minute, acuminate tubercles or granulations at the base of the finger. The movable finger of the chela is not without teeth, as originally described, but provided with six to eight distinct, but very lightly sclerotized, low, blunt marginal teeth whose apices are basally inclined.

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Examination of the paratypic specimens of *Pseudotyrannochthonius newelli*, originally described to include two setae on the sternite of segment XI, confirms Muchmore's correction (*in litt*.) that these two setae are absent.

Based upon the above study and examination of extensive material recently collected, the authors conclude that *Pseudotyrannochthonius incognitus* and *Pseudotyrannochthonius newelli*, fall within a common range of continuous variation in morphological characteristics and are, therefore, synonymous.

The present paper includes an emended diagnosis of *P. incognitus*, a description of a new species, *P. gracilis*, brief discussions of the ecology of the two species, and a key to the western species of the genus.

SUBORDER HETEROSPHYRONIDA CHAMBERLIN FAMILY CHTHONIIDAE HANSEN SUBFAMILY CHTHONIINAE HANSEN TRIBE PSEUDOTYRANNOCHTHONIINI BEIER GENUS *PSEUDOTYRANNOCHTHONIUS* BEIER

KEY TO ADULT FORMS OF NORTH AMERICAN SPECIES OF *PSEUDOTYRANNOCHTHONIUS*

> Pseudotyrannochthonius incognitus (Schuster) (Figs. 1 and 2)

chelal length of male 0.79–0.94 mm., of female 0.89–1.11 mm.; femur length of male 0.49–0.66 mm., of female 0.59–0.76 mm. *incognitus* (Schuster)

Allochthonius incognitus Schuster, 1966, Pan-Pacific Ent., **42**: 172–175 (original description), p. 173, fig. 1–5 (chela, carapace, male genital area, coxal spines of pedal coxa I, intercoxal tubercle).

Pseudotyrannochthonius incognitus (Schuster), Muchmore, 1967, Trans. Amer. Microsc. Soc., 86: no. 2, p. 134 (new combination).

Pseudotyrannochthonius newelli Muchmore, 1967, Trans. Amer. Microsc. Soc., **86:** no. 2, pp. 134–136 (original description), p. 133, fig. 1–5 (coxal spines, male palp and chela, female palp and chela).

³ Corrected by Muchmore (personal communication).



FIG. 1. Pseudotyrannochthonius incognitus (Schuster). Drawn from holotype male (UCD Type #225) except as indicated. Comparable structures drawn to the same scale as those in Fig. 3. A. Tip of cheliceral fingers, showing dentition grading into basal granular field. B. Carapace and left chelicera. C. Epistomal area. D. Single lateral coxal spine blade from right coxa I. E, F, G. Coxal spine series showing variability of proximal fusion of blades; E. from right coxa I (male, JC-1954.01001 [two spines broken]), F. from left coxa I (male, DM-10.04001), G. from right coxa I (Muchmore's paratype male, WM 392.02004).

As discussed above, *P. newelli* is clearly conspecific with *P. incognitus*, and thus are synonymous.

EMENDED DIAGNOSIS: Small, four-eyed species of typical generic facies, sexually dimorphic in size and chelal shape.

MALE: Carapace often constricted posteriorly; posterior margin lightly sclerotized or membranous medially; entire carapace including membranous portion longer than broad (Fig. 1B); derm reticulate; lateral and extreme anterio-medial margins delicately spinose-reticulate; epistomal process vestigial, consisting of a low, rounded elevation protruding slightly from a weak, median concavity, the anterior margin reflecting the minutely spinose carapacal derm, at most microdenticulate (Fig. 1C); four well-developed eyes, anterior pair strongly corneate and approximately one ocular diameter from anterior carapacal margin, posterior pair less developed, interocular distance one-half ocular diameter; chaetotaxy m4m-2(16).

40

Abdomen typical of the genus; tergal and sternal scuta entire; derm of sternites and tergites reticulate, minutely spinose laterally; pleural membrane minutely spinose; genital area typical. Range of variation in abdominal chaetotaxy as shown in Table 1; abdominal

chaetotaxy of holotypic terga 2:4:4:4:6:6:6:7:5:4:2:0, of sterna $11:(4-4):(3)\frac{4-5}{6}(3):(3)8(3):$ 12:12:11:11:7:6:0:mm.

Coxal area of typical generic facies; chaetotaxy normally 2-2-1:0-3-2-CS:2-2:2-3:2-3; apical process of coxa I broadly rounded; coxal spines comprise a transverse row of six to 10 blades arising individually from sclerotized, closely contiguous, ball-shaped pedistals which appear partially fused in some cases, each blade, except the most medial, is trifid, the apex of the central ramus acumino-spatulate and extending well beyond the lateral rami (Fig. 1D-G); intercoxal tubercle present between bases of coxae III and IV bearing two stout setae.

Chelicera (Fig. 1A, B) of typical facies, shorter than carapace and robust (1.8 to 2.2 times as long as broad); galea a very low rounded elevation to vestigial; serrula exterior of 18 to 20 blades; serrula interior of 16 to 18 blades; flagellum comprised of a biseriate row of 11 pinnate setae; fixed finger with a large median tooth and one to three microdenticles which grade into a pronounced acumino-granulate field basally; movable finger with four to six medially placed microdenticles preceded basally by a distinct granulate field; hand with small accessory seta in addition to usual *is, es, sb,* and *b* (total of five).

Palp of typical generic facies; derm of all podomeres uniformly reticulated except for distal portion of chelal fingers; vestitural setae simple acuminate. Palpal proportions: trochanter 1.4–1.8, femur 4.2–5.4, and tibia 1.9–2.2 times as long as broad; chela 4.4–5.1 times as long as broad or deep; movable finger 1.6–1.8 times as long as hand.

Chela moderately robust, heterocurvidigitate and gaping; movable finger distinctly shorter than fixed finger, apex approximating fixed finger at region of diploid setae; chaetotaxy and dentition as illustrated (Fig. 2A); fixed finger with 14 to 23 widely spaced, welldeveloped, acuminate teeth which become shorter and closer basally; movable finger with variable dentition, consisting of a distal series of six to eight low, blunt, poorly sclerotized, lightly pigmented, and basally inclined moderately prominent to inconspicuous marginal teeth or laminae, and a basal series of five to 12 minute, spaced microdenticles observable in the most denticulate specimens.

Legs of typical structure; derm of all podomeres distinctly reticulated; leg IV with welldifferentiated tactile setae on tibia (two, with indices of 0.26–0.33 and 0.64–0.78), metatarsus (one, index of 0.23–0.33), and telotarsus (one, index of 0.23–0.36). Leg I: basifemur 4.4–5.2, telofemur 3.2–3.6, tibia 3.3–3.7, and miotarsus 7.3–8.8 times as long as deep. Leg IV: "miofemur" 2.7–3.4, tibia 4.6–5.4, metatarsus 2.6–3.4, and telotarsus 9.0–11.0 times as long as deep.

MEASUREMENTS (in mm.), MALE: body length 1.43-1.84; abdominal breadth 0.50-0.70. Carapace: median sclerotized length 0.38-0.44, ocular breadth 0.35-0.45; anterior eye diameter 0.04-0.05. Chelicera 0.31-0.38 long by 0.15-0.19 broad. Palp: trochanter 0.17-0.21 by 0.10-0.14; femur 0.49-0.66 by 0.11-0.13; tibia 0.22-0.28 by 0.11-0.14; chela 0.79-0.94 by 0.15-0.21 broad or deep; hand 0.30-0.35 long; movable finger 0.50-0.62 long. Leg I: basifemur 0.33-0.40 by 0.07-0.08; telofemur 0.21-0.26 by .06-0.08; tibia 0.16-0.21 by 0.05-0.06; miotarsus 0.35-0.44 by 0.04-0.06. Leg IV: "miofemur" 0.52-0.61 by 0.17-0.23; tibia 0.38-0.47 by 0.08-0.10; metatarsus 0.17-0.21 by 0.06-0.08; telotarsus 0.41-0.48 by 0.04-0.05.

FEMALE: In general, similar to but larger in size than male.

Genital area typical, lateral cribriform plates elongate, transverse, and often overlapping the more conspicuous median cribriform plate. Range of variation in abdominal chaetotaxy as shown in Table 1; abdominal chaetotaxy of allotypic terga 2:4:4:4:6:6:7:7:5:4:2:0; of sterna 5:(3)8(3):(3)8(3):13:12:11:10:8:6:0:mm.

		TERG	ITES			STERNI	TES	
Segment	Male	Female	Trito- nymph	Deuto- nymph	Male	Female	Trito- nymph	Deuto- nymph
Ι	2	2	2	2	7 to 12	4 to 8	4	2
П	2 to 4	4	4	4	(4-4)			
III	4	4	4	4	(3)5 to 6-4 to 7(3)	(3)7 to 10(2 to 3)	(2)5 to 6(2)	(1)2(1)
					6 to 8			
IV	4 to 5	4 to 5	4	4	(2 to 3)6 to 9(2 to 3)	(3)6 to 9(2 to 3)	(2)6(2)	(1)4(1)
Λ	9	5 to 6	9	9	12 to 14	11 to 16	9 to 11	9
ΝI	6 to 7	6 to 7	9	9	10 to 13	11 to 13	9 to 10	9
ΠΛ	6 to 7	6 to 7	5 to 7	7	9 to 12	10 to 13	8 to 10	1
IIIV	6 to 8	6 to 7	2	9	7 to 11	8 to 11	7 to 10	7
IX	4 to 5	4 to 5	ю	S	6 to 9	7 to 9	5 to 7	1
X	3 to 5	4 to 5	4 to 5	4	5 to 7	5 to 7	4 to 6	Ŋ
IX	2	2	2	2	01	0	0	0
IIX	0	0	0	0	mm	mm	mm	mm

42

NEW YORK ENTOMOLOGICAL SOCIETY

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FIG. 2. Pseudotyrannochthonius incognitus (Schuster). Comparable structures drawn to the same scale as those in Fig. 3. A. External aspect of left chela of male (holotype, UCD Type #225). B. External aspect of left chela of tritonymph (JC-1412.02001). C. Internal aspect of right chela of deutonymph (JC-1412.02002). D. External aspect of left chela of female (JC-1931.02001).

Palp, except for chela, similar to male; chela markedly sexually dimorphic, hand not only larger but tending to be broader and deeper in proportion to the length (Fig. 2D); fixed finger with 11 to 20 spaced well-developed teeth similar in form and spacing to male; dentition of movable finger similar to male except less prominent, consisting of a distal series of six to eight low, blunt and poorly sclerotized teeth and a basal series of as few as one or two to six or seven extremely minute microdenticles, visible only under high magnification and in favorably oriented specimens; movable finger always meeting fixed finger proximal to diploid setae. Palpal proportions: trochanter 1.5–1.7, femur 4.5–5.4, and tibia 1.9–2.1 times as long as broad; chela 3.8–4.4 times as long as broad or deep; movable finger 1.6–1.8 times as long as hand.

Leg IV with well-differentiated tactile setae on tibia (two, with indices of 0.26–0.31 and 0.66–0.70), metatarsus (one, index of 0.24–0.36) and telotarsus (one, index of 0.23–0.33). Leg I: basifemur 4.5–5.1, telofemur 3.0–3.7, tibia 3.1–3.4, and miotarsus 7.6–8.9 times as long as deep. Leg IV: "miofemur" 2.8–3.5, tibia 4.3–5.5, metatarsus 2.6–3.1, and telotarsus 8.9–10.0 times as long as deep.

MEASUREMENTS (in mm.), FEMALE: body length 1.67–2.21; abdominal breadth 0.59–0.84. Carapace: median sclerotized length 0.41–0.50, ocular breadth 0.45–0.57; anterior eye diameter 0.04–0.05. Chelicera 0.38–0.47 long by 0.19–0.23 broad. Palp: trochanter 0.20–0.25 by 0.12– 0.15; femur 0.59–0.76 by 0.13–0.15; tibia 0.27–0.32 by 0.14–0.15; chela 0.89–1.11 by 0.22–0.27 broad or deep; hand 0.32–0.40 long; movable finger 0.59–0.71 long. Leg I: basifemur 0.37–0.46 by 0.08–0.10; telofemur 0.23–0.29 by 0.07–0.09; tibia 0.18–0.23 by 0.06–0.07; miotarsus 0.40–0.50 by 0.05–0.06. Leg IV: "miofemur" 0.55–0.68 by 0.18–0.22; tibia 0.41–0.52 by 0.08–0.11; metatarsus 0.18–0.24 by 0.07–0.08; telotarsus 0.42–0.53 by 0.05–0.06.

TRITONYMPH: Much like adult in general conformation but lighter in color and smaller in size.

Carapacal and dorsal abdominal chaetotaxy similar to adult, ventral chaetotaxy not as extensively developed both on abdominal sternites (Table 1) and on coxae (2-2-1:0-3-1-CS: 2-2:2-2); coxal spines similar morphologically but fewer in number (usually six trifid and one medial simple blade); intercoxal tubercle present; cheliceral chaetotaxy as in adult.

Three tactile setae on movable finger of chela (SB, ST, T) and seven on fixed finger of chela (Fig. 2B); dentition of chelal fingers typical of species but more conspicuous on movable finger than in adult; fixed finger with 15–20 macrodenticles, movable finger with variable dentition, a total of approximately 18 "teeth" in the most denticulate specimens consisting of a distal series of seven to 10 blunt, poorly sclerotized, lightly pigmented, and basally inclined prominent marginal teeth, and a basal series of nine to 11 minute, spaced microdenticles. Palpal proportions: trochanter 1.5–1.7, femur 4.3–4.8, and tibia 1.9–2.1 times as long as broad; chela 4.1–4.7 times as long as broad or deep; movable finger 1.6–1.8 times as long as hand.

Legs of typical structure; leg IV with tactile setae on tibia (two, with indices of 0.26–0.34 and 0.63–0.69), metatarsus (one, index of 0.23–0.31), and telotarsus (one, index of 0.23–0.31). Leg I: basifemur 3.8–4.5, telofemur 2.8–3.2, tibia 2.7–3.3, and miotarsus 6.3–7.2 times as long as deep. Leg IV: "miofemur" 2.7–3.2, tibia 4.2–4.9, metatarsus 2.2–2.8, and telotarsus 7.4–8.3 times as long as deep.

MEASUREMENTS (in mm.), TRITONYMPH: body length 1.16-1.35; abdominal breadth 0.32-0.54. Carapace: median sclerotized length 0.34-0.38, ocular breadth 0.26-0.38; anterior eye diameter 0.04. Chelicera 0.30-0.32 long by 0.15-0.16 broad. Palp: trochanter 0.16-0.18 by 0.09-0.12; femur 0.44-0.52 by 0.10-0.11; tibia 0.20-0.23 by 0.11-0.12; chela 0.62-0.75 by 0.14-0.17 broad or deep; hand 0.24-0.28 long; movable finger 0.39-0.50 long. Leg I: basifemur 0.27-0.32 by 0.06-0.08; telofemur 0.17-0.20 by 0.06-0.07; tibia 0.13-0.17 by 0.05; miotarsus 0.29-0.35 by 0.05. Leg IV: "miofemur" 0.38-0.46 by 0.14-0.16; tibia 0.29-0.35 by 0.07-0.08; metatarsus 0.13-0.16 by 0.05-0.07; telotarsus 0.31-0.37 by 0.04-0.05.

DEUTONYMPH: (Based on specimen JC-1412.02002). Similar to adult but much smaller, paler, derm less well-sclerotized, eyes less well-developed.

Carapace and dorsal abdominal chaetotaxy similar to adult, chaetotaxy of ventral surface not as extensively developed as adult or tritonymph both on abdominal sternites (Table 1) and on coxae (2-2-1:0-2-0-CS:2-1:2-1:2-1); coxal spines of typical adult configurations but with fewer blades (five trifid and one simple medial blade); bisetose intercoxal tubercle present; hand of chelicera with one less seta than adult or tritonymph (*b* missing).

Movable finger of chela with two tactile setae, fixed finger with six tactile setae (Fig. 2C); chelal dentition, especially of movable finger, more prominent than either adult or tritonymph, fixed finger with 16 spaced macrodenticles, movable finger with seven conspicuous teeth preceded basally by three reduced and less distinct denticles. Palpal proportions: trochanter 1.5, femur 3.8, and tibia 1.8 times as long as broad; chela 4.2 times as long as broad or deep; movable finger 1.7 times as long as hand.

Legs typical of species; leg IV with differentiated tactile setae on tibia (two, with indices of 0.25 and 0.64), metatarsus (one, index of 0.23), and telotarsus (one, index of 0.17). Leg I:

basifemur 3.4, telofemur 2.3, tibia 2.5, and miotarsus 6.4 times as long as deep. Leg IV: "miofemur" 2.9, tibia 3.9, metatarsus 2.2, and telotarsus 5.8 times as long as deep.

MEASUREMENTS (in mm.), DEUTONYMPH: body length approximately 0.91; abdominal breadth approximately 0.30. Carapace: median sclerotized length 0.29; ocular breadth 0.29; anterior eye diameter 0.03. Chelicera 0.23 long by 0.12 broad. Palp: trochanter 0.13 by 0.08; femur 0.34 by 0.09; tibia 0.16 by 0.09; chela 0.51 by 0.12 broad or deep; hand 0.20 long; movable finger 0.34 long. Leg I: basifemur 0.20 by 0.06; telofemur 0.12 by 0.05; tibia 0.11 by 0.05; miotarsus 0.24 by 0.04. Leg IV: "miofemur" 0.31 by 0.11; tibia 0.23 by 0.06; metatarsus 0.10 by 0.05; telotarsus 0.26 by 0.05.

ECOLOGY: The authors' fieldwork supports Schuster's observation (1966) that *Pseudotyrannochthonius incognitus* is "widespread and rarely collected." Populations of the species appear to be highly localized as indicated by the erratic recovery of specimens from seemingly suitable microhabitats; generally, population levels have been found to be low.

The species, though never abundant, is widely distributed in the lowland (sea level to approximately 2,000 ft. elev.) humid Transition Life Zone west of the Cascade Mountains of the Pacific Northwest, from at least Skamania County, Washington, south to Humboldt County, California. Schuster records a tritonymph from Idaho. Throughout its distribution, the species is typically associated with leaf litter, soil, and decomposing wood from beneath such dominant deciduous species as: Acer macrophyllum Pursh, A. circinatum Pursh, Alnus rubra Bong., or Quercus (Tourn.) L. spp. Frequently the above species are associated in second growth timber with at least one of the following conifers: Pseudotsuga menziesii (Mirb.) France, Tsuga heterophylla (Raf.) Sarg., Thuja plicata Donn., or Picea sitchensis (Bong.) Carr. Samples of coniferous litter unmixed with deciduous components, or duff of pure Quercus, or of Populus trichocarpa T. and G. or of Populus tremuloides Michx., though yielding other chthoniids, have proven unproductive of Pseudotyrannochthonius incognitus.

Hoff (1959, p. 58) found in New Mexico that "interspecies competition is so great that pseudoscorpions of related species and genera are seldom taken in the same collection." This rigorous inter-generic competition does not appear to be exhibited in the soil-humus inhabiting genera of Chthoniidae in the Pacific Northwest. Representatives of at least one other chthoniid genus were found in all but one of the 39 collections of *P. incognitus* belonging to the authors. Most frequently the genus *Apochthonius* Chamberlin is associated, but often *Mundochthonius* Chamberlin, and sometimes *Kleptochthonius* Chamberlin, are collected with *Pseudotyrannochthonius*.

Collection data for 137 specimens from 46 separate collections made over a span of years were pooled and analyzed by month. With the exception of a single deutonymph, the only nymphal forms recovered to date have been trito-nymphs. Although field searches were fairly evenly distributed throughout the year, nymphs have been collected only from midsummer to late autumn (July–November). Adults have been recovered during all months of the year; however,

both sexes were collected in greatest number during the winter and spring (November–April), the population reaching a peak in December. Despite nearly equal frequencies of males and females found in midwinter, the widely disparate sex ratios observed during summer produce an overall sex ratio of approximately twice as many males as females collected. This preliminary analysis suggests that detailed investigation of the life history of the species and of annual densities in natural populations would be fruitful. Adequate verification of population dynamics, however, is contingent upon the refinement of specialized statistical field techniques suitable for the study of chthoniids.

TYPE RECORDS:

California. Humboldt County: 18.0 miles south of Klamath (Del Norte County), 13 August 1953, two tritonymphs.

Idaho. Shoshone County: Jct. Nicolas Creek and Coeur d'Alene River, 29 July 1959, one tritonymph.

Oregon. Douglas County: Loon Lake, 30 June 1959, one male [UCD Type #225, holotype of *Allochthonius incognitus* (Schuster 1966, p. 174) = *Pseudotyrannochthonius incognitus* (Muchmore 1967, p. 134)]; 1.1 mile east of Scottsberg, 2 July 1959, one male. Washington County: 2.0 miles south of Timber, 1 December 1948, four males and one female [WM 392.02002 allotype of *Pseudotyrannochthonius newelli* (Muchmore 1967, p. 134), hereby designated as allotype of *P. incognitus*].

NEW RECORDS:

California. Huhboldt County: Dry Lagoon State Park, 114.0 miles north of county line, 22 March 1967, one male.

Oregon. Benton County: 6 miles west of Greenberry, 3 March 1937, two males and two females; state highway 34, Benton County Line, 15 September 1960, two males. Clackamas County: 1.5 miles east of Beaver Creek, 4 February 1967, one female; approximately 4 miles north of Sandy, 30 December 1967, one male and seven females; approximately 4 miles north and 1 mile west of Sandy, 30 December 1967, one male. Coos County: Marine Institute of Biology, Charleston, 13 August 1956, one male, 30 April 1967, one male. Curry County: 2 miles south of Denmark, 27 April 1937, two males; Humbug Mountain State Park, 6 miles south of Port Orford, 15 September 1960, three tritonymphs; 1.5 miles south of Nesika Beach, 29 January 1967, seven males and one female; 4.5 miles south of Gold Beach, 30 January 1967, two males. Douglas County: 19 miles north of Wolf Creek, 6 April 1937, one male; Cottage Grove, 18 April 1937, one male; Canyon Creek, November 1937, one female. Lane County: Walton, 1 December 1957, two males and five females; 6 miles north of Noti, 15 September 1960, one tritonymph; 2 miles west of Noti, 15 September 1960, five tritonymphs. Lincoln County: Five Rivers (Alsea River), 13 March 1937, two females; 7.7 miles northwest of Eddyville, 20 June 1966; two males and one female. Linn County: 5 to 6 miles east of Mill City, September 1941, one deutonymph and one tritonymph. Marion County: Fern Ridge Road, Mill Creek between Stayton and Mehama, 28 September 1941, one male and two tritonymphs; 4 miles southwest of Silver Falls State Park, 5 March 1967, two males; 10 miles southwest of Silverton on state highway 214, 5 March 1967, three males. Multnomah County: Section Line Road, 4 miles east of Gresham, 15 July 1967, three nymphs, 30 December 1967, nine males; Oneonta Trail, near Oneonta Falls, 33 miles east of Portland, November 1967, one male. Tillamook County: Tierra Del Mar, 6 March 1955, one male; Cape Lookout State Park, 12 miles southwest of Tillamook, 29 August 1966, three tritonymphs, 9 April 1967, one male; 10.5 miles east of Tillamook,

13 November 1966, one female; Camp West Wind, 4.5 miles north of Otis Junction, one female. Washington County: "Government Lot," Forest Grove, 18–24 April 1941, one male and one female; Timber, 19 April 1941, two males; 2 miles west of Forest Grove, 15–16 April 1942, two males; 4 miles west and 3 miles north of Forest Grove, 30 October 1966, six tritonymphs, 26 November 1966, four males, one female and one tritonymph, 18 December 1966, seven males and eight females; Bishop Road, 2 miles north of Helvetia, 1 November 1966, two males and two females, 21 January 1968, two males and one female.

Washington. Skamania County: 0.9 miles due north from USGS Gaging Station on Lewis River of Swift Res., 21 June 1966, one male and one female.

Pseudotyrannochthonius gracilis n. sp. (Fig. 3)

DIAGNOSIS: Relatively small, four-eyed species with facies typical of the genus; sexually dimorphic in size, and chelal shape; derm reticulated throughout. In life, specimens are delicate in appearance, with pale tan, almost transparent legs; light tan palps; chelicerae tan with reddish-brown fingers; greenishgray carapace and tergites.

MALE: (Holotype followed by paratypic variation in parentheses). Carapace constricted caudally; posterior margin lightly sclerotized medially; entire carapace, including membranous portion, longer than ocular breadth; heavily reticulate derm obviously spinose laterally and lightly spinose anteriorly; epistomal process vestigial, consisting of a low, rounded elevation protruding only partially from a median concavity, anterior margin microdenticulate (Fig. 3C); four well-developed eyes, anterior pair strongly corneate and located approximately one and one-half ocular diameters from anterior carapacal margin, posterior pair less developed, interocular distance one-quarter ocular diameter or less; chaetotaxy m4m-2(16).

Structure of abdomen typical; tergal and sternal scuta entire and obviously minutely spinose laterally; pleural membrane minutely spinose; male genitalia typical. Abdominal chaetotaxy of terga 2:4:4:4:6:6:7:7:5:4:2:0, of sterna $11:(4-4):(3)\frac{5-5}{10}(3):(3)8(3):13:12:11:$ 10:7:6:0:mm. [range of male types 9 to 12:(4-4):(2 to $3)\frac{4-4}{8}$ to $\frac{1}{3}(3):(3)6$ to 8(3):11 to

14:11 to 13:10 to 11:9 to 11:7 to 8:6 to 8:0:mm.].

Coxal area of typical generic facies; chaetotaxy normally 2-2-1:0-3-2-CS:2-2:2-3:2-3; apical process of coxa I broadly rounded and non-setose; a total of eight or nine coxal spines on each coxa I in a transverse series of eight (six to nine) trifid and one (or two) simple medial blades which arise from a lightly sclerotized or translucent hillock, the central ramus of each blade sharply acumino-spatulate and extending beyond the lateral rami (Fig. 3F); intercoxal tubercle with two stout setae.

Chelicera (Fig. 3C, D, E) typical of the genus, shorter than carapace and robust (2.2 [1.9–2.2]) times as long as broad; galea a low, rounded elevation to vestigial; serrula exterior of approximately 20 blades; serrula interior of 16 to 17 blades; flagellum a biseriate row normally of 11 pinnate setae; fixed finger with a large median tooth and one to two smaller marginal denticles which grade into a very prominent acumino-granulate field basally; movable finger with five to eight medially placed marginal microdenticles which generally



FIG. 3. *Pseudotyrannochthonius* gracilis n. sp. Comparable structures drawn to the same scale as those in Figs. 1 and 2. A. External aspect of left chela of male (JC-1967.02001). B. Dorsal aspect of left palp of male (DM-366.01001). C. Carapace and right chelicera (holo-type male). D, E. Variable dentition of cheliceral fixed finger; D. holotype male, E. male (DM-366.01002). F. Coxal spine series from right coxa I (male, JC-1967.02001). G. External aspect of left chela of female (allotype).

intergrade with a basal granular field; hand normally with one small accessory seta in addition to *is*, *es*, *sb*, *b* (total of five).

Palp (Fig. 3B) of typical generic facies; derm of podomeres reticulate; vestitural setae simple acuminate. Palpal proportions: trochanter indeterm. (1.7), femur 5.2(5.1-5.6), and tibia 2.1(2.1-2.2) times as long as broad; chela 4.7(4.7-5.1) times as long as broad or deep; movable finger 1.7(1.6-1.7) times as long as hand.

Chela moderately robust; fingers curved and gaping; movable finger distinctly shorter than fixed finger and meeting it proximal to the diploid setae; chaetotaxy and dentition as illustrated (Fig. 3A); fixed finger with 22(16–22) well-developed acuminate teeth which become smaller and closer together basally; movable finger superficially "toothless" but under high magnification seen to bear a distal series of approximately six (six to eight) very lightly sclerotized and poorly pigmented low, basally-inclined, elongate laminae and a basal series of three to seven extremely minute, spaced microdenticles.

Legs of typical structure; derm of all podomeres distinctly reticulated; leg IV with welldifferentiated tactile setae on tibia (two, with indices of 0.30[0.26-0.32] and 0.66[0.65-0.68]), metatarsus (one, index of 0.28[0.25-0.30]), and telotarsus (one, index of 0.32[0.25-0.33]). Leg I: basifemur 4.7(4.7-5.0), telofemur 3.9(3.6-3.9), tibia 3.7(3.4-3.7), and miotarsus 8.5 (8.5-8.7) times as long as deep. Leg IV: "miofemur" 3.3(3.0-3.3), tibia 5.2(4.9-5.4), metatarsus 3.1(2.9-3.1), and telotarsus 9.8(9.2-9.8) times as long as deep.

MEASUREMENTS (in mm.), MALE (holotype and range for all male types): body length 1.85(1.73-1.85); abdominal breadth 0.68(0.54-0.68). Carapace: median sclerotized length 0.46(0.44-0.48), ocular breadth 0.48(0.39-0.48); anterior eye diameter 0.05(0.04-0.05). Chelicera 0.43(0.38-0.43) long by 0.20(0.18-0.20) broad. Palp: trochanter indeterm. (0.22-indeterm.); femur 0.72(0.68-0.72) by 0.14(0.13-0.14); tibia 0.30(0.26-0.30) by 0.14(0.13-0.14); chela 1.04(0.98-1.04) by 0.23(0.19-0.23) broad or deep; hand 0.39(0.36-0.39) long; movable finger 0.65(0.62-0.65) long. Leg I: basifemur 0.40(0.38-0.41) by 0.09(0.08-0.09); telofemur 0.27(0.26-0.27) by 0.08(0.07-0.08); tibia 0.22(0.20-0.22) by 0.06(0.05-0.06). Jeg IV: "miofemur" 0.65(0.62-0.65) by 0.20(0.20-0.22); tibia 0.50(0.47-0.50) by 0.10(0.09-0.10); metatarsus 0.23(0.22-0.23) by 0.08(0.07).

FEMALE: (Allotype followed by paratypic variation in parentheses): Very similar to male but larger.

Genital area of typical facies. Abdominal chaetotaxy of allotypic terga 2:4:4:4:6:6:7:7:5: 4:2:0, of allotypic sterna 8:(3)10(3):(3)8(3):12:12:11:9:7:6:0:mm.

Palp except for chela similar to male; chela sexually dimorphic, hand not only larger but markedly broader and deeper in proportion to length (Fig. 3G); teeth of both fingers similar to male in form and spacing, fixed finger with 17-20 well-developed teeth and movable finger with six to eight poorly developed teeth; tip of movable finger always meeting fixed finger proximal to diploid setae. Palpal proportions: trochanter 1.6, femur 5.1(5.1-5.5), and tibia 2.1(2.1-2.2) times as long as broad; chela 4.1(4.0-4.4) times as long as broad or deep; movable finger 1.8(1.8-1.9) times as long as hand.

Leg IV with well-differentiated tactile setae on tibia (two, with indices of 0.29[0.26-0.29] and 0.65[0.65-0.67]), metatarsus (one, index of 0.28[0.26-0.29]), and telotarsus (one, index of 0.30[0.30-0.32]). Leg I: basifemur 5.0(4.9-5.2), telofemur 3.5(3.5-3.8), tibia 3.7(3.3-3.7), and miotarsus 8.3(8.3-8.7) times as long as deep. Leg. IV: "miofemur" 3.2(3.2-3.4), tibia 5.0(5.1-5.4), metatarsus 3.1(3.1-3.3), and telotarsus 10.3(10.3-10.8) times as long as deep.

MEASUREMENTS (in mm.), FEMALE (allotype and range for all female types): body length 1.89(1.89–2.43); abdominal breadth 0.72(0.68–0.78). Carapace: median sclerotized length 0.50(0.49–0.51), ocular breadth 0.52(0.45–0.52); anterior eye diameter 0.05(0.04–0.05). Che-

NEW YORK ENTOMOLOGICAL SOCIETY

licera 0.49(0.45-0.50) long by 0.23(0.21-0.23) broad. Palp: trochanter 0.26 by 0.16 (range indeterm.); femur 0.78(0.77-0.78) by 0.15(0.14-0.16); tibia 0.33(0.32-0.35) by 0.16(0.14-0.16); chela 1.13(1.12-1.13) by 0.28(0.26-0.28) broad or deep; hand 0.42(0.39-0.42) long; movable finger 0.73(0.71-0.74) long. Leg I: basifemur 0.45(0.44-0.46) by 0.09(0.09); telofemur 0.29(0.28-0.30) by 0.08(0.08); tibia 0.25(0.22-0.25) by 0.07(0.06-0.07); miotarsus 0.50(0.47-0.50) by 0.06(0.06). Leg IV: "miofemur" 0.71(0.71) by 0.22(0.20-0.22); tibia 0.53(0.53-0.54) by 0.11(0.10-0.11); metatarsus 0.26(0.25-0.26) by 0.08(0.08-0.09); telotarsus 0.54(0.53-0.54) by 0.05(0.05).

REMARKS: This species appears to exhibit an unusually high frequency of intraspecific variation in several morphological characters. For example, the large marginal denticles of the cheliceral fixed finger exhibit great variation, both between right and left chelicerae on a single specimen, and between individuals (Fig. 3D, E). The species also shows frequent doubling or deletion of setae. All but one of the paratypes show one or more deviations from the "normal" chaetotaxy of the carapace, chelicerae, coxal area, or abdomen. Examples of variation from the usual pattern of chaetotaxy are as follows: one specimen showing loss on the carapace of one anterior marginal seta, resulting in a distribution of m3m-2(15); four specimens with two accessory setae on the hand of the right chelicera and a single accessory seta on the hand of the left chelicera; three specimens with a doubling or loss of setae on a single coxa only (1 or 2-2-1: 0-3 or 4-2-CS:2-1 or 2:2-3:2-3); and four specimens with doubled setae on several abdominal tergites or sternites.

ECOLOGY: Despite extensive collecting efforts made throughout the year from west central Washington southward into California, this new species has been found only during the winter months of November through February at extremely low population levels in the lowlands near Puget Sound in Washington and near the Smith River in northern California. Unlike Pseudotyrannochthonius incognitus, this species appears to be associated with either moss or coniferous duff rather than with deciduous debris. Pseudotsuga menziesii (Mirb.) (in Washington) and Sequoia sempervirens Endl. (in California), with no significant associated deciduous species, were the dominant trees at the successful collection sites. Although most specimens have been recovered from a dense groundcover of moss or duff with no shrub layer present, some specimens have been collected from beneath an almost impenetrable broad-leaf evergreen shrub layer of Vaccinium ovatum Pursh and Gaultheria shallon Pursh under second-growth P. menziesii. Berlese extraction of a large number of collections from the type localities and adjacent areas made over a period of two years, although yielding several hundred chthoniids in all stages of development, produced only 10 adult specimens of Pseudotyrannochthonius gracilis. Representatives of the genera Kleptochthonius, Apochthonius, Mundochthonius, and Microcreagris Balzan are abundantly present at the type locality.

RECORDS: (all specimens collected by authors except as noted).

California. Del Norte County: along Smith River, near Crescent City, 9 November 1956, Vestres and Schuh collectors, one paratype male (DM-90.01001).

Washington. Mason County: 2.0 miles south and 0.5 miles west of Grapeview, 25 November 1967, one paratype male (DM-352.01001), 21 January 1968, two paratype females (DM-363.01001, DM-363.01002); 1.5 miles south and 0.5 miles west of Grapeview, 21 January 1968, two paratype males (DM-366.01001, DM-366.01002); 2.5 miles north of Grant, 21 January 1968, paratypes, one female and one male (DM-365.01001, DM-365.01002). Thurston County: Puget, 11 February 1932, W. W. Baker collector, one paratype male (JC-1967.02001), 27 December 1966, male holotype (DM-236.01001) and female allotype (DM-237.01001).

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